TURKISH TEXT TO SPEECH SYSTEM

A THESIS

SUBMITTED TO THE DEPARTMENT OF COMPUTER ENGINEERING

AND THE INSTITUTE OF ENGINEERING AND SCIENCE OF

BILKENT UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

By

Barış Eker

January, 2002

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

Advisor: Prof. Dr. H.Altay Güvenir

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

Co-Advisor: Asst. Prof. Dr. İlyas Çiçekli

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

Prof. Dr. Cevdet Aykanat

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

Assist. Prof. Dr. David Davenport

Approved for the Institute of Engineering and Science:

Prof. Dr. Mehmet Baray

Director of the Institute of Engineering and Science

ABSTRACT

TURKISH TEXT TO SPEECH SYSTEM

Barış Eker
MS in Computer Engineering
Supervisor: Asst.Prof.İlyas Çiçekli
January, 2002

Scientists have been interested in producing human speech artificially for more than two centuries. After the invention of computers, computers are used in order to synthesize speech. By the help of this new technology, Text To Speech (TTS) systems that take a text as input and produce speech as output were started to be created. Some languages like English and French has taken most of the attention and some languages like Turkish has not been taken into consideration.

This thesis presents a TTS system for Turkish that uses diphone concatenation method. It takes a text as input and produces corresponding speech in Turkish. The output can be obtained in one male voice only in that system. Since Turkish is a phonetic language, this system also can be used for other phonetic languages with some minor modifications. If this system is integrated with a pronunciation unit, it can also be used for languages that are not phonetic.

Keywords: Text To Speech, TTS, Turkish, Speech Synthesis, Diphone Concatenation

ÖZET

TÜRKÇE METİN SESLENDİRME

Barış Eker
Bilgisayar Mühendisliği, Yüksek Lisans
Tez Yöneticisi: Yrd. Doç. Dr. İlyas Çiçekli
Ocak, 2002

Bilim adamları sesin yapay olarak üretilmesi konusunda iki yüzyılı aşkın bir süredir çalışıyorlar. Bilgisayarın icadından sonra, ses üretmek için bilgisayarlar kullanılmaya başlandı. Bu yeni teknolojinin yardımıyla girdi olarak bir metin alıp bu metnin sesli olarak okunmuş halini üreten "Metin Seslendirme" sistemleri üretilmeye başlandı. İngilizce ve Fransızca gibi bazı diller araştırmacıların ilgisini çekerken, Türkçe gibi diller konusunda çok fazla çalışma yapılmadı.

Bu tezde Türkçe için ikili fonem birleştirme tekniğini kullanan bir "Metin Seslendirme" sistemi anlatılmaktadır. Sistem girdi olarak bir metin alır ve çıktı olarak bu metne karşılık gelen Türkçe sesleri üretir. Türkçe fonetik bir dil olduğu için bu sistem, ufak değişikliklerle benzer fonetik diller için de kullanılabilir. Eğer sisteme bir telaffuz ünitesi entegre edilirse, sistem fonetik olmayan diller için de kullanılabilir.

Anahtar Kelimeler: Metin Seslendirme, Türkçe, Ses Sentezi, İkili Fonem Birleştirme

ACKNOWLEDGEMENT

I would like to thank my supervisor Prof. Dr. H. Altay Güvenir and my co-advisor Dr. İlyas Çiçekli for their guidance and encouragement to complete my thesis. This thesis would not be completed without their help.

I am also indebted to Prof. Dr. Cevdet Aykanat and Dr. David Davenport for showing keen interest to the subject matter and accepting to read and review this thesis.

I would like to thank also Göker Canıtezer for his partnership in my senior project that can be considered as the starting point of this thesis.

One of my biggest gratitude is to my family. They always supported me during my education. I thank my wonderful wife Fatma Eker for her support and tolerance during my thesis study.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 What is Text To Speech (TTS)?

Computers that can interact with human via speech had become a dream for scientists since the early stages of the computer age. Computers that can talk and recognize speech had become favorites of the science fiction films. Scientists from different areas such as computer science, electronics engineering, etc. made a lot of research on these subjects in order to reach this dream. There have been two main research areas about this: Text to speech (TTS) and Speech recognition. These two problems are analyzed differently. Scientists are now working on TTS and speech recognition systems, however, they can be combined to create a computer that can understand speech and talk in the future when the systems become accurate enough.

A TTS system is a system that can convert a given text into speech signals. The source of this text can be very different. While the output of an OCR can be an input for this system, the text that is generated by a language generation system can also be an input for a TTS system. The aim of an ideal TTS system is to be able to process any text that a human can read. For example, a TTS system should be able to read numbers, handle abbreviations, resolve different spellings for a word, etc.

A TTS system consists of mainly two parts: Text processing part and speech synthesis part. Text processing part is involved in parsing the input text and preparing input text for the speech synthesis part. Text processing part can be very complex in an ideal system.

Because, in order to be able to process any text and produce a correct result, text parsing should be very accurate. First aim of the text processing part is to divide input text into “correct subparts” that can be processed by speech synthesis part. “Correct subparts” can change according to the synthesis technique that is used in speech synthesis part. Other aim of text processing part is to determine the intonation in a word and in a sentence. This information should also be transferred to speech synthesis part in a format that it can understand. These aims are achieved to some extent in text processing parts of TTS systems regarding the quality of the system. Speech synthesis part is responsible for synthesizing the final speech. It takes the input coming from text processing part and produces output speech. There are two popular types of speech synthesis technique: Rule-based and concatenative synthesis. According to the type of the technique used, some preprocessing for the system has to be done. For example, a database for the main sound units that will be used in the synthesis should be recorded before the system starts running.

1.2 Difficulties in TTS

In order to work correctly in every case, a computer should be programmed accordingly. The programmer should predict the cases that the program can face. While this is easy for some tasks, it can be very hard to manage for some tasks like natural language processing. Since it is very hard to determine every possible input to the system, some techniques that are different from the classical programming approach should be used. However, these techniques usually offer some heuristics that give correct result in most cases but not in all cases. A TTS system deals with a natural language text, therefore a TTS system also meet such problems.

Pronunciation is one of the problems. If a language is not phonetic, then TTS system should deal with pronunciation. One solution is to record the pronunciations for all the words for some language, but this is costly solution in terms of memory. Another solution is to produce some general rules about pronunciation and applying these rules to input words. This is a better solution in terms of memory, however it requires very good

linguistic research and it may fail in some exceptional cases, since these rules may not apply to every word. Another problem is ambiguity in pronunciation; there may be several possible different pronunciations for a word and text processing part should decide which one is correct. Text processing part should also deal with abbreviations. It is very hard to create a system that can handle all abbreviations, since every day new abbreviations are added to daily life. Beside this, there may be ambiguity in abbreviations. For example, TTS system should decide whether “St.” would be pronounced as “Street” or “Saint”. Reading numbers is another hard task in TTS systems. System should first understand what kind of number it is and behave accordingly. Normal numbers are read differently from phone numbers. Also a number can be read differently, if it is a serial number of a brand. For example, in “Nokia 8850”, this should be read as “Nokia eighty-eight, fifty”, not “eight thousand eight hundred fifty”.

Deciding about the intonation is one of the most difficult tasks, since it may change in context. Consider these two cases:

-Who wants to go?
-**I** want to go.

-What do you want to do?
-I want to **go.**

While intonation is on “I” in the first example, it is on “go” in the second example. Text processing part should understand this from the contexts.

Text processing part is only half of the problem, perhaps less. After deciding on the correct pronunciation and intonation, speech synthesis part should realize this. This is a very difficult task, because perceptually identical sounds may be acoustically different in different context. For example, p’s in “speech” and “peach” are perceptually very similar; they are acoustically very different. The precise duration and frequencies of a sound depend on many factors like the segments that it precedes and follow, its place in the

word, whether it is emphasized or not, etc. As text processing part deals with intonation, it determines only where the intonation should occur for a natural speech, however it is the role of speech synthesis part to realize this. The mechanism of intonation is not fully understood yet; there are different intonation models, however none of them is successful enough to work correctly in all cases.

An ideal TTS system should be able to come up with good solutions for these problems. There is no system that can solve these problems perfectly yet, all systems try to do their best, their level of success in solving these problems determines the quality of the system.

1.3 Applications of TTS

Although we use speech a lot in our daily life, in fact we do not learn many things by speaking with respect to seeing. Generally, we prefer reading book in order to learn something, instead of listening. On the other hand, we use speech frequently. By speech, we do not need to look a direction; we do not need to hold something. Therefore, our hands and eyes are free. We can do another thing that does not require much concentration. Moreover, text to speech technology opens the computer world to blind people. They can read every text, check that what they wrote, they can reach the text parts of Internet.

Another usage of the text to speech is, by the help of the telephone line, reaching the computer from a distant place. This can be used by the reservation systems (e.g. airline, bus, etc). In addition, banking and finance corporations can use this technology to provide the account information to the user or to do new transactions by the telephone line. Therefore, people do not need to go to banks and wait for their turn to do simple transactions. Furthermore, it does not require special hardware. If a telephone can be found in any part of the world, a bank system can be reached.

Synthesized speech can also be used in many educational situations. A computer with a speech synthesizer can teach 24 hours a day and 365 days a year. It can be programmed

for special tasks like teaching spelling and pronunciation for a lot of different languages. Electronic mail has become one of the mostly used ways of communication. However, sometimes it is impossible to reach emails. To solve this problem, some systems that can read emails are developed. Customer uses his telephone to listen his emails. These systems should be interactive in order to be useful. Ideally, people should interact via speech with system however this requires an automatic speech recognition system. Technology is away from understanding fluent speech, however systems that can understand some simple commands like "ok", "cancel", "next", etc. are available.

1.4 A Short History of TTS

History of TTS starts after the invention of first computer, because a text to speech system needs a computer. It should be able to convert a given text into speech automatically. However, early efforts about speech synthesis were made over two centuries ago. Russian Professor Christian Kratzenstein explained physiological differences between five long vowels (/a/, /e/, /i/, /o/, and /u/) and created a system to produce these sounds artificially in 1779 in St.Petersburg [27, 29].

Wolfgang von Kempelen made a machine called as “Acoustic-Mechanical Speech Machine” which was able to produce single sounds and some sound combinations, in 1791 in Vienna [28, 29]. In fact, he started his research before Kratzenstein, in 1769, and he also published a book about his studies on human speech production and his experiments with his speaking machine.

Charles Wheatstone constructed his famous version of von Kempelen’s speaking machine in about mid 1800’s [27]. This was a bit more complicated machine and it was able to produce vowels and most of the consonants. It was also able to produce some sound combinations and even some words.

In 1838, Willis found the connection between a specific vowel sound and the geometry of the vocal tract. He produced different vowel sounds using tube resonators that are

identical to organ pipes. He discovered that the vowel sound quality depends only on the length of the tube but not on its diameter [29].

In 1922, Stewart introduced first full electrical speech synthesis device, it was only able to produce static vowel sounds. Producing consonants or connected sounds were not possible in this system [28]. Wagner also developed a similar system. In 1939, first device to be considered as a speech synthesizer, VODER, is introduced by Homer Dudley in New York [27, 28]. Although the speech quality and intelligibility was far from good, the potential for producing artificial speech was demonstrated. The first formant synthesizer, PAT (Parametric Artificial Talker), was introduced by Walter Lawrence in 1953 [28]. In 1972, John Holmes introduced his synthesizer that he tuned by hand the synthesized sentence “I enjoy the simple life”. The quality was so good that the average listener could not tell the difference between the synthesized sound and the natural one [28].

Noriko Umeda and his companions developed the first full text-to-speech system for English in Japan. The speech was quite intelligible but monotonous and it was far away from the quality of present systems. Allen, Hunnicutt, and Klatt produced MITalk, which is used in Telesensory Systems Inc. commercial TTS system with some modifications, in 1979 in M.I.T. [1, 28].

In the late 1970’s and early 1980’s, a considerable amount of TTS products were produced commercially. There were different TTS chips that offer hardware solutions beside the software products that run on computers. After these days, a lot of TTS system, like DecTalk, Whistler, Mbrola, etc. that can be considered as successful has been created for different languages. However, more progress is needed for a system that produces quality sound in terms of both intelligibility and naturalness [4,5,10,13].

1.5 Major TTS Systems

This section describes some of the major TTS systems, developing tools and ongoing

projects. Although it is not possible to present all the systems, well-known systems are presented.

1.5.1 MITalk

This system was demonstrated in 1979 by Allen, Hunnicutt and Klatt. This was a formant synthesizer system that was developed in MIT labs. The technology used in this system formed the basis for many systems for today [1].

1.5.2 Infovox

Telia Promotor AB Infovox is one of the most famous multilingual TTS systems. The first commercial version was developed at Royal Institute of Technology, Sweden, in 1982. The synthesis method used in this system is cascade formant synthesis [18]. Currently, both software and hardware implementations of this system are available.

The latest full commercial version, Infovox 230, is available for American and British English, Danish, Finnish, French, German, Icelandic, Italian, Norwegian, Spanish, Swedish and Dutch [17]. The speech is intelligible and system has 5 different built-in voices, including male, female and child. New voices can also be added by the user.

Recently, Infovox 330 is introduced, this includes English, German and Dutch versions and other languages are under development. Unlike earlier Infovox systems, this version is based on diphone concatenation method. It is more complicated and requires more computational load.

1.5.3 Bell Labs TTS System

The current system is based on concatenation of diphones or triphones. It is available for English, German, French, Spanish, Italian, Russian, Romanian, Chinese, and Japanese [14]. Other languages are under development. Software is identical for all languages

except English, so that this can be seen as multilingual system. Language specific information needed is stored in separate tables and parameter files.

The system has good text analysis capabilities, word or proper name pronunciation, intonation, segmental duration, accenting, and prosodic phrasing. One of the best characteristics of the system is that it is entirely modular so that different research groups can work on different modules independently. Improved modules can be integrated anytime as long as the information passed among the modules are properly defined [6,14].

1.5.4 CNET PSOLA

France Telecom CNET introduced a diphone-based synthesizer that used PSOLA, which is one of the most promising methods for concatenative synthesis, in mid 1980's. The latest commercial product is available from Elan Informatique as ProVerbe TTS system. The pitch and speaking rate are adjustable in the system. The system is currently available for American and British English, German, French and Spanish.

1.5.5 ETI Eloquence

This system was developed by Eloquent Technology, Inc., USA. It is currently available for British and American English, German, French, Italian, Mexican and Castillian Spanish. There are some languages, like Chinese, under development. There are 7 different voices for every language and they are easily customizable by the user [7,8].

1.5.6 Festival TTS System

This system was developed in CSTR at the University of Edinburgh. British and American English, Spanish and Welsh are currently available languages in the system. System is available freely for educational, research and individual use [2].

1.5.7 MBROLA

This is a project that was initiated by the TCTS Laboratory in the Faculte Polytechnique de Mons, Belgium. The main goal of the project is to create a multilingual TTS system for non-commercial purposes and research oriented uses. The method used in this project is very similar to PSOLA. However, since PSOLA is a trademark of CNET, this project is named MBROLA.

MBROLA is not a complete TTS system, since it does not accept raw text as the input. It takes a list of phonemes with some prosodic information like duration and pitch and produces the output speech. Diphone databases for American/British/Breton English, Brazilian Portuguese, French, Dutch, German, Romanian and Spanish with male and female voices are available and work on databases for other languages is currently continuing [4,5,13].

1.5.8 Whistler

This is a trainable speech synthesis system that is under development at Microsoft. The aim of the system is to produce natural sounding speech and produce an output that resembles acoustic and prosodic characteristics of the original speaker. The speech engine is based on concatenative synthesis and training procedure on Hidden Markov Models [10].

1.6 Turkish Text-to-speech

Most of the research on TTS has been made on English. There has been some research for other languages like German, French, Japanese, etc. There are systems that can be considered as “good” for a lot of language. However, since there are not enough researchers on this area for Turkish, sufficient progress has not been made up to now.

Currently, there is one commercial Turkish TTS system available. The system is developed by GVZ Technologies. Their system produces an intelligible sound. Although they claim that the system produces a natural sound, it is far from producing natural sound at that point. There are currently one male and one female voice available. They claim that a new speaker can be added to system in two weeks. Although this is not an ideal TTS system, it can be considered as a good attempt to an ideal TTS system for Turkish.

Turkish is a language that is read as it is written as a difference from languages like English, German. This brings some simplicity to the system, because the system does not have to deal with how a word will be pronounced. TTS systems for languages that require a pronunciation module usually solve this problem by determining some general rules that are correct generally. Although, Turkish is a phonetic language, there are some special cases. Firstly, there are some words that have two possible pronunciations. For example, “hala” is pronounced differently in different contexts.

-Annem hala gelmedi. (This is pronounced softly)
-Babanın kız kardeşine hala denir. (This is pronounced strongly)

The system should make the decision by looking at the context. Second problem is different pronunciations for some letters. For example, in word “kağıt”, “k” is soft, so it should be pronounced accordingly. In this case, system can not understand it from the context, because this is the property of this word. System should have information about these exceptional words and be able to handle them.

If it is considered that there are some cases that even people read wrongly, creating a perfect TTS system that can read every text correctly is a very difficult task and this requires the time and effort of a big research team. Since we are only 2 people team, creating a perfect TTS system was not our aim. We thought our system as a step to a good TTS system for Turkish. We tried to concentrate on the understandability of the output speech of the system. Some other criterion like intelligibility of speech is beyond

the scope of our system.

We can consider a text as sum of paragraphs. Paragraphs consist of sentences and sentences are built from words. Therefore a TTS system should be able to read a word. Our aim in this system was to cover as much Turkish word as possible. If a system is able to pronounce words, then it is easy to combine the output words and read a sentence. After reading sentences, the system can read paragraphs, finally all texts. However, if a simple concatenation within the words is applied, the output sentence may not be as good as a human can read, but it can be understandable. Since our aim in this system was to create an understandable output speech we did not concentrate on the process between words. We thought every word in text as independent and produce the output accordingly. A system that will be built on this system can concentrate on better passing between words and sentences and a much better speech quality can be obtained.

Chapter 2

Speech Production

2.1 Human Speech Production

Speech is produced in vocal organs in human. Vocal organs can be seen in Figure 1. Lungs are the main energy source with diaphragm for speech production. The airflow is forced through the glottis between the vocal cords and the larynx to the three main cavities: vocal tract, pharynx and nasal cavity. The airflow exits from oral and nasal cavities through nose and mouth, respectively. Glottis is the most important sound source in the vocal system. It is a V-shaped opening between the vocal cords. Vocal cords act differently during speech to produce different sounds. It modulates the airflow by rapidly closing and opening, which helps to creation of vowels and voiced consonants. The fundamental frequency of vibration of vocal cords is about 110Hz with men, 200 Hz with women and 300 Hz with children. To produce stop consonants vocal cords may act from a completely closed position that prevents airflow to a totally open position. However, for unvoiced consonants like /s/ or /f/ they may be completely open. For phonemes like /h/ an intermediate position may occur.

The pharynx connects the larynx to the oral cavity. It has almost fixed dimensions, but its length may be changed slightly by raising or lowering the larynx at one end and the soft palate at the other end. The soft palate also isolates or connects the route from the nasal cavity to the pharynx. At the bottom of the pharynx are the epiglottis and false vocal cords to prevent food reaching the larynx and to isolate the esophagus acoustically from the vocal tract. The epiglottis, the false vocal cords and the vocal cords are closed during swallowing and open during normal breathing.

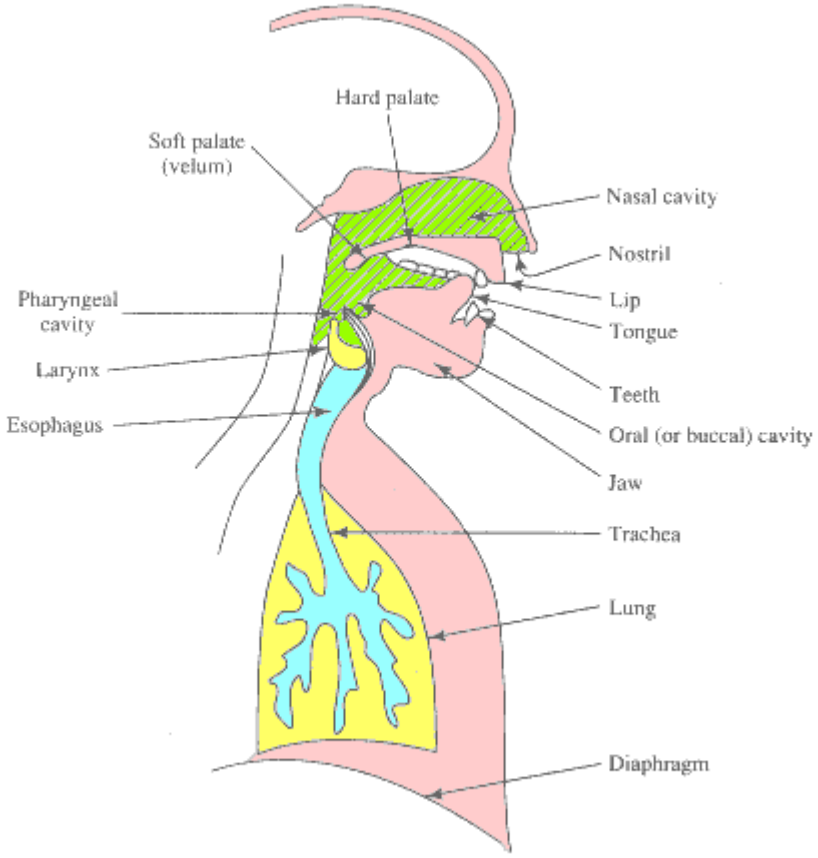

Figure 1: Vocal Organs

The oral cavity is one of the most important parts of the vocal tract. Its size, shape and acoustics can be varied by the movements of the palate, the tongue, the lips, the cheeks and the teeth. Especially the tongue is very flexible, the tip and the edges can be moved independently and the entire tongue can move forward, backward, up and down. The lips control the size and shape of the mouth opening through which speech sound is radiated. Unlike the oral cavity, the nasal cavity has fixed dimensions and shape. Its length is about 12 cm and volume 60 cm^3. The air stream to the nasal cavity is controlled by the soft palate [15,16].

2.2 Speech Synthesis Techniques

There are several methods to produce synthesized speech. All of these methods have some advantages and disadvantages. These methods are usually categorized as 3 groups: articulatory synthesis, formant synthesis, and concatenative synthesis. In this section, we will give an overview of each method.

2.2.1 Articulatory Synthesis

Articulatory synthesis method tries to model the human vocal organs as perfectly as possible, therefore it is potentially most promising method. However, it is most difficult method to implement and requires a lot of computation. Because of these reasons, this method has got less attention than other synthesis methods and has not been implemented at the same level of success with the other methods [21,22].

The vocal tract muscles cause articulators to move and change the shape of the vocal tract and this results in different sounds. The data for analysis of the articulatory model is usually derived from X-ray analysis of the natural speech. However, this data is usually obtained as 2-D although the real vocal tract is naturally 3-D. Therefore, articulatory synthesis is very difficult to model due to unavailability of sufficient data of the motions of the articulators during speech. By this method, the mass and degree of freedom of articulators also could not be considered and that causes some deficiency. The movements of tongue are so complicated that it is also very hard to model precisely.

The articulatory synthesis is very rarely used in current systems. Because analyze operation to obtain the necessary parameters for this model is a very difficult task and this model require a lot of computation in run-time. However, by the development of the analysis methods and increase in computation power may make articulatory synthesis future's method, because it seems the best model for the human speech system.

2.2.2 Formant Synthesis

This is probably the most widely used method during last decades. This is based on source-filter model. Here, source models lungs and filter models vocal tract. There are two basic structures used in this technique: cascade and parallel. However, for a better performance, usually a combination of these used. This technique also makes it possible to produce infinite number of sounds, so it is more flexible than concatenative synthesis. DECTalk, MITalk, earlier versions of Infovox are examples of systems that use Formant Synthesis method [1, 17, 18, 19].

The cascade structure is better for non-nasal voiced sounds. Since it requires less control information than the parallel structure, it is easier to implement. However, it is a problem to generate fricatives and plosive bursts. The parallel structure is better for nasals, fricatives and stop consonants, but some vowels can not be modeled with this structure. Since none of these techniques is enough to produce satisfying sound, a combination of these two is used in most of the systems [1,11,23].

Formant synthesis systems do not require a speech database; therefore they need small memory space. Also, they are able to produce different sounds, namely they are not dependent on one speaker. These are the advantages of a formant synthesis system. However, for modeling human speech some parameters should be extracted for the filter that will be used in this model. Obtaining these parameters is a difficult task. Also, these parameters should be used according to some formula and this requires some computational load in run-time. Although computational load in these systems are much less than articulatory synthesis systems, they are more than concatenative synthesis systems.

2.2.3 Concatenative Synthesis

Connecting prerecorded utterances can be considered as the easiest way to produce intelligible and natural sounding synthetic speech. However, concatenative synthesizers

are usually limited to one or a few speakers and require more memory than the other techniques require.

One of the most important steps in concatenative synthesis is to decide on the correct unit length. There is usually a trade-off between longer and shorter units. It is easier to obtain more natural sound with longer units; however in this case the amount of unit required and memory needed becomes more. When shorter units are used, less memory is needed, however preparing database requires a more precise process and usually output speech is less natural.

The decision on unit length changes according to the need of the application. Unit length can be very different in the range starting from “phoneme” and goes to “word”.

2.2.3.1 Word Concatenation

If an application with a small vocabulary is needed, such as airline reservation system, this method can easily be used. If the words are recorded separately, intonation will be lost. Moreover, system will be limited with prerecorded words. In addition to this, since the words start from zero level and finish at zero level, concatenating without further processing produces a sentence that in every word you stop for a while. If the words are taken from a sentence and there is intonation in the sentence, that will affect the system. For example, if there is intonation on “I” in sentence “I want to go” and word “I” is recorded from this sentence, the system will always read word “I” with intonation even when it is not wanted. However, these systems require very little computation in run-time, since they simply concatenate prerecorded words. One other advantage of these systems is that speech quality within the output words is almost perfect since they are prerecorded, not created in run-time [1].

2.2.3.2 Phoneme Concatenation

In this method, firstly the phonemes in the language should be extracted. This number is about 30-60. Then, phonemes are recorded. Namely, some sample words or sentences are

recorded and phonemes are extracted from them using a sound editor by hand or using some automated techniques, which are not fully available yet. After that, energy values of the different phonemes are normalized. Finally, these phonemes are concatenated in order to build the words. In this concatenation operation, some digital signal processing techniques should be used to provide the smoothness in passing between the phonemes. One of the difficulties in these systems is to obtain the phonemes accurately from an input speech since the start and end of a phoneme in speech signal can not be determined certainly. So, a lot of trial may be needed to get the final phoneme set. After obtaining the phoneme set, these phonemes should be concatenated smoothly; however this is also a difficult task. Also, if more than one phoneme is possible to use at a point, decision on which one will be used should correctly be made by the system. On the other hand, these systems do not require much memory since only a few speech parts is prerecorded. Also, different type of voices can be obtained with some process on phonemes [1].

2.2.3.3 Diphone Concatenation

Syllables are segments, which are longer than phoneme and smaller than a word. These are the basic speech units. There are a few methods for concatenating these segments. Diphones can be used as segments for concatenation. In order to get a good result, concatenation should be made from the stable parts of the sound. Thus, the stable parts of the speech are the voiced expirations or the unvoiced ones that can be nearly zero. Joining at the voiced parts of the speech gives good results, but as they are recorded at different times with different words there may be unbalanced transitions between two voiced segments. In order to pass this bottleneck, some algorithms like PSOLA are used. PSOLA method takes two speech signals. One of these signal ends with a voiced part and the other starts with a voiced part. These voiced parts should correspond to same phoneme. PSOLA changes the pitch values of these two signals so that pitch values at both sides become equal. So a much smoother passing between the segments is provided. The advantage of this technique is to obtain a better output speech when compared to other techniques. However, these systems require a lot of memory since lots of speech units should be prerecorded. The control on the output speech is less in this technique when compared to others so these systems are usually limited to one speaker. Adding a

new speaker usually means recording the entire database from beginning for the new speaker. Bell Labs TTS System, later versions of Infovox, CNET PSOLA are examples of systems that uses diphone concatenation method [6, 14, 24].

Chapter 3

Turkish TTS

3.1 Structure of Turkish TTS System

The technique that will be used in speech synthesis part of a TTS system determines how NLP part will work to some extent. For example, if phoneme concatenation will be used, then NLP part should parse the text accordingly and give phonemes in the text as its output.

Diphone concatenation is the most commonly used method in speech synthesis part of TTS systems. The input text is parsed accordingly and passed to speech synthesis unit. Speech synthesis unit finds the corresponding pre-recorded sounds from its database and tries to concatenate them smoothly. It uses some algorithms like PSOLA and some other techniques to make a smooth pass in diphones and for intonation, if this is wanted to be achieved in TTS system. This method is used in my project. My system does try to produce intelligible sound, but does not care about intonation. In this system, text processing and speech synthesis parts are not fully separated. Text processing part seems to have control over speech synthesis part. While text-processing part tries to parse the input text, it also produces the output speech with the help of speech synthesis part.

My system takes a text as its input. It assumes that the text consists of words, and it progresses word by word. Words can include letters and numbers, and they are assumed to be separated by blank(s), newline character or punctuation marks. When a word is obtained from the text it is passed to a unit that can process a word, namely that takes a word as text and produces corresponding speech. This part separates the word into

diphones; using diphone database it gets speech file corresponding to diphone and its pitch value and finally it concatenates the previously recorded speech segments using PSOLA algorithm and produces sound. The overall system concatenates the words that are produced by this part and creates final speech. The general structure of the system can be seen in Figure 2.

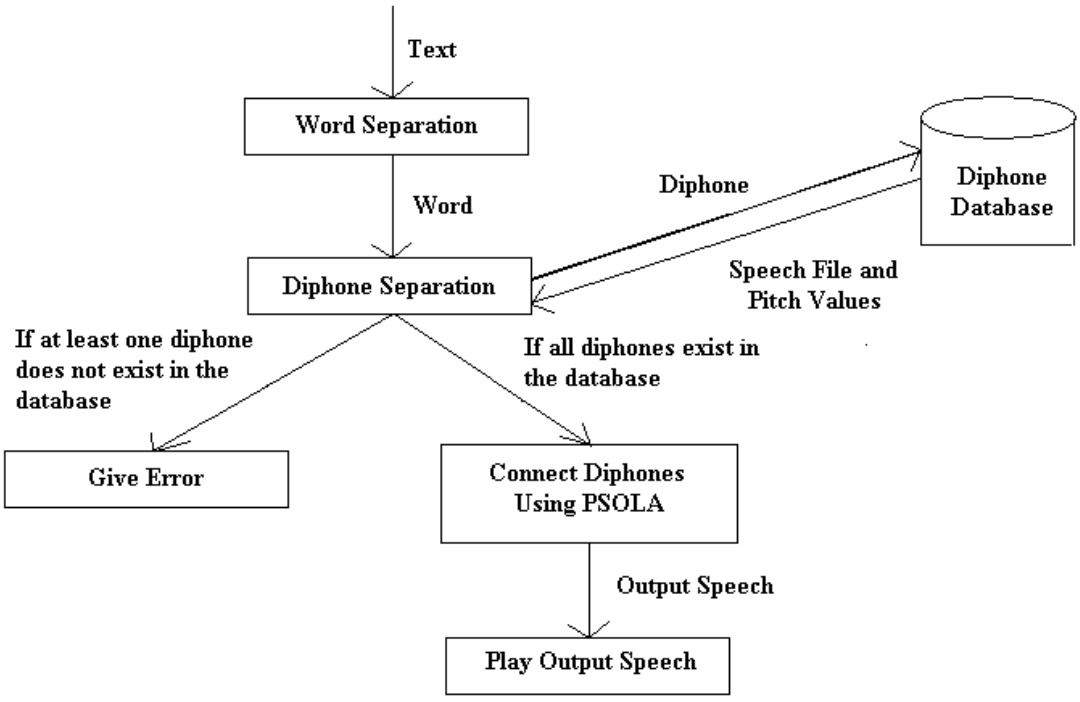

Figure 2: The general structure of the system

3.2 Text Processing

Text processing part in this system only separates the given text into its words and words into units that speech synthesis part can understand, which are diphones. Lengths of these speech units are two or three letters. In order speech synthesis part to work correctly, separations are made at voiced parts as much as possible. If this is impossible with saving three letters length limit, then separation in unvoiced parts is also made. PSOLA algorithm is used in concatenation of voiced parts; unvoiced parts are concatenated directly. If separation is made at a voiced place, then this voiced letter is included in both

diphones. For example, word “kar” is separated as “ka” and “ar”. Since separation is made at a voiced letter, which is “a”, it is included in both diphone. This does not apply to unvoiced case. In ideal case, all separations should be made at voiced parts, however this increases possible length of the units to about 4-5. For example, the word “kartlar” should be separated as “ka”, “artla” and “ar”. In this case there is a 5-letter-length speech unit. By this way the number of units to be recorded explodes. Therefore, such a limit is put with the constraint, if it is impossible to separate at voiced parts, then separation should be made between two unvoiced sounds. Since unvoiced parts are also usually stable parts of speech, concatenation in unvoiced parts does not reduce output quality much. How the system produces its output can be understood better with examples in Table 1.

Input	Output
Barış	Ba-arı-ış
Karartmak	Ka-ara-art-ma-ak
Bilkent	Bi-il-ke-ent
Tren	Tre-en
Sporcu	Spo-or-cu
Saat	Sa-at
Bilgisayar	Bi-il-gi-isa-aya-ar

Table 1: Examples of separating a word into diphones

The general separation strategy can be explained as follows: First, separations are made only at voiced parts, this should be made in all voiced parts, however if 3 letter length limit rule is violated, then the units having length more than 3 are also separated in unvoiced parts. For example, word “karalamak” is firstly separated as “ka”, ”ara”, ”ala”, ”ama”, ”ak”. Since all units obey 3-letter length limit, this separation is the final separation.

However, word “bildirmek” is initially separated as “bi”, “ildi”, “irme” and “ek”. Since “ildi” and “irme” have length 4, they are also separated and the final result is “bi”, “il”, “di”, “ir”, “me”, “ek”. However the system works a little bit different than this, and it makes separation in one pass for all cases. In this technique, the system outputs diphones

while processing it letter by letter, while it is on a letter sometimes it may look one letter behind or one letter forward. Finite state machine for this process can be seen in Figure 3. Program code can easily be written from this finite state machine.

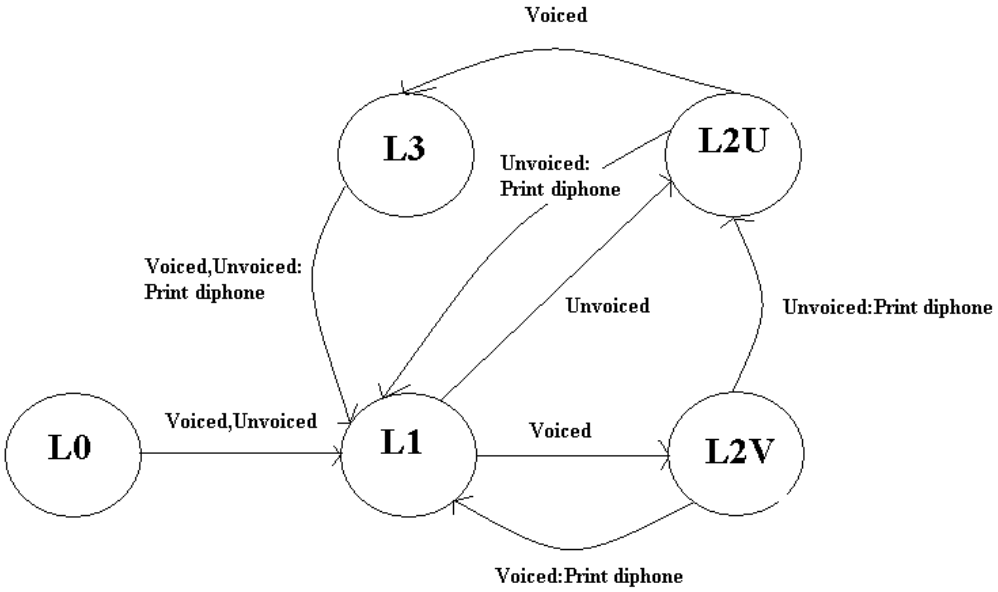

Figure 3: Finite state machine for word parser of the system

States in this FSM are related with the length of the candidate diphone. Namely, “L3” means the length of the candidate diphone is 3. “L2U” means length is 2 and second letter of the diphone is an unvoiced letter. For “L2V”, the second letter of diphone is a voiced letter.

The input text should only contain letters and numbers. Numbers are converted into words by the system. The system does omit the punctuations, since intonation and correct timing are not aimed in the system.

Testing whether a TTS system works well in text processing part may be very hard, because only the output of text processing part may mean nothing, in some cases produced speech should be tested, for example to test intonation. Also, as it is said before how speech synthesis part works determines how text-processing part works to some

extent. Since the main aim of this thesis project is to obtain a system that can produce an intelligible speech, speech synthesis part gets more importance. In that case, a text processing part that can simply obtains words from a text, converts numbers into words and divides them into diphones correctly is considered to be enough for our purposes. A system that has a better speech synthesis unit may need a better text processing part to be able show its abilities. For example, if speech synthesis part is able to produce intonation, text-processing part should give necessary parameters to speech synthesis part. In this project, different pronunciations for some letters are not considered, if this was to be considered, then speech synthesis part should have been able to deal with words having these letters.

3.3 Turkish Speech Synthesis

The duty of the speech synthesis part is to concatenate two given sounds smoothly. There are two possible concatenation strategies in our system: With PSOLA or without PSOLA. The strategy that will be used is decided in text processing part. There are also some other techniques that are used in the system to make a smooth pass at concatenation points.

3.3.1 Basics About Sound Files

There are different file formats to represent sounds. Different sound formats may hold different information about the sound. The file format used in this project is “wav” format, which is one of the most famous sound formats. According to wav file format, samples are stored as raw data, namely no process for compression is made. The wav file itself consists of three "chunks" of information: The RIFF chunk which identifies the file as a wav file, The FORMAT chunk which identifies parameters such as sample rate and the DATA chunk which contains the actual data (samples).

Byte Number	
0 - 3	"RIFF" (ASCII Characters)
4 - 7	Total Length Of Package To Follow (Binary, little endian)
8 - 11	"WAVE" (ASCII Characters)

Table 2: RIFF Chunk (12 bytes in length total)

Byte Number	
0 – 3	"fmt_" (ASCII Characters)
4 - 7	Length Of FORMAT Chunk (Binary, always 0x10)
8 - 9	Always 0x01
10 - 11	Channel Numbers (Always 0x01=Mono, 0x02=Stereo)
12 - 15	Sample Rate (Binary, in Hz)
16 - 19	Bytes Per Second
20 - 21	Bytes Per Sample: 1=8 bit Mono, 2=8 bit Stereo or 16 bit Mono, 4=16 bit Stereo
22 – 23	Bits Per Sample

Table 3: FORMAT Chunk (24 bytes in length total)

Byte Number	
0 - 3	"data" (ASCII Characters)
4 - 7	Length Of Data To Follow
8 - end	Data (Samples)

Table 4: DATA Chunk

In the wav file format, the value of a sample corresponds to energy level of sound at that point, and absolute value of energy level is related with the volume of the sound. Therefore, increasing the absolute value of a sample means increasing the sound volume. Time domain representation shows the energy level of sound at a certain time, therefore it can be said that wav file format represents sound file in time domain. Since, the values of samples of sound files are seen as one-dimensional array, making modifications on the

array means modification in time domain. Since TD-PSOLA (Time Domain PSOLA) algorithm requires sound files represented in time domain, and TD-PSOLA technique is used in this project, all these properties of wav file format makes the dealing with sound files easier.

There are mainly two kinds of voices in human speech: voiced and unvoiced. Voiced speech shows a periodic characteristic when we look at their time domain representation. On the other hand unvoiced sounds are non-periodic. Examples of voiced and unvoiced part of a speech can be seen in Figure 4. In that graph, the x-axis is the time, and y-axis is the energy level.

Pitch is a period of speech data. Pitch is only applicable to voiced parts of the speech since these parts are periodic. We can not talk about pitch values in unvoiced parts of the speech since these parts are non-periodic. The value of pitch can be calculated by dividing the number of samples in a given speech part to the number of period in this part. For example, if there are 900 samples in a part and 6 period of speech, pitch value is 900/6=150. Periodic speech signals and pitch periods can be seen in Figure 5.

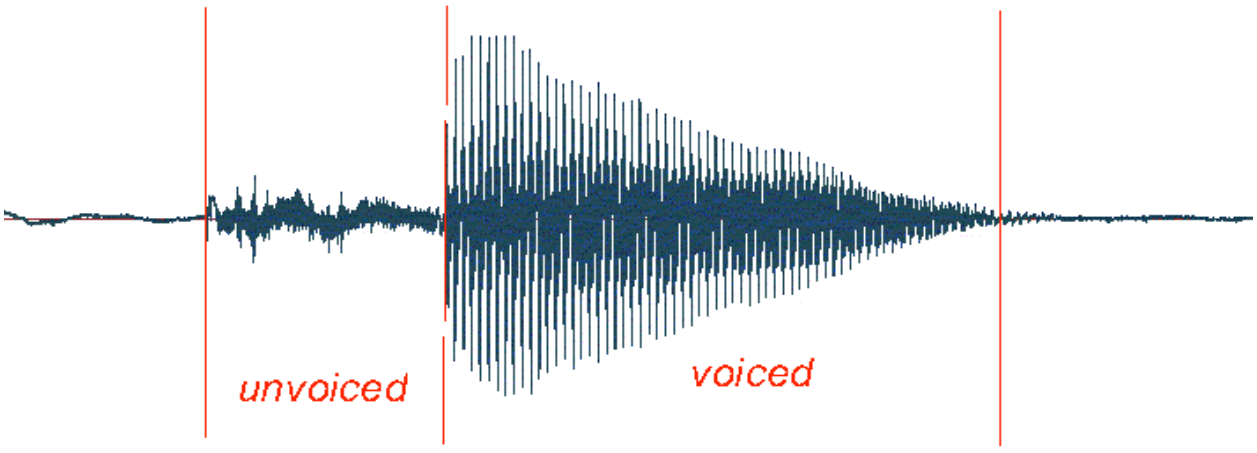

Figure 4: Examples of voiced and unvoiced letters

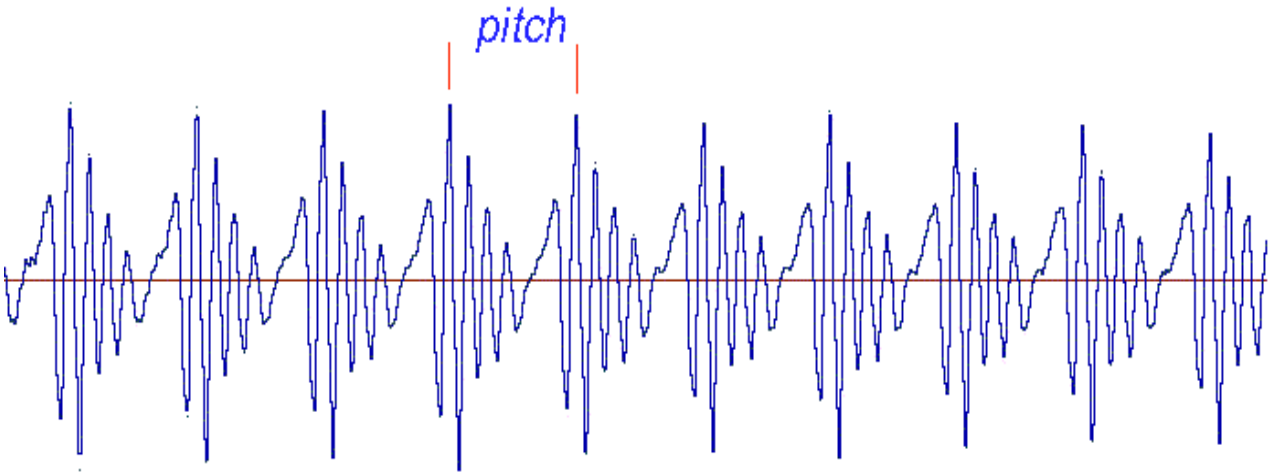

Figure 5: A periodic speech signal and pitch period

3.3.2 Database Preparation

Database preparation is one of the most vital parts in TTS systems that use a concatenation technique in speech synthesis part. The subunits should be recorded before the system starts running. The characteristics of the subunits depend on the concatenation technique used in speech synthesis part. If words are concatenated, the necessary words should be recorded. In my system, since diphone concatenation is used, necessary diphones are recorded in the sound database. Database preparation part can be divided into two parts as obtaining the text to be recorded and obtaining diphones from recorded speech.

3.3.2.1 Obtaining Text

As mentioned before, to create diphone database, some text is initially read, recorded and analyzed by the help of a sound editor. To obtain diphones from a text or from full words gives better quality than obtaining diphones by only recording themselves which causes very strange intonations. To decide on these input text or input words is an important step. First, we started database preparation by reading and recording some articles from newspapers, books, etc. and obtaining diphones from there that are not included in our

database. After some point we realized that, new articles recorded adds very few diphones to our database, since most of the diphones passing in text are recorded before although number of recorded diphones are about %10 of possible diphones. At that point we decided on finding a better way to obtain diphones. Our aim was to record as less word as possible, so that we will not spend time on words that will not bring new diphones to our database. To decrease the number of words recorded, as few diphones as possible should repeat in input words. Since it is very hard to prepare such an input text manually a program for this purpose is written. A greedy algorithm for this purpose is used. Program takes a big word list, calculates the number of diphones in each word and gets the word that has the largest number of diphones. Then, it adds obtained diphones from this word to a list and process all the words again to calculate the number of diphones that are not in this list. The word having largest number of diphones is taken again and process goes on like this. Process ends when all the words have 0 new diphone. However, since this process requires passing word list over and over again, when the size of word list increase it takes very much time to complete the operation. To overcome this problem, we used another greedy approach here. We created a sublist from the real list by having the words that are longer than a limit such as 16 letters. Processing this list could be completed in a tolerable time. After completing this process if all diphones can not be obtained the limit is decreased and process is repeated again. With the help of these methods, the input text to record is obtained.

3.3.2.2 Obtaining Diphones from Speech Records

There are several possible techniques that can be used for obtaining diphones from recorded speech. First, they can be divided as automated and un-automated techniques. In automated technique, a text is read by a speaker and it is recorded. Then, speech is separated into its diphones by the system using some intelligent algorithms. Although this makes database preparation much easier, there are no algorithms that are successful enough to be used in a TTS system. The research on automating this process is continuing [9].

The most convenient way is to read some text, record it and then extract diphones from

this sound using a sound editor. However, some standards that can change from system to system should be considered in order to have a consistent system at least in itself. There are some standards in my system. First, when cutting speech units in voiced parts, we cut all diphones to have “8” full pitch period. This number could be different for different diphones, however to prevent different length voiced parts at output speech that can distort the quality, this is a good way. Increasing or decreasing this number also increases or decreases the length of the voiced part of the speech respectively. We chose “8” as the number of pitch period, because after making some experiments on this number, we realized that we obtained acceptable output speech with this number of pitch period. Although we recorded 8 pitch period, we can change it to any number less than “8” by the help of PSOLA, while the system is running to produce output. Another standard is to cut voiced parts at their peak point. If all voiced parts are recorded like this, it is more likely that they will match at concatenation points. This is very important, because if the levels of two sounds are very different at concatenation point, a disturbing noise is heard at this concatenation point that reduces intelligibility of the speech. The third standard is to cut unvoiced parts at a point as stable as possible and at zero energy level.

Perceptually same sounds may be acoustically very different in different places of a word. When a sound taken from a part of the word is replaced with a same sound that is taken from another part of the word, some changes in quality is very likely to appear, because phonemes are affected by their neighbour phonemes. Therefore we thought that there must be different diphones recorded for different parts of the words in order to have a better quality speech. We divided these parts into three: beginning, middle, and end. We tried to record different diphones for these parts and they are used accordingly; namely a diphone extracted from the beginning of a word is not used in constructing a word that needs this diphone in the middle or at the end. For example, if a “ba” diphone is recorded from word “Barış”, it is not used in synthesis of “Kurbağa”. We make a differentiation between these phonemes by putting a letter at the end of each phoneme with a “_” which tells the system from where the diphone is extracted. “na” extracted from “namlı” is recorded as “na_b”, “na” extracted from “atnalı” is recorded as “na_o” and “na” extracted

from “ayna” is recorded as “na_s”.

PSOLA method uses pitch values for the diphones in the concatenation process. Pitch value is the number of samples in a full wave period for periodic sounds like voiced sounds. Using these pitch values, it calculates the final pitch values for these diphones and makes necessary changes to obtain these values. Every diphone has pitch values for both left and right side. If left or right side is unvoiced, then the pitch value for this part is considered to be 0. For example, in my database, pitch values for “ka_b” is 0 for the left side and 147 for the right side; pitch values for “ara_o” is 142 for the left side and 145 for the right side. These values should either be calculated in real-time or they should be pre-calculated and used in run-time. Since this is a time consuming process and hard to do automatically we preferred to calculate them while preparing database, so that the system could get this values from a table while running. To make these calculations we used a semi-automatic technique. We programmed a tool that makes calculating pitch values easier. This tool draws AMDF (Average Magnitude Difference Function) function for the speech signal; by this way it becomes easier to see the pitch values. The formula for the AMDF function is here:

$$AMDF(k) = \sum_{i=k+1}^{N} | s(i) - s(i-k) | ,$$

Here, “s” corresponds to speech signal and N is the length of the analysis window. At the points that AMDF function has minimum, there is a pitch period. This tool takes three parameters: The name of the diphone, the number of samples that is wanted to be processed (typically 500, so that about 3 or 4 pitch period appears in the plot) and whether pitch value for right side or left side is calculated. AMDF function drawn for the right side of the diphone “ka_b”, using 500 samples can be seen in Figure 6. By this way, exact values may not be found, but guesses very close to real values can be made. After these values are calculated, they are stored in a text file and they are used by the system in the run-time.

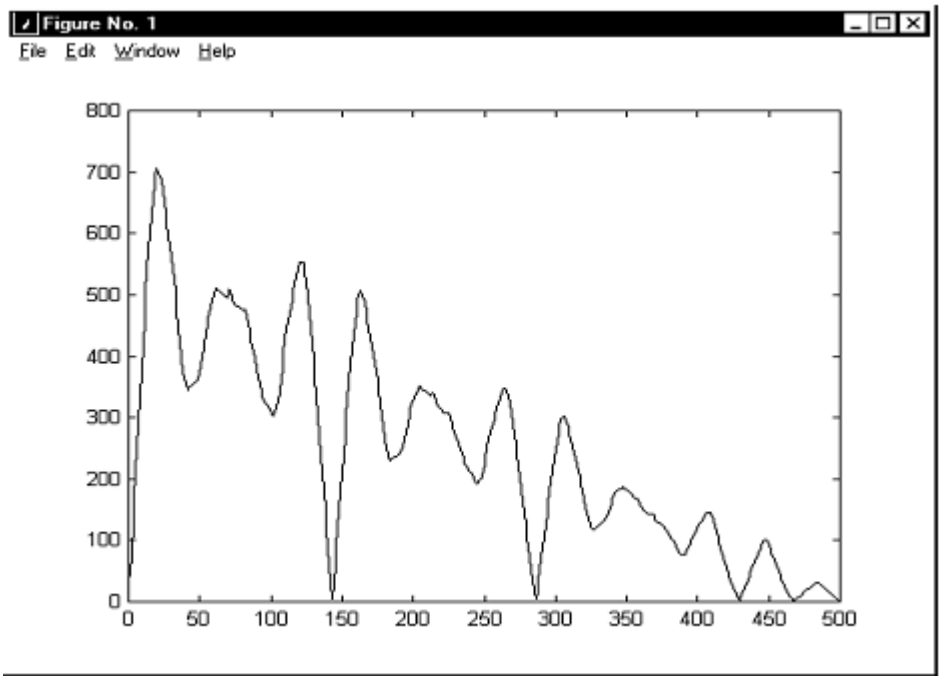

Figure 6: AMDF function for diphone "ka_b" in our database

3.3.2.3 Database File Format

Sound database in Turkish TTS consists of two files. One file holds all the sound files and other file is an index to this file. These two files could be combined into one binary file, however due to some limitations in MATLAB, this was very hard.

Index file holds information about the diphones in the system. It holds their pitch values and their locations in the sound file. Index file is a simple text file that includes 5 lines for every diphone. The content of these lines can be seen in Table 5. Sound file is a huge "wav" file in that all diphones are concatenated.

Line #	Content	Example
1	Diphone name	ene_o
2	Left pitch value	138
3	Right pitch value	150
4	Starting position in sound file	495529
5	Ending position in sound file	500884

Table 5: Content of 5 lines for every diphone in sound database index file

Firstly, all diphones are recorded as separate “wav” files. Also, a text file to hold pitch values of these diphones is created manually. A helper program takes these two files and creates two files for sound database. Both index file and sound file is sorted according to diphone name.

3.3.3- Diphone Concatenation

The technique used in speech synthesis part is diphone concatenation technique, because this is the easiest method to implement among others and it can be considered as successful. Articulatory synthesis requires very good understanding of speech processing and an intensive research for obtaining necessary parameters. After obtaining parameters a good modeling and a lot of calculation is needed. Therefore, we decided that this kind of systems require more than what a 2 people team can do in about a year. Formant synthesis also requires a good background on signal processing and intensive research for obtaining necessary parameters. Obtaining signal processing background and these parameters may require years for our team, therefore we considered this method also as not suitable for us. However, concatenation methods do not require much background, by simply recording some words, a very simple system could be created. On the other hand, in order to establish a good system, lots of effort is required for this method too.

Diphone is selected as the speech unit for concatenation. Different sizes have different advantages and disadvantages. Word concatenation is a good method for systems that require limited number of vocabulary. Only necessary words are recorded and they are used in runtime, no serious job is done in concatenation. If phoneme is used as the speech unit, the system can handle unlimited number of vocabulary by recording all phonemes in the language. The number of phonemes in a language is typically between 30 and 60. Although database size is small for this case, preparing this database requires a lot of care and it is very hard to deal with. Also, handling concatenation of these units in the system requires more operations in runtime to produce intelligible speech. Diphone concatenation stays in between them. Database size is larger than phoneme database,

however they are easier to deal with in runtime. Also, it is easier to obtain a successful system with diphone concatenation.

3.3.3.1 Accessing Diphones in Run Time

As it is mentioned in Section 3.3.2.3, previously recorded sounds are stored in a database in our system. While program starts running, the information stored in the database is loaded into memory as a sorted array of records according to diphone name. Each record holds diphone name, pitch information about diphone and corresponding sound data. When pitch information or sound data for a diphone is needed in run time, array is searched by comparing diphone names. Binary search algorithm is used for this purpose. When a diphone is found, necessary information can be obtained from the record. By that way database access is made once at the beginning and data is used from main memory in run time.

3.3.3.2 PSOLA

The main technique used in speech synthesis part of this system is PSOLA. PSOLA (Pitch Synchronous Overlap Add) method was firstly developed at France Telecom (CNET). PSOLA actually is not a speech synthesis method, however it allows concatenation of prerecorded speech units smoothly [3]. Since it provides a good control over pitch and duration, it is a successful method; therefore it is used in some commercial systems such as ProVerbe and HADIFIX [20].

There are several versions of PSOLA like TD-PSOLA (Time Domain-PSOLA), FD-PSOLA (Frequency Domain-PSOLA), etc [3, 25, 26]. The most commonly used version is TD-PSOLA, which is also used in this system, since its computational efficiency is better when compared to others. The basic algorithm consists of three steps. In the first step, the original speech signal is divided into separate but usually overlapping short-term analysis signals. Each analysis signal is modified to synthesis signal in the second step. At the end, the synthesis step, the signals are added in an overlapping manner [3, 26]. Short term signals $x_m(n)$ are obtained from digital speech waveform $x(n)$ by multiplying the signal by a sequence of pitch-synchronous analysis window $h_m(n)$:

$$x_m(n) = h_m(t_m - n)\,x(n)$$

where m is an index for the short time signal. The progress of PSOLA can be seen in Figure 7. The windows, which are usually Hanning windows, are centered around the successive instants t_m, called pitch-marks. These marks are set in a pitch synchronous way in the voiced parts of the signal. The window length is proportional to the local pitch period and usually varies from 2 to 4. The pitch markers are either determined manually or by some pitch mark estimation algorithm [3]. In this system, speech signal is recorded in a way that first pitch mark is at the beginning of the signal, first sample, and the others are assumed to be located in a periodic way over the signal according to the pre-calculated pitch values. For example, if pitch period of a sample is 150, first pitch mark is on the 1st sample, second pitch mark is on 151st sample, third one is assumed to be on 301st sample, etc. With this assumption we do not need to neither inspect pitch marks manually nor use an algorithm for automatically inspection of pitch marks.

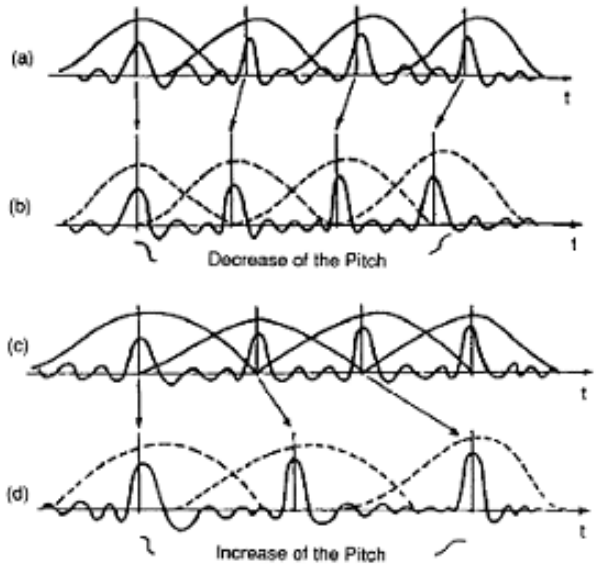

Figure 7: Progress of PSOLA algorithm

The aim of the PSOLA is to modify the pitch periods so that two consecutive speech parts to be concatenated has same pitch values. The modification of pitch periods is

achieved by changing time interval between pitch markers. For the previous example, if we want new pitch period to be 160, new pitch marks will be at 1st, 161st, 321st, etc. speech samples. Although, the modification of pitch period also means modification of duration of speech; by omitting speech segments or by replicating speech segments, more control over duration can be obtained.

One of the problems with applying PSOLA algorithm is the mismatches at the concatenation points. Although unvoiced signals are cut at peak points in the database preparation phase, peak points of every sound does not match always. The values of samples in our project is between –1 and 1. Therefore, if a diphone ends at level 0.7 and other starts at 0.4, concatenating these two diphones will cause a mismatch in speech signal and distortion in output speech. We thought that, we could cut some part of the signal from beginning or end until the end of the signal is at some level. We thought that if all voiced signals starts or ends in about level 0.5 as much as possible, mismatch problem with voiced part concatenation is minimized. Therefore, if PSOLA algorithm is applied to one side of a diphone, this side is omitted until it starts or ends about level 0.5. It is observed that this simple process improves the quality of output speech to some extent.

Since this system uses diphone concatenation technique, to be able to read all Turkish words, all necessary diphones for Turkish should be pre-recorded. However, preparing a complete database is a very difficult and time-consuming task. Also, new words for Turkish that includes diphones that is not seen before may appear. To be able to handle some diphones that is not in the database, our system tries to produce these diphones in run-time by using other pre-recorded diphones. This usually works for three-letter length diphones. We have recorded a sound for each letter in our database. When a diphone that is not in our database is needed, we split it into two according to characteristics of it. If it’s VUV(voiced, unvoiced, voiced) diphone it is splitted as V and UV. We have a sound for V in our database and if we have sound for UV part in our database, we combine them and produce VUV sound. This is also added in our sound array in memory so that if this diphone is met again in run time it can be used from memory. UUV diphones are

splitted as U and UV, VUU diphones are splitted VU and U. Creating diphones in run time may sometimes reduce the sound quality, since phonemes are affected from their neighbor phonemes. Therefore, necessary diphones should be recorded as much as possible.

3.4 Evaluation

Our aim in that project was to create a system that produces understandable speech output for a given Turkish text. The things like prosody or intonation that affect the naturalness of the speech are beyond the scope of this project, therefore this project should be evaluated according to this criteria.

In order this system to read every Turkish word properly, a diphone database that will cover all diphones that occur in Turkish words should be prepared. The diphone database in our system has not been fully completed; therefore we can not say that this system will read every Turkish word properly. However, by creating some necessary diphones in run-time using pre-recorded diphones, the number of Turkish words that can be read is very high. When we look at the words that we can obtain by our diphone database, we see that system gives acceptable outputs in most cases. Bad outputs are usually caused by bad recordings. This means that the method used in this project is an applicable one and an effort on completing and preparing a better diphone database will result in a system that will produce more understandable output for all Turkish words.

Chapter 4

Implementation

The decision on the implementation environment is vital in the progress of the system. Because, this may affect the completion time of system, it may affect the performance of the system, etc.

After some research on this area we realized some alternatives that we can use for implementation. First alternative was to use some libraries that are written by some researchers and used in some systems. In that case, we would prepare the speech database and write a small code, however we would not have enough control over the process and would not obtain much information about the process. We did not choose this option, because our aim was to learn the basics of constructing of TTS system while creating a Turkish TTS system.

Second alternative was to use C or C++ as the language and use a development environment for them. One important problem with these languages was the difficulty of the accessing and manipulating sound files that would be used in the project very frequently. This would require a lot of effort to create libraries only for these purposes. The other disadvantage was that the code would be platform dependent, because accessing sound files is different in different platforms like Windows, Unix. Although the system would run faster than the other alternatives we did not choose this option due to its negative points.

Third alternative was Java that is a platform independent language. It has also lots of good interactive development environments (IDE). It is very easy to play sound files in

Java, however we needed to make manipulations on them in run-time and in Java, this is more difficult than C or C++. Also the output code would be slower. Due to these points, we eliminated this option.

4.1 Implementation Environment

We chose Matlab as our development environment which is a program that makes some scientific experiments easier and also has a programming language which is very similar to C. Matlab runs under Windows and Unix and the code written in Matlab in one platform runs in other platforms without any problem. Accessing and manipulating sound files in Matlab is very easy when compared to others and this was the most important point while we were making our decision. Although the program runs a bit slower than C, since Matlab does not create an executable file and only interpret the programming code, the required time for the completion of the program was acceptable, since our system is not intended to be used as a real-time system.

The sound files can be seen as one-dimensional array in Matlab. The size of the array is determined by the sample frequency and time length of the sound file. For example, if sample frequency of a sound is 22050 and it lasts in 2 seconds, array corresponding to this sound file has 22050x2=44100 samples. A sample in an array corresponds to energy level of sound at that point. Changing the value of an element of an array simply changes the energy level of the sound file at that point. Therefore, making modification on sound files in Matlab is equal to making modifications on arrays in other languages. Playing sounds is also very easy in Matlab and done by "sound" command. It takes two parameters, one is the array corresponding to our sound and the second one is sample frequency for playing. Second parameter is optional, default value for sample frequency is 8000 Hz. Reading a sound file is also easy and it is done via "wavread" command. It takes the location of the sound file as the input parameter and gives the corresponding array as the output.

Beside these good points mentioned above, there are some other advantages of using

Matlab. It is very easy to manipulate arrays in Matlab. You can easily copy some part of the array to another array by a simple command. The graph of the array can also easily be drawn so that the modifications made can be inspected visually.

On the other hand, there were some difficulties that we met during our Matlab experience. The first problem was binary files. We wanted to put our sound database and all necessary information into one sound file. However, since it is not possible to write structures into binary files with Matlab, we had to separate our database into two files. Another problem was the difficulty in using strings. Since strings are behaved as matrix, some operations like comparing string are difficult. There is a built-in function to check the equality of string however it requires two strings to have equal length to make comparison. There is no built-in function to compare alphabetical order of strings. Therefore, we wrote such a function, since it is needed in some sorting and searching operations.

4.2 Algorithms and Complexities

4.2.1 Text Processing Algorithms

Text processing is done very simply in this system. Text is initially divided into words; therefore every letter in the word is passed once. After word is obtained, it is separated into its diphones and during this process each letter is also processed once more. Therefore, the complexity of text processing is related with the length of the text. If the length of the text is N, then the time required in the text processing part is O(N).

4.2.2 Speech Processing Algorithms

Output speech grows diphone by diphone in speech synthesis part. The corresponding signal for every new diphone obtained in the text processing part, signal R, is added to the right of the resulting speech signal obtained up to now, signal L. If the letter at the

concatenation point is an unvoiced letter, the signal L and the signal R are normalized and concatenated with a simple process. The normalization process requires finding the maximum points in two signals and multiplying every sample in the part that does not contain the maximum of these two maximums by the ratio of them. If signal L has M samples and signal R has N samples, the time required for finding maximums is O(M)+O(N) and time required for multiplication is O(max(M,N)). Concatenation process is achieved by setting the values of N sample to the end of signal L, which means O(N) time. Therefore, total time required for adding a new diphone to the resulting signal is O(M)+O(N)+O(max(M,N))+O(N), simply O(M+N) if the letter at the concatenation point is an unvoiced letter.

If the letter at the concatenation point is a voiced letter, as a difference from the unvoiced case, PSOLA algorithm is applied for signal L and signal R to make their pitch values equal at concatenation point, after that the signal L and signal R are normalized and finally they are concatenated with a simple process. The PSOLA algorithm is achieved in two steps. Windowing is applied to the some part of the speech signal that is considered to belong voiced part and different speech signals are obtained. Length of this part is equal to T(pitch value)xP(number of pitch periods processed). P is equal to 8 in our system and TxP can practically be considered as equal to the length of the signal. This windowing operation is applied P times and every windowing requires TxP multiplication. If signal length is N the time required for the first step is O(T xPxP)=O(NxP). If P is equal to 8, the complexity is O(N). Second step requires adding obtained speech signal. This requires (P-1) times addition of NxP points. Therefore, O(TxPx(P-1))=O(Nx(P-1))=O(N) time required for the second step. If the signal length is N, time required for PSOLA operation is O(N). In our case, PSOLA is applied to both signal L and signal R and this results in O(M)+O(N) operation. As a result, O(M)+O(N)+O(M+N)=O(M+N) time required if the letter at the concatenation point is a voiced letter.

Although the complexities for two cases seem to be equal, the time required for the second case will be much higher for the first cases, since hidden constants, such as P, are

big numbers.

Chapter 5

Conclusion

5.1 Conclusion

As a result of this project we obtained a working system that gets a Turkish text as input and generates corresponding speech signal for this text. Although the software part of the system is nearly complete according to aims of the projects, the diphone database is not complete yet. However, the results obtained from the current database are an indication that a complete database will match the aims of the project much better.

One point that should be noted is that this is not a high level TTS system; it takes its input as text and it accepts that the text comes in a format that words are in their phonetics forms. Therefore, with some minor refinements, this system can be used to create TTS systems for other languages like English, German, French, etc. with a preprocessing module that converts the text in those languages in the phonetic form.

5.2 Future Work

The first thing that should be done about this project is to complete the diphone database and apply more experiments on words. Applying some standard tests that are used in the evaluation of TTS system would be useful in understanding the quality of the system.

Second step may be to make the architecture more parametric. For example, pitch values or speech durations can be given by the user. In order to do this easier and more formal a

simple scripting language can be developed.

Third thing that can be done is to make a faster system. Although system produces output in acceptable for small sentences, it requires much time for long sentences. Therefore, in order to have a real-time reading system, the system should be faster. According to our experiments, the part that consumes most time is PSOLA part. Therefore, if all diphones are applied PSOLA offline, so that all diphones have same pitch values, the system will have a better speed.

After obtaining a stable system for one voice, other voices could be added to the system. Some better methods other than recording all the diphones for adding a new voice can be researched.

Having obtained an intelligible speech, it can be better to pay attention on naturalness. In this respect, a better text processor according to needs should be implemented and models for intonation, prosody, etc. should be developed.

BIBLIOGRAPHY

[1] Allen J., Hunnicutt S., Klatt D., From Text to Speech: The MITalk System, Cambridge University Press, 1987

[2] Black A., Taylor P., Festival Speech Synthesis System: System Documentation(1.1.1), Human Communication Research Centre Technical Report HCRC/TR-83, 1997

[3] Carpentier F., Moulines E., Pitch-Synchronous Waveform Processing Techniques for Text-to-Speech Synthesis Using Diphones, Proceedings of Eurospeech 89 (2): 13-19, 1989

[4] Dutoit T., Leich H., MBR-PSOLA: Text-to-Speech Synthesis Based on an MBE Re-Synthesis of the Segments Database, Speech Communication, vol. 13: 435-440, 1993

[5] Dutoit T., Pagel V., Pierret N., Bataille F., Vrecken O., The MBROLA Project: Towards a Set of High Quality Speech Synthesizers Free of Use for Non Commercial Purposes, Proceedings of ICSLP 96(3), 1996

[6] Bell Laboratories TTS Homepage, <http://www.bell-labs.com/project/tts>

[7] ETI Eloquence Homepage, <http://www.eloq.com/eti0elo.html>

[8] Hertz S., The ETI-Eloquence Text-to-Speech System, White Paper, Eloquent Technology Inc., <http://www.eloq.com/White1297-1.htm>, 1997

[9] Hon H., Acero A., Huang X., Liu J., Plumpe M., Automatic Generation of Synthesis Units for Trainable Text-to-Speech Systems, Proceedings of ICASSP 98 (CDROM), 1998

[10] Huang X., Acero A., Adcock J., Hon H., Goldsmith J., Liu J., Plumpe M., Whistler: A Trainable Text-to-Speech System, Proceedings of ICSLP96 (4), 1996

[11] Klatt D., Software for a Cascade/Parallel Formant Synthesizer, Journal of the Acoustical Society of America, JASA, Vol. 67: 971-995, 1980

[12] Klatt D., The Klattalk Text-to-Speech Conversion System, Proceedings of ICASSP 82 (3): 1589-1592, 1982

[13] MBROLA Project Hompage, <http://tcts.fpms.ac.be/synthesis/mbrola.html>

[14] Möbius B., Schroeter J., Santen J., Sproat R., Olive J., Recent Advances in Multilingual Text-to-Speech Synthesis, Fortschritte der Akustik, DAGA-96, 1996

[15] Rabiner L., Juang B.H., Fundamentals of Speech Recognition, Prentice Hall, New Jersy, 1993.

[16] Deller Jr J.R., Proakis J.G., Hansen J.H.L., Discrete-Time Processing of Speech Signals, Prentice Hall, New Jersey, 1987

[17] Infovox Homepage <http://www.infovox.se/>

[18] Ljungqvist M., Lindström A., Gustafson K., A New System for Text-to-Speech and Its Applications to Swedish, ICSLP 94(4): 1779-1782, 1994

[19] Hallahan W., DECTalk Software: Text-to-Speech Technology and Implementation, Digital Technical Journal, <http://www.digital.com/DTJ101>, 1996

[20] Portele T., Steffan B., Preuss R., Sendlmeier W., Hess W., HADIFIX-A Speech Synthesis System for German, Proceedings of ICSLP 92(2): 1227-1230, 1992

[21] Kröger B., Minimal Rules for Articulatory Speech Synthesis, Proceedings of EUSIPCO92 (1): 331-334, 1992

[22] Rahim M., Goodyear C., Klejin B., Schroeter J., Sondhi M., On the Use of Neural Networks in Articulatory Speech Synthesis, Journal of the Acoustical Society of America, JASA vol.93 (2): 1109-1221, 1993

[23] O'Saughnessy D., Speech Communication – Human and Machine, Addison-Wesley, 1987

[24] Donovan R., Trainable Speech Synthesis, PhD Thesis, Cambridge University Engineering Department, England, 1996

[25] Kortekaas R., Kohlrausch A., Psychoacoustical Evaluation of the Pitch-Synchronous Overlap-and-Add Speech-Waveform Manipulation Technique Using Single-Formant Stimuli, Journal of the Acoustical Society of America, JASA, Vol 101 (4): 2202-2213, 1997

[26] Valbret H., Moulines E., Tubach J., Voice Transformation Using PSOLA Technique, Proceedings of Eurospeech 95 (3): 1853-1856, 1995

[27] Flanagan J., Speech Analysis, Synthesis, and Perception, Springer-Verlag, Berlin-Heidelberg-New York, 1972

[28] Klatt D., Review of Text-to-Speech Conversion for English, Journal of the Acoustical Society of America, JASA vol. 82(3): 737-793, 1987

[29] Schroeder M., A Brief History of Synthetic Speech, Speech Communication vol.13,pp. 231-237, 1993

Appendices

Appendix A- List of diphones in Turkish TTS & their pitch values

a	137	137
ab_b	0	0
ab_o	133	0
ab_s	140	0
ac_b	0	0
ac_o	142	0
ac_s	154	0
aca_o	148	148
acx_b	0	0
acx_o	142	0
acx_s	147	0
ad_b	0	0
ad_o	148	0
ad_s	150	0
af_b	0	0
af_o	147	0
af_s	150	0
ag_b	0	0
ag_o	143	0
ag_s	145	0
agx_b	0	0
agx_o	146	0
ah_b	0	0
ah_o	127	0
ah_s	145	0
aj_b	0	0
aj_o	133	0
aj_s	145	0
ak_b	0	0
ak_o	132	0
ak_s	133	0
al_b	0	0
al_o	130	0
al_s	142	0
alix_o	142	143
am_b	0	0
am_o	145	0
am_s	145	0

ama_o	141	138
an_b	0	0
an_o	130	0
an_s	138	0
and_o	139	0
ap_b	0	0
ap_o	145	0
ap_s	150	0
ar_b	0	0
ar_o	140	0
ar_s	136	0
as_b	0	0
as_o	135	0
as_s	151	0
asix_o	132	161
asix_s	131	0
asx_b	0	0
asx_o	135	0
asx_s	150	0
at_b	0	0
at_o	150	0
at_s	135	0
av_b	0	0
av_o	149	0
av_s	151	0
ay_b	0	0
ay_o	147	0
ay_s	150	0
az_b	0	0
az_o	134	0
az_s	152	0
ba_b	0	135
ba_o	0	135
ba_s	0	0
be_b	0	150
be_o	0	135
be_s	0	0
bi_b	0	150
bi_o	0	147
bix_b	0	135
bix_o	0	151
bo_b	0	151
bo_o	0	150
box_b	0	137
bro_b	0	149
bro_o	0	149
bu_b	0	145

bu_o	0	149
bux_b	0	147
bux_o	0	147
c	0	0
ca_b	0	140
ca_o	0	144
ca_s	0	0
ce_b	0	141
ce_o	0	141
ce_s	0	0
ci_o	0	147
ci_s	0	0
cix_b	0	135
cix_o	0	133
cix_s	0	0
co_b	0	138
co_o	0	138
cox_b	0	133
cox_o	0	133
cu_b	0	133
cux_b	0	141
cux_o	0	141
cx	0	0
cxa_b	0	133
cxa_o	0	133
cxa_s	0	0
cxi_b	0	150
cxi_s	0	0
cxix_o	0	117
cxo_b	0	127
da_b	0	135
da_o	0	138
da_s	0	0
de_b	0	143
de_o	0	133
de_s	0	0
di_b	0	142
di_o	0	142
dix_b	0	135
dix_o	0	147
do_b	0	148
do_o	0	140
dox_b	0	140
dox_o	0	140
du_b	0	137
du_o	0	137
dux_b	0	139

dux_o	0	139
e	135	135
eb_b	0	0
eb_o	127	0
ebi_s	150	0
ec_b	0	0
ec_o	127	0
ec_s	127	0
ece_o	140	152
ef_b	0	0
ef_o	127	0
ef_s	127	0
eg_b	0	0
eg_o	133	0
egx_b	0	0
egx_o	127	0
eh_b	0	0
eh_o	135	0
ej_b	0	0
ej_o	130	0
ek_b	0	0
ek_o	130	0
ek_s	130	0
eke_o	140	153
el_b	0	0
el_o	130	0
ele_o	143	142
eli_o	148	124
em_b	0	0
em_o	133	0
em_s	147	0
eme_o	150	157
en_b	0	0
en_o	132	0
en_s	152	0
ene_o	138	150
eni_o	133	135
ent_s	150	0
ep_o	133	0
epe_o	133	155
er_b	0	0
er_o	145	0
er_s	134	0
ere_o	150	150
ere_s	150	0
ert_o	138	0
ert_s	138	0

es_b	0	0
es_o	133	0
es_s	133	0
esi_o	148	140
esi_s	150	0
et_o	135	0
et_s	135	0
eti_o	150	145
ev_o	150	0
ev_s	150	0
evk_o	140	0
ey_o	153	0
eye_s	153	0
eyi_s	153	0
ez_s	140	0
ezo_o	140	140
f	0	0
fa_b	0	138
fa_o	0	138
fa_s	0	0
fe_b	0	137
fe_o	0	137
fi_b	0	128
fi_o	0	128
fix_b	0	133
fix_o	0	133
fo_b	0	138
fo_o	0	138
fox_b	0	143
fox_o	0	143
fu_b	0	127
fu_o	0	127
fux_b	0	135
fux_o	0	135
g	0	0
ga_b	0	139
ga_o	0	139
ge_b	0	138
ge_o	0	138
gi_b	0	138
gi_o	0	138
gix_b	0	137
gix_o	0	137
go_b	0	138
go_o	0	138
gox_b	0	142
gox_o	0	142

gu_b	0	145
gu_o	0	145
gux_b	0	143
gux_o	0	143
ha_b	0	145
ha_o	0	145
ha_s	0	0
he_b	0	133
he_o	0	133
hi_b	0	135
hi_o	0	135
hix_b	0	128
hix_o	0	128
ho_b	0	127
ho_o	0	133
hox_b	0	133
hox_o	0	133
hu_b	0	125
hu_o	0	125
hux_b	0	113
hux_o	0	113
i	141	141
ib_o	135	0
ibe_o	135	142
ici_o	142	147
icx_b	0	0
icx_o	130	0
icxe_b	0	148
ik_s	117	0
ika_o	125	123
il_o	147	0
il_s	147	0
ile_o	150	148
ile_s	142	0
im_o	120	0
im_s	130	0
in_o	131	0
in_s	131	0
ina_o	147	150
ini_s	140	0
ir_o	135	0
ir_s	140	0
ira_o	137	152
ira_s	137	0
ire_o	141	152
is_b	0	0
is_o	148	0

is_s	128	0
isxi_b	0	140
iv_o	141	0
iva_o	141	148
ix	150	150
ixgxix_o	150	150
ixk_s	149	0
ixl_o	147	0
ixl_s	147	0
ixla_o	140	152
ixn_o	140	0
ixn_o	138	0
ixna_s	140	0
ixnix_o	140	138
ixnix_s	138	0
ixp_s	137	0
ixr_b	0	0
ixr_o	135	0
ixr_s	145	0
ixra_o	135	138
ixrs_o	133	0
ixrs_s	133	0
ixsix_o	135	152
ixsx_o	148	0
ixt_o	142	0
ixya_s	148	0
iz_o	132	0
iz_s	132	0
ize_s	150	0
ja_b	0	135
ja_o	0	135
ja_s	0	0
je_b	0	140
je_o	0	140
ji_b	0	150
ji_o	0	150
jix_b	0	142
jix_o	0	142
jo_b	0	142
jo_o	0	142
jox_b	0	145
jox_o	0	145
ju_b	0	150
ju_o	0	150
jux_b	0	150
jux_o	0	150
k	0	0

ka_b	0	137
ka_o	0	137
ka_s	0	0
ke_b	0	150
ke_o	0	145
ki_b	0	118
ki_o	0	118
kix_b	0	140
kix_o	0	140
kix_s	0	0
ko_b	0	137
ko_o	0	137
kox_b	0	135
kox_o	0	135
ku_b	0	140
ku_o	0	140
kux_b	0	142
kux_o	0	142
la_b	0	138
la_o	0	133
la_s	0	0
le_b	0	131
le_o	0	131
le_s	0	0
li_b	0	139
li_o	0	139
li_s	0	0
lix_b	0	140
lix_o	0	140
lo_b	0	145
lo_o	0	145
lox_b	0	140
lox_o	0	140
lu_b	0	140
lu_o	0	140
lu_s	0	0
lux_b	0	139
lux_o	0	139
ma_b	0	135
ma_o	0	136
ma_s	0	0
me_b	0	148
me_o	0	138
me_s	0	0
mi_b	0	150
mi_o	0	150
mix_b	0	137

mix_o	0	137
mo_b	0	152
mo_o	0	152
mox_b	0	150
mox_o	0	150
mu_b	0	142
mu_o	0	142
mux_b	0	148
mux_o	0	148
na_b	0	148
na_o	0	148
na_s	0	0
ne_b	0	150
ne_o	0	150
ne_s	0	0
ni_b	0	148
ni_o	0	148
nix_b	0	147
nix_o	0	147
nix_s	0	0
no_b	0	149
no_o	0	149
nox_b	0	145
nox_o	0	145
nu_b	0	150
nu_o	0	150
nux_b	0	151
nux_o	0	151
o	150	150
of_b	0	0
of_o	125	0
og_b	0	0
og_o	147	0
ogx_b	0	0
ogx_o	150	0
oh_b	0	0
oh_o	145	0
ol_o	151	0
ol_s	151	0
ola_o	148	165
ola_s	135	0
on_o	133	0
on_s	133	0
onz_s	149	0
op_s	149	0
or_b	0	0
or_o	150	0

or_s	150	0
oru_o	140	150
oru_s	140	0
os_o	139	0
os_s	137	0
ost_o	138	0
ost_s	138	0
osx_o	126	0
osx_s	126	0
ox	148	148
oxb_o	146	0
oxbe_o	146	153
oxc_o	137	0
oxce_o	137	143
oxh_o	143	0
oxl_o	142	0
oxle_o	142	160
oxle_s	142	0
oxm_o	135	0
oxn_o	139	0
oxnt_o	140	0
oxr_o	143	0
oxr_s	143	0
oxst_o	131	0
oxst_s	131	0
p	0	0
pa_b	0	138
pa_o	0	135
pa_s	0	0
pe_s	0	0
ra_b	0	148
ra_o	0	148
ra_s	0	0
re_o	0	133
re_s	0	0
rox_b	0	137
rox_o	0	137
ru_b	0	142
ru_o	0	142
ru_s	0	0
rux_b	0	143
rux_o	0	143
s	0	0
sa_b	0	134
sa_o	0	134
sa_s	0	0
se_b	0	142

se_o	0	142
si_b	0	131
si_o	0	131
si_s	0	0
so_b	0	142
so_o	0	142
sox_b	0	145
sox_o	0	145
su_b	0	137
su_o	0	137
sux_b	0	142
sux_o	0	142
sxa_b	0	139
sxa_o	0	139
sxa_s	0	0
sxe_b	0	140
sxe_o	0	140
sxi_b	0	135
sxi_o	0	135
sxix_b	0	139
sxix_o	0	139
sxo_b	0	140
sxo_o	0	140
sxox_b	0	139
sxox_o	0	139
sxu_b	0	128
sxu_o	0	128
sxux_b	0	143
sxux_o	0	143
t	0	0
ta_b	0	125
ta_o	0	135
ta_s	0	0
te_b	0	133
te_o	0	133
te_s	0	0
ti_b	0	134
ti_o	0	134
tix_b	0	137
tix_o	0	137
to_b	0	141
to_o	0	141
tox_b	0	132
tox_o	0	132
tu_b	0	135
tu_o	0	135
tux_b	0	142

tux_o	0	147
u	142	142
uf_b	0	0
uf_o	147	0
uf_s	147	0
uh_b	0	0
uh_o	135	0
uhu_o	135	145
uk_b	0	0
uk_o	139	0
uka_o	145	148
ul_b	0	0
ul_o	147	0
ul_s	147	0
ulu_b	0	147
ulu_o	137	147
um_b	0	0
um_o	145	0
un_b	0	0
un_o	135	0
un_s	135	0
un_s	151	0
up_b	0	0
up_o	135	0
ur_b	0	0
ur_o	135	0
ur_s	134	0
ura_o	145	150
us_b	0	0
us_o	143	0
us_s	142	0
usa_o	142	150
usx_b	0	0
usx_o	135	0
usx_s	147	0
usxa_b	0	150
usxa_o	135	150
ut_b	0	0
ut_o	138	0
ut_s	138	0
uv_b	0	0
uv_o	135	0
ux	148	148
uxb_o	150	0
uxba_o	148	151
uxbi_o	150	142
uxc_b	0	0

uxc_o	137	0
uxcx_b	0	0
uxcx_o	140	0
uxf_b	0	0
uxf_o	143	0
uxk_o	139	0
uxks_o	139	0
uxks_s	139	0
uxl_b	0	0
uxl_o	149	0
uxm_b	0	0
uxm_o	140	0
uxn_b	0	0
uxn_o	139	0
uxn_s	137	0
uxn_s	145	0
uxnux_o	140	139
uxp_s	145	0
uxr_b	0	0
uxr_o	145	0
uxr_o	143	0
uxre_o	145	150
uxre_s	145	0
uxrk_o	140	0
uxrk_s	140	0
uxs_b	0	0
uxs_o	151	0
uxs_s	151	0
uxsu_o	131	137
uxt_o	129	0
uxtux_o	129	146
uxv_b	0	0
uxv_o	148	0
uxve_b	0	0
uxve_o	148	155
uxy_b	0	0
uxy_o	140	0
uxye_b	0	0
uxye_o	143	160
uxye_s	143	0
uxz_b	0	0
uxz_o	143	0
uy_b	0	0
uy_o	138	0
uz_b	0	0
uz_o	135	0
uza_b	0	152

uza_o	135	152
va_b	0	140
va_o	0	140
va_s	0	0
ve_b	0	150
ve_o	0	150
vi_b	0	150
vi_o	0	150
vix_b	0	150
vix_o	0	150
vo_b	0	150
vo_o	0	150
vox_b	0	150
vox_o	0	150
vu_b	0	145
vu_o	0	145
vux_b	0	150
vux_o	0	150
ya_b	0	143
ya_o	0	143
ya_s	0	0
ye_b	0	147
ye_o	0	147
yi_b	0	150
yi_o	0	150
yix_b	0	147
yix_o	0	147
yo_b	0	141
yo_o	0	145
yox_b	0	148
yox_o	0	148
yux_b	0	148
yux_o	0	148
za_b	0	135
za_o	0	135
za_s	0	0
ze_b	0	126
ze_o	0	126
zi_b	0	149
zi_o	0	149
zix_b	0	150
zix_o	0	150
zo_b	0	140
zo_o	0	140
zox_b	0	151
zox_o	0	151
zu_b	0	146

zu_o	0	146
zux_b	0	147
zux_o	0	147

Appendix B- List of all diphones to cover all Turkish words

aa_b	aa_o	aa_s	ab_b	ab_o	ab_s	aba_b	aba_o	aba_s
abb_b	abd_b	abe_o	abe_s	abi_b	abi_o	abi_s	abix_o	abix_s
abl_o	abl_s	abo_b	abo_o	abo_s	abs_o	abu_b	abu_o	abux_o
aby_s	ac_b	ac_o	ac_s	aca_b	aca_o	aca_s	acc_o	ace_b
ace_o	ace_s	ach_b	ach_o	ach_s	aci_b	aci_o	acix_b	acix_o
acix_s	ack_o	ack_s	acl_s	aco_o	aco_s	acs_s	acu_b	acu_o
acx_b	acx_o	acx_s	acxa_b	acxa_o	acxa_s	acxe_b	acxe_o	acxi_o
acxix_b	acxix_o	acxix_s	acxo_o	acxox_o	acxs_o	acxsx_o	acxt_o	acy_o
acy_s	acz_b	acz_o	ad_b	ad_o	ad_s	ada_b	ada_o	ada_s
add_o	ade_b	ade_o	ade_s	adi_b	adi_o	adi_s	adix_b	adix_o
adix_s	ado_b	ado_o	ado_s	adr_o	adt_s	adu_o	adux_o	ady_o
ae_b	ae_o	ae_s	af_b	af_o	af_s	afa_b	afa_o	afa_s
afe_b	afe_o	afe_s	aff_o	afg_b	afi_b	afi_o	afi_s	afix_o
afix_s	afo_b	afo_o	afox_o	afs_o	afu_o	ag_b	ag_o	ag_s
aga_b	aga_o	age_b	age_o	age_s	agh_b	agh_o	agi_b	agi_o
agix_o	agix_s	ago_o	ago_s	agox_o	ags_o	agu_b	agu_o	agux_o
agx_b	agx_o	agx_s	agxa_b	agxa_o	agxa_s	agxi_o	agxi_s	agxix_b
agxix_o	agxix_s	agxm_o	agxo_o	agxox_o	agxu_b	ah_b	ah_o	ah_s
aha_b	aha_o	aha_s	ahe_o	ahh_b	ahi_b	ahi_o	ahi_s	ahix_b
ahix_o	ahix_s	ahl_o	ahm_o	ahn_o	aho_o	aht_o	ahu_b	ahu_o
ahu_s	ahux_o	ai_b	ai_o	ai_s	aix_b	aix_o	aix_s	aj_b
aj_o	aj_s	aja_b	aja_o	aja_s	aje_o	aji_b	aji_o	ajix_o
ajix_s	ajo_o	aju_o	ak_b	ak_o	ak_s	aka_b	aka_o	aka_s
akd_b	akd_o	ake_b	ake_o	ake_s	akf_o	akh_o	aki_b	aki_o
aki_s	akix_b	akix_o	akix_s	akk_o	akk_s	akl_o	akm_b	ako_b
ako_o	ako_s	akox_o	akr_s	aks_o	aks_s	akt_b	akt_o	akt_s
aku_b	aku_o	aku_s	akux_b	akux_o	aky_o	al_b	al_o	al_s
ala_b	ala_o	ala_s	alb_b	alc_b	alc_o	ald_b	ald_o	ald_s
ale_b	ale_o	ale_s	alf_b	alg_b	alg_o	algx_o	ali_b	ali_o
ali_s	alix_b	alix_o	alix_s	alj_s	alk_o	all_o	all_s	alm_o
alo_o	alo_s	alox_o	alp_b	alp_o	alp_s	als_b	als_o	alt_b
alt_o	alt_s	alu_o	alux_b	alux_o	aly_o	aly_s	alz_o	am_b
am_o	am_s	ama_b	ama_o	ama_s	amb_b	amb_o	ame_b	ame_o
ame_s	amg_b	amgx_o	ami_b	ami_o	ami_s	amix_b	amix_o	amix_s
amm_o	amo_b	amo_o	amp_b	amp_o	amp_s	ams_b	ams_o	amsx_o
amu_b	amu_o	amux_o	amy_o	amz_s	an_b	an_o	an_s	ana_b
ana_o	ana_s	anc_o	ancx_o	ancx_s	and_b	and_o	and_s	ane_b

ane_o	ane_s	ang_b	ang_o	ang_s	anh_o	ani_b	ani_o	ani_s
anix_b	anix_o	anix_s	anj_o	ank_o	ank_s	anl_o	anl_s	anm_o
anm_s	ann_o	ann_s	ano_b	ano_o	ano_s	anox_o	ans_b	ans_o
ans_s	ansx_o	ant_b	ant_o	ant_s	anu_o	anu_s	anux_o	any_s
anz_s	ao_b	ao_o	ao_s	ap_b	ap_o	ap_s	apa_b	apa_o
apa_s	ape_b	ape_o	aph_o	aph_s	api_o	api_s	apix_o	apix_s
apo_b	apo_o	app_b	app_o	aps_b	apt_o	apu_o	aq_o	aqa_s
aqu_b	aqu_o	ar_b	ar_o	ar_s	ara_b	ara_o	ara_s	arb_o
arc_b	arc_o	arcx_o	ard_b	ard_o	ard_s	are_b	are_o	are_s
arf_o	ari_b	ari_o	ari_s	arix_b	arix_o	arix_s	arj_o	ark_o
ark_s	arl_b	arl_o	arm_o	arn_b	arn_o	aro_o	aro_s	arp_o
arr_o	ars_b	ars_o	ars_s	arsx_o	art_b	art_o	art_s	aru_b
aru_o	arux_o	ary_o	ary_s	arz_b	arz_o	as_b	as_o	as_s
asa_b	asa_o	asa_s	asb_s	asc_o	ase_b	ase_o	ase_s	ash_b
ash_o	ash_s	asi_b	asi_o	asi_s	asix_b	asix_o	asix_s	ask_o
aso_b	aso_o	aso_s	asox_o	asp_b	asp_o	asp_s	ass_o	ass_s
ast_b	ast_o	ast_s	asu_b	asu_o	asu_s	asux_o	asx_b	asx_o
asx_s	asxa_b	asxa_o	asxa_s	asxe_b	asxe_o	asxi_b	asxi_o	asxix_b
asxix_o	asxix_s	asxk_b	asxl_s	asxm_s	asxo_o	asxox_o	asxu_o	asxux_o
asy_s	asz_o	at_b	at_o	at_s	ata_b	ata_o	ata_s	atc_o
atcx_o	ate_b	ate_o	ate_s	ath_b	ath_o	ath_s	ati_b	ati_o
ati_s	atix_b	atix_o	atix_s	atk_o	atk_s	atm_b	atm_o	atn_s
ato_b	ato_o	ato_s	atox_b	atox_o	atr_o	att_b	att_o	att_s
atu_o	atux_b	atux_o	aty_s	atz_o	au_b	au_o	au_s	av_b
av_o	av_s	ava_b	ava_o	ava_s	ave_b	ave_o	ave_s	avi_b
avi_o	avi_s	avix_b	avix_o	avix_s	avo_o	avu_b	avu_o	avux_o
aw_o	awa_b	awa_o	awa_s	awe_o	awi_o	awk_o	aws_b	aws_o
ax_o	ax_s	axa_o	axi_b	axi_o	axix_o	ay_b	ay_o	ay_s
aya_b	aya_o	aya_s	aye_b	aye_o	aye_s	ayi_b	ayi_o	ayi_s
ayix_b	ayix_o	ayix_s	ayn_o	ayo_o	ayox_o	ayp_s	ays_b	ayt_b
ayt_o	ayt_s	ayu_o	ayux_o	az_b	az_o	az_s	aza_b	aza_o
aza_s	aze_b	aze_o	aze_s	azi_b	azi_o	azi_s	azix_b	azix_o
azix_s	azo_b	azo_o	azp_o	azu_o	azu_s	azz_o	ba_b	ba_o
ba_s	bda_s	be_b	be_o	be_s	bgg_b	bha_b	bi_b	bi_o
bi_s	bix_b	bix_o	bje_b	bla_b	ble_b	bli_b	blo_b	blu_b
blu_o	blux_b	bly_b	bmg_b	bmm_s	bmw_b	bo_b	bo_o	bo_s
box_b	box_o	bpp_b	br_b	bra_b	bre_b	bri_b	bro_b	bro_o
brox_b	bru_b	brux_b	bry_b	bu_b	bu_o	bu_s	bux_b	bux_o
by_b	byc_b	byr_b	ca_b	ca_o	ca_s	cci_b	cd_b	cde_o
cdu_b	ce_b	ce_o	ce_s	ch_b	ch_o	ch_s	cha_b	che_b
che_o	che_s	chi_b	chi_o	chix_b	cho_b	chp_b	chr_b	chu_b
ci_b	ci_o	ci_s	cix_b	cix_o	cix_s	cla_b	cla_o	cle_b
cli_b	clo_b	clu_b	cmu_b	cn_b	cni_o	cnr_b	co_b	co_o
co_s	cox_b	cox_o	cr_b	cra_b	cre_b	cri_b	crix_o	cro_b

cro_s	cru_b	cs_b	csix_b	cu_b	cu_o	cu_s	cux_b	cux_o
cux_s	cxa_b	cxa_o	cxa_s	cxe_b	cxe_o	cxe_s	cxi_b	cxi_o
cxi_s	cxix_b	cxix_o	cxix_s	cxo_b	cxo_o	cxox_b	cxox_o	cxu_b
cxu_o	cxu_s	cxux_b	cxux_o	cxux_s	cxyd_b	cy_b	cyi_s	cyp_b
da_b	da_o	da_s	dda_s	de_b	de_o	de_s	dgm_b	dh_b
dhk_b	dho_b	di_b	di_o	di_s	dix_b	dix_o	dix_s	dja_b
dje_b	djo_b	dju_b	dmi_b	dna_b	dne_b	do_b	do_o	do_s
dox_b	dox_o	dra_b	dre_b	dri_b	dro_b	dru_b	dsp_b	dtm_b
dtp_b	du_b	du_o	du_s	dux_b	dux_o	dux_s	dve_b	dy_b
dya_s	dye_s	dyp_b	dz_b	ea_b	ea_o	ea_s	eb_b	eb_o
eb_s	eba_o	eba_s	ebe_b	ebe_o	ebe_s	ebi_b	ebi_o	ebi_s
ebo_o	ebo_s	ebr_o	ebt_s	ebu_b	ebu_o	ebux_b	eby_s	ec_b
ec_o	ec_s	eca_o	eca_s	ecc_b	ecc_o	ece_b	ece_o	ece_s
ech_o	ech_s	eci_b	eci_o	eci_s	eck_o	eck_s	eco_b	eco_o
ect_o	ect_s	ecu_b	ecu_o	ecux_o	ecx_b	ecx_o	ecx_s	ecxe_o
ecxe_s	ecxi_o	ecxu_s	ed_b	ed_o	ed_s	eda_b	eda_o	eda_s
ede_b	ede_o	ede_s	edg_o	edi_b	edi_o	edi_s	edix_o	edo_b
edo_o	edr_o	eds_s	edt_s	edu_b	edu_o	edux_o	edy_o	edy_s
ee_o	ee_s	ef_b	ef_o	ef_s	efa_o	efa_s	efe_b	efe_o
efe_s	eff_s	efi_o	efi_s	efo_b	efo_o	eft_s	efu_o	efux_o
eg_b	eg_o	eg_s	ega_o	ega_s	ege_b	ege_o	ege_s	egh_o
egi_b	egi_o	egl_o	ego_b	ego_o	egox_o	egu_b	egu_o	egux_o
egx_b	egx_o	egxe_b	egxe_o	egxe_s	egxi_b	egxi_o	egxi_s	egxn_s
egxsx_o	egxu_o	eh_b	eh_o	eh_s	eha_o	ehe_b	ehe_o	ehh_o
ehi_b	ehi_o	eho_o	ehr_b	ei_b	ei_o	ei_s	eix_o	eix_s
ej_b	ej_o	eja_o	ejc_o	eje_o	eji_o	eji_s	ejix_o	ejn_o
ek_b	ek_o	ek_s	eka_b	eka_o	ekb_b	eke_b	eke_o	eke_s
ekh_s	eki_b	eki_o	eki_s	ekix_o	ekl_o	ekm_o	ekn_s	eko_b
eko_o	ekox_o	eks_b	eks_o	eks_s	ekt_o	ekt_s	eku_o	eku_s
ekux_o	eky_s	el_b	el_o	el_s	ela_b	ela_o	ela_s	elb_o
elcx_o	eld_o	eld_s	ele_b	ele_o	ele_s	elf_b	elf_o	elg_o
eli_b	eli_o	eli_s	elix_o	elj_o	elk_b	elk_o	ell_b	ell_o
ell_s	elo_b	elo_o	elox_o	elp_o	els_o	els_s	elsx_b	elt_o
elt_s	elu_o	elu_s	elux_o	ely_b	ely_s	em_b	em_o	em_s
ema_b	ema_o	ema_s	emb_b	emb_o	eme_b	eme_o	eme_s	emi_b
emi_o	emi_s	emk_o	emk_s	emo_b	emo_o	emo_s	emp_o	ems_o
ems_s	emt_o	emu_o	emux_o	en_b	en_o	en_s	ena_b	ena_o
ena_s	enb_o	enc_b	enc_o	enc_s	encx_o	encx_s	end_o	end_s
ene_b	ene_o	ene_s	enf_b	eng_b	eng_o	enh_o	eni_b	eni_o
eni_s	enix_b	enix_o	enk_o	enk_s	enl_b	enl_o	enn_o	eno_o
enox_o	enq_b	ens_b	ens_o	ens_s	ensx_o	ent_b	ent_o	ent_s
enu_o	enux_o	eny_s	enz_s	eo_b	eo_o	eo_s	ep_o	ep_s
epa_b	epa_o	epe_b	epe_o	epe_s	epi_b	epi_o	epo_o	epo_s
eps_o	ept_o	epu_o	equ_o	er_b	er_o	er_s	era_b	era_o

era_s	erc_b	erc_o	ercx_b	ercx_s	erd_s	ere_b	ere_o	ere_s
erf_o	erg_b	erg_o	erg_s	erh_o	eri_b	eri_o	eri_s	erix_o
erix_s	erk_b	erk_o	erk_s	erl_o	erm_o	ern_b	ern_o	ern_s
ero_b	ero_o	ero_s	erox_o	erp_o	err_o	err_s	ers_o	ers_s
ert_o	ert_s	eru_b	eru_o	erux_o	erv_o	erv_s	ery_o	ery_s
es_b	es_o	es_s	esa_b	esa_o	esa_s	esb_o	esc_o	ese_b
ese_o	ese_s	esh_o	esh_s	esi_b	esi_o	esi_s	esix_o	esix_s
esk_b	esk_o	esk_s	esn_o	eso_o	esox_o	esp_b	ess_o	ess_s
est_b	est_o	est_s	esu_o	esu_s	esux_s	esx_b	esx_o	esx_s
esxa_b	esxa_o	esxe_b	esxe_o	esxe_s	esxi_b	esxi_o	esxi_s	esxk_o
esxm_o	esxo_b	esxo_o	esxt_o	esxux_o	et_b	et_o	et_s	eta_b
eta_o	eta_s	etc_o	ete_b	ete_o	ete_s	eth_o	eth_s	eti_b
eti_o	eti_s	etix_o	etk_b	etl_o	etn_o	eto_o	etox_o	etr_o
ets_o	ets_s	ett_o	ett_s	etu_b	etu_o	etux_b	etux_o	eu_b
eu_o	eu_s	ev_b	ev_o	ev_s	eva_b	eva_o	eva_s	evc_s
eve_b	eve_o	eve_s	evh_o	evi_b	evi_o	evi_s	evix_o	evk_o
evo_b	evo_o	evo_s	evr_o	evs_o	evu_o	evy_o	ew_o	ewa_o
ewe_o	ewi_o	ewo_o	ewr_s	ews_o	ewu_o	ewux_o	ex_b	ex_o
ex_s	exa_b	exa_o	exc_b	exe_b	exe_s	exi_b	exi_o	exp_b
exs_b	ext_b	exu_o	ey_b	ey_o	ey_s	eya_b	eya_o	eya_s
eye_o	eye_s	eyh_o	eyi_b	eyi_o	eyi_s	eyk_o	eyk_s	eyl_o
eyl_s	eyn_o	eyn_s	eyo_o	eyp_o	eyr_s	eys_o	eyt_o	eyt_s
eyux_b	ez_b	ez_o	ez_s	eza_b	eza_o	eze_b	eze_o	eze_s
ezi_b	ezi_o	ezi_s	ezix_o	ezo_o	ezu_b	ezu_o	ezux_o	fa_b
fa_o	fe_b	fe_o	fe_s	fi_b	fi_o	fix_b	fix_o	fla_b
fle_b	fli_b	flix_b	flo_b	flox_b	flu_b	fna_b	fo_b	fo_o
fox_o	fp_b	fr_b	fra_b	fre_b	fri_b	frix_b	fro_b	fru_b
fu_b	fu_o	fu_s	fux_b	fux_o	ga_b	ga_o	ga_s	gby_s
ge_b	ge_o	ge_s	gha_b	ghe_b	ghi_b	gi_b	gi_o	gi_s
gix_b	gix_o	gix_s	gja_b	gkr_b	gla_b	gle_b	gli_b	glo_b
gm_b	gmb_b	gne_b	go_b	go_o	go_s	gox_b	gox_o	gox_s
gr_b	gra_b	gra_o	gre_b	gri_b	gro_b	grox_b	gru_b	grux_b
gs_b	gsm_b	gtux_b	gu_b	gu_o	gu_s	gux_b	gux_o	gwy_b
gxe_o	gxi_o	gxi_s	gxix_o	gxix_s	gxu_o	gxu_s	gxux_o	gxux_s
gy_o	gyu_b	ha_b	ha_o	ha_s	hbe_o	hco_o	hda_o	hda_s
hde_o	hdk_b	he_b	he_o	he_s	hgg_o	hhh_s	hi_b	hi_o
hi_s	hix_b	hix_o	hix_s	hka_s	hko_o	hla_b	hla_o	hle_o
hly_o	hma_o	ho_b	ho_o	ho_s	hox_b	hox_o	hp_b	hri_b
hrix_b	hro_o	hrox_o	hry_s	hs_s	hsix_o	hsy_b	hta_o	hte_s
hu_b	hu_o	hu_s	hux_b	hux_o	hvi_b	hvi_o	hwa_o	hy_b
hy_o	hy_s	hye_s	hyix_s	hyu_b	ia_b	ia_o	ia_s	ib_b
ib_o	ib_s	iba_b	iba_o	iba_s	ibb_o	ibe_b	ibe_o	ibe_s
ibi_b	ibi_o	ibi_s	ibo_o	ibu_o	ibux_o	ic_b	ic_o	ic_s
ica_b	ica_o	ica_s	ice_b	ice_o	ice_s	ich_o	ich_s	ici_o

ici_s	ick_o	ick_s	ico_o	ico_s	ics_o	ics_s	ict_s	icu_o
icx_b	icx_o	icx_s	icxa_b	icxa_o	icxa_s	icxe_b	icxe_o	icxe_s
icxi_b	icxi_o	icxi_s	icxo_o	icy_o	icz_s	id_b	id_o	id_s
ida_b	ida_o	ida_s	idd_o	ide_b	ide_o	ide_s	idi_b	idi_o
idi_s	idix_s	ido_b	ido_o	ido_s	idt_o	ie_b	ie_o	ie_s
if_b	if_o	if_s	ifa_b	ifa_o	ife_o	ife_s	iff_o	iff_s
ifi_o	ifi_s	ifo_o	ifs_o	ift_o	ift_s	ig_b	ig_o	iga_o
iga_s	ige_o	igg_o	igh_o	igi_o	igi_s	ign_o	ign_s	igo_o
igo_s	igox_o	igs_o	igs_s	igt_o	igu_o	igux_o	igx_b	igx_o
igx_s	igxe_o	igxe_s	igxi_o	igxi_s	igxix_o	igy_s	ih_b	ih_o
ih_s	iha_b	iha_o	iha_s	ihe_s	ihi_o	ihi_s	ihix_o	ihk_o
ihl_b	ihm_o	iho_o	ihox_b	ihu_o	ii_b	ii_o	ii_s	iix_b
iix_o	ij_o	ija_o	ije_o	iji_o	ijn_s	iju_o	ik_b	ik_o
ik_s	ika_b	ika_o	ika_s	ike_b	ike_o	ike_s	ikh_o	iki_b
iki_o	iki_s	ikix_o	iko_b	iko_o	iko_s	ikox_o	iks_o	iks_s
ikt_b	ikt_s	iku_o	iku_s	ikux_o	ikv_b	il_b	il_o	il_s
ila_b	ila_o	ila_s	ilcx_b	ild_o	ild_s	ile_b	ile_o	ile_s
ilf_o	ili_b	ili_o	ili_s	ilk_b	ilk_o	ill_o	ill_s	ilm_o
ilo_o	ils_s	ilt_o	ilu_o	ilux_b	ilux_o	ilv_o	im_b	im_o
im_s	ima_b	ima_o	ima_s	imb_o	imcx_b	ime_b	ime_o	ime_s
imi_b	imi_o	imi_s	imix_o	imix_s	imk_b	imk_o	imo_b	imo_o
imo_s	imp_o	ims_o	imu_o	imux_o	imv_s	in_b	in_o	in_s
ina_b	ina_o	ina_s	inc_b	inc_o	incx_o	incx_s	ind_o	ind_s
ine_b	ine_o	ine_s	ing_b	ing_o	ing_s	inh_s	ini_b	ini_o
ini_s	inix_s	ink_o	inn_o	inn_s	ino_o	ino_s	inox_b	inox_o
inr_o	ins_o	ins_s	int_b	int_o	int_s	inu_o	inux_o	inz_o
inz_s	io_o	io_s	iox_o	ip_b	ip_o	ip_s	ipa_o	ipe_b
ipe_o	ipi_b	ipi_o	ipo_b	ipo_o	ipp_o	ips_o	ips_s	ipu_o
iqu_o	ir_b	ir_o	ir_s	ira_b	ira_o	ira_s	irc_o	ird_s
ire_b	ire_o	ire_s	iri_b	iri_o	iri_s	irix_o	irk_o	irl_o
irl_s	irm_s	irn_o	iro_b	iro_o	iro_s	irox_o	irs_o	irt_o
iru_o	iru_s	irux_o	is_b	is_o	is_s	isa_b	isa_o	isa_s
isc_o	ise_b	ise_o	ise_s	ish_s	isi_b	isi_o	isi_s	isix_s
isk_o	isk_s	ism_b	ism_s	iso_o	iso_s	isox_o	isp_o	iss_o
ist_b	ist_o	ist_s	isx_b	isx_o	isx_s	isxa_b	isxa_o	isxe_b
isxe_o	isxe_s	isxi_b	isxi_o	isxi_s	isxk_o	isxo_o	isxox_o	isxt_o
isxt_s	isxu_o	isz_s	it_b	it_o	it_s	ita_b	ita_o	ita_s
itc_o	ite_b	ite_o	ite_s	ith_o	ith_s	iti_b	iti_o	iti_s
itm_b	itm_o	itm_s	ito_b	ito_o	ito_s	itox_o	its_o	its_s
itt_o	itu_o	itux_o	itux_s	ity_o	ity_s	itz_o	itz_s	iu_b
iu_o	iu_s	iv_b	iv_o	iv_s	iva_b	iva_o	iva_s	ive_b
ive_o	ive_s	ivi_o	ivo_o	iwa_o	iwi_s	ix_o	ix_s	ixa_o
ixa_s	ixb_o	ixba_o	ixba_s	ixbe_o	ixbi_o	ixbix_o	ixbix_s	ixbm_b
ixbo_o	ixc_o	ixc_s	ixca_o	ixca_s	ixce_b	ixce_o	ixch_s	ixci_o

ixcix_o	ixcix_s	ixcx_o	ixcx_s	ixcxa_o	ixcxa_s	ixcxe_o	ixcxix_o	ixcxix_s
ixd_o	ixda_o	ixda_s	ixde_b	ixde_o	ixdi_o	ixdix_o	ixdix_s	ixds_o
ixds_s	ixe_o	ixf_o	ixfa_o	ixfe_o	ixfi_o	ixfix_o	ixfix_s	ixfu_b
ixg_b	ixg_s	ixgi_o	ixgix_o	ixgox_o	ixgux_o	ixgx_b	ixgx_o	ixgx_s
ixgxa_o	ixgxa_s	ixgxix_o	ixgxix_s	ixh_b	ixh_o	ixha_o	ixha_s	ixho_o
ixi_o	ixi_s	ixix_b	ixix_o	ixix_s	ixk_o	ixk_s	ixka_o	ixka_s
ixke_o	ixkix_o	ixkix_s	ixkl_o	ixkm_o	ixko_o	ixkox_o	ixku_o	ixl_b
ixl_o	ixl_s	ixla_o	ixla_s	ixld_o	ixle_o	ixli_b	ixlix_b	ixlix_o
ixlix_s	ixll_o	ixll_s	ixlm_s	ixln_o	ixlo_o	ixlox_o	ixlp_s	ixlt_o
ixly_o	ixly_s	ixm_b	ixm_o	ixm_s	ixma_o	ixma_s	ixmb_b	ixme_b
ixme_o	ixmi_o	ixmix_o	ixmix_s	ixml_s	ixmm_o	ixmo_s	ixmt_o	ixmu_o
ixmu_s	ixmz_o	ixn_b	ixn_o	ixn_s	ixna_o	ixna_s	ixncx_o	ixnd_s
ixne_b	ixne_o	ixne_s	ixng_o	ixni_o	ixni_s	ixnix_o	ixnix_s	ixnk_s
ixnm_o	ixnm_s	ixnn_b	ixnn_s	ixno_o	ixnr_o	ixns_b	ixnt_b	ixo_b
ixo_o	ixox_o	ixp_b	ixp_o	ixp_s	ixpa_o	ixpa_s	ixpe_o	ixpix_o
ixr_b	ixr_o	ixr_s	ixra_b	ixra_o	ixra_s	ixrd_s	ixre_o	ixrh_o
ixri_o	ixrix_b	ixrix_o	ixrix_s	ixrk_b	ixrk_o	ixrk_s	ixrm_o	ixrn_o
ixro_o	ixrp_o	ixrs_o	ixrt_o	ixs_b	ixs_o	ixs_s	ixsa_b	ixsa_o
ixse_o	ixsi_s	ixsix_b	ixsix_o	ixsix_s	ixso_o	ixsox_o	ixss_b	ixst_b
ixsx_o	ixsx_s	ixsxa_o	ixsxa_s	ixsxi_o	ixsxix_b	ixsxix_o	ixsxix_s	ixt_b
ixt_o	ixt_s	ixta_o	ixta_s	ixte_o	ixtix_o	ixtix_s	ixtl_s	ixtr_o
ixtux_o	ixtz_b	ixu_o	ixu_s	ixux_o	ixv_o	ixva_b	ixva_o	ixve_o
ixvix_o	ixvo_o	ixx_o	ixx_s	ixy_o	ixy_s	ixya_o	ixya_s	ixye_o
ixye_s	ixyix_o	ixyix_s	ixyo_o	ixyox_o	ixz_b	ixz_o	ixz_s	ixza_o
ixza_s	ixze_o	ixzix_o	ixzix_s	ixzo_b	ixzo_o	ixzz_s	iy_o	iy_s
iya_o	iya_s	iye_o	iye_s	iyi_b	iyi_o	iyi_s	iyix_o	iyix_s
iyl_o	iyl_s	iyn_s	iyo_b	iyo_o	iyo_s	iyox_o	iyu_o	iyux_b
iyux_o	iz_b	iz_o	iz_s	iza_b	iza_o	iza_s	ize_o	ize_s
izi_b	izi_o	izi_s	izm_o	izm_s	izn_s	izo_b	izo_o	izox_o
izu_o	izu_s	izux_o	izz_o	ja_b	ja_o	ja_s	je_b	je_o
je_s	ji_b	ji_o	ji_s	jix_o	jix_s	jo_b	jo_o	jo_s
jox_b	jox_o	ju_b	ju_o	jux_b	ka_b	ka_o	ka_s	kdp_b
kdv_b	ke_b	ke_o	ke_s	kh_b	kha_b	kho_b	kho_o	khu_b
ki_b	ki_o	ki_s	kix_b	kix_o	kix_s	kka_b	kkk_b	kkk_s
kkt_b	kl_b	kla_b	kle_b	kli_b	kli_s	klo_b	klu_b	klux_b
kma_b	kn_b	kni_b	kni_o	knix_o	kno_b	knox_b	ko_b	ko_o
ko_s	kox_b	kox_o	kr_b	kra_b	kre_b	kri_b	kri_o	krix_b
kro_b	kru_b	kry_b	ksi_b	ksix_b	ksix_o	kss_b	ksy_s	kta_b
kti_b	ku_b	ku_o	kux_b	kux_o	kux_s	kvi_b	ky_b	ky_o
ky_s	kya_s	kye_s	kyix_s	kyo_b	kyr_b	la_b	la_o	la_s
lbs_b	lci_o	ldp_b	le_b	le_o	le_s	lgc_b	lhe_b	lhu_o
li_b	li_o	li_s	lix_o	lix_s	lju_b	lkw_o	ll_b	lla_b
lli_b	lo_b	lo_o	lo_s	lox_b	lox_o	lpg_b	lu_b	lu_o
lu_s	lux_b	lux_o	lux_s	ly_b	ly_o	ly_s	lyb_b	lye_o

lyix_o	lyn_b	ma_b	ma_o	ma_s	mbo_o	mc_b	mca_b	mcb_b
mcc_b	mcg_b	mde_o	me_b	me_o	me_s	mfox_b	mgd_b	mgk_b
mhp_b	mhz_b	mi_b	mi_o	mi_s	mix_b	mix_o	mix_s	mka_b
mkr_b	mky_b	mla_b	mla_o	mlk_b	mmo_s	mne_s	mno_b	mo_b
mo_o	mox_b	mox_o	mpi_b	mpi_o	mpix_o	mr_b	mrix_o	msp_b
msux_b	mta_b	mte_b	mu_b	mu_o	mu_s	mux_b	mux_o	mya_b
myo_b	mys_b	na_b	na_o	na_s	nba_b	nbo_b	ncux_b	nda_b
nda_o	nde_s	ne_b	ne_o	ne_s	ngu_b	nhi_b	ni_b	ni_o
ni_s	nix_b	nix_o	nix_s	nji_b	nne_o	no_b	no_o	no_s
nox_b	npq_b	nsu_b	nte_b	nu_b	nu_o	nu_s	nux_b	nux_o
ny_b	nye_b	oa_b	oa_o	oa_s	ob_b	ob_o	oba_b	oba_o
oba_s	obb_o	obe_b	obe_o	obi_b	obi_o	obn_o	obo_o	obs_o
obu_b	obu_o	obu_s	obux_o	oc_b	oc_o	oc_s	oca_b	oca_o
occ_o	och_o	och_s	oci_o	oci_s	ock_o	ock_s	oco_o	ocs_o
ocu_o	ocu_s	ocx_o	ocx_s	ocxa_o	ocxe_o	ocxi_o	ocxix_b	ocxo_o
ocxu_o	od_b	od_o	od_s	oda_b	oda_o	oda_s	ode_b	ode_o
odi_b	odi_o	odi_s	odm_s	odn_s	odo_o	odo_s	ods_s	odu_b
odu_o	odux_o	ody_o	oe_o	oe_s	of_b	of_o	of_s	ofa_b
ofa_o	ofe_o	off_b	off_o	off_s	ofi_b	ofi_o	ofo_o	ofox_o
oft_o	ofu_o	og_b	og_o	og_s	oga_o	oga_s	oge_o	ogh_o
ogi_b	ogi_o	ogo_o	ogq_o	ogu_b	ogu_s	ogux_b	ogx_b	ogx_o
ogx_s	ogxa_o	ogxa_s	ogxl_o	ogxo_o	ogxu_b	ogxu_o	ogxu_s	ogy_o
ogy_s	oh_b	oh_o	oh_s	oha_b	oha_o	ohe_b	ohe_o	ohi_b
ohi_o	ohl_o	ohn_o	ohn_s	oho_o	ohp_o	ohu_o	oi_b	oi_o
oj_o	oje_b	oje_o	oji_o	oji_s	ojo_o	ok_b	ok_o	ok_s
oka_b	oka_o	oka_s	oke_b	oke_o	oke_s	oki_b	oki_o	okl_o
oko_b	oko_o	oko_s	okox_o	oks_o	okt_o	oku_b	oku_o	oku_s
okux_o	ol_b	ol_o	ol_s	ola_b	ola_o	ola_s	olb_o	olc_o
old_o	old_s	ole_b	ole_o	ole_s	olf_o	olg_s	oli_b	oli_o
oli_s	olix_o	olk_o	oll_o	olm_s	olo_o	olo_s	olox_o	olp_o
ols_o	olt_o	olu_b	olu_o	olu_s	olux_b	olux_o	olux_s	oly_b
oly_o	olz_o	om_b	om_o	om_s	oma_b	oma_o	oma_s	omb_o
ome_b	ome_o	omi_o	omi_s	omix_o	omo_b	omo_o	omo_s	omp_o
oms_o	omu_b	omu_o	omu_s	omux_o	on_b	on_o	on_s	ona_b
ona_o	ona_s	oncx_o	ond_o	ond_s	one_b	one_o	one_s	ong_o
ong_s	oni_b	oni_o	oni_s	onix_o	onix_s	onk_o	onk_s	onl_o
onm_o	onn_o	ono_b	ono_o	onox_o	ons_o	ons_s	ont_o	ont_s
onu_b	onu_o	onu_s	ony_b	ony_o	ony_s	onz_o	oo_b	oo_o
oo_s	oox_b	op_b	op_o	op_s	opa_b	opa_o	opa_s	ope_b
ope_o	oph_o	opi_b	opi_o	opi_s	opix_o	opl_o	opo_b	opo_o
opox_o	opp_b	opp_o	opu_o	opux_o	oqu_o	or_b	or_o	or_s
ora_b	ora_o	ora_s	orb_s	orc_b	orc_o	orcx_o	ord_o	ord_s
ore_b	ore_o	ore_s	orf_o	org_b	org_o	org_s	ori_b	ori_o
ori_s	orix_o	orix_s	ork_b	ork_o	orl_b	orl_o	orl_s	orm_o
orn_o	oro_b	oro_o	orp_o	orr_o	ors_o	ors_s	ort_b	ort_o
ort_s	oru_b	oru_o	oru_s	orux_o	ory_o	ory_s	orz_s	os_b
os_o	os_s	osa_b	osa_o	osa_s	osc_o	osd_b	ose_o	osi_b

osi_o	osk_o	oso_o	oso_s	oss_o	ost_b	ost_o	ost_s	osu_o
osu_s	osx_b	osx_o	osx_s	osxa_o	osxa_s	osxe_o	osxi_o	osxl_o
osxu_o	osxux_o	ot_b	ot_o	ot_s	ota_b	ota_o	ota_s	otc_o
ote_b	ote_o	ote_s	oth_b	oth_o	oth_s	oti_b	oti_o	otix_o
oto_b	oto_o	oto_s	ots_o	ots_s	ott_b	ott_o	ott_s	otu_b
otu_o	otu_s	ou_b	ou_o	ou_s	oux_o	ov_b	ov_o	ov_s
ova_b	ova_o	ova_s	ove_b	ove_o	ove_s	ovi_b	ovi_o	ovix_o
ovo_b	ovo_o	ovo_s	ovs_o	ovu_b	ovu_o	ovu_s	ow_b	ow_o
ow_s	owa_o	owa_s	owe_b	owe_o	owi_o	owix_o	own_o	own_s
ows_o	ows_s	owu_o	ox_o	ox_s	oxa_b	oxb_o	oxbe_b	oxbe_o
oxbux_b	oxbux_o	oxca_b	oxce_o	oxch_o	oxcux_b	oxcx_o	oxcxe_o	oxcxux_o
oxd_o	oxde_b	oxde_o	oxdi_b	oxdo_o	oxdp_b	oxdux_b	oxdux_o	oxe_o
oxf_b	oxf_o	oxfox_o	oxg_b	oxg_o	oxge_b	oxgx_b	oxgx_o	oxgxe_b
oxgxe_o	oxgxr_b	oxgxux_b	oxgxux_o	oxh_o	oxi_b	oxjl_b	oxk_b	oxk_o
oxka_o	oxke_o	oxko_o	oxkux_b	oxkux_o	oxl_b	oxl_o	oxla_o	oxlcx_b
oxle_b	oxle_o	oxle_s	oxlg_o	oxll_o	oxln_o	oxlux_b	oxlux_o	oxlux_s
oxly_o	oxm_b	oxm_o	oxm_s	oxme_b	oxme_o	oxmo_o	oxmox_o	oxmux_b
oxmux_o	oxn_b	oxn_o	oxna_b	oxnd_o	oxne_b	oxne_o	oxni_o	oxnk_o
oxnn_s	oxnox_o	oxnp_b	oxnt_o	oxnux_b	oxnux_o	oxp_b	oxp_o	oxpe_b
oxpe_o	oxpo_o	oxpux_b	oxpux_o	oxr_b	oxr_o	oxr_s	oxra_o	oxre_b
oxre_o	oxre_s	oxrf_o	oxri_b	oxri_o	oxrn_o	oxro_o	oxrox_o	oxrt_b
oxrt_o	oxrux_b	oxrux_o	oxrux_s	oxs_o	oxse_o	oxsi_o	oxst_b	oxst_o
oxsux_o	oxsx_o	oxsxe_o	oxsxk_o	oxsy_b	oxt_b	oxt_o	oxta_b	oxta_o
oxte_b	oxte_o	oxtox_o	oxtt_o	oxtu_o	oxtux_b	oxtux_o	oxv_b	oxv_o
oxv_s	oxva_o	oxve_b	oxve_o	oxvi_o	oxvux_b	oxvux_o	oxy_b	oxy_o
oxy_s	oxya_o	oxye_s	oxyi_o	oxyl_o	oxys_b	oxys_o	oxyux_b	oxyux_o
oxyux_s	oxz_b	oxz_o	oxz_s	oxza_b	oxza_o	oxze_b	oxze_o	oxze_s
oxzi_b	oxzo_b	oxzox_o	oxzux_b	oxzux_o	oxzux_s	oy_b	oy_o	oy_s
oya_b	oya_o	oya_s	oye_o	oye_s	oyi_o	oyo_o	oyo_s	oys_o
oyu_b	oyu_o	oyu_s	oz_o	oz_s	oza_b	oza_o	oza_s	oze_o
ozi_o	ozn_o	ozo_o	ozo_s	ozox_o	ozs_o	ozu_o	ozu_s	pa_b
pa_o	pa_s	pc_b	pdk_b	pds_b	pe_b	pe_o	pe_s	pfd_b
pfe_b	pfi_b	ph_b	pha_b	phe_b	phi_b	pho_b	pho_o	pi_b
pi_o	pix_b	pix_o	pkk_b	pla_b	ple_b	pli_s	plo_b	plu_b
plux_b	pnv_b	po_b	po_o	po_s	pox_b	ppk_b	pr_b	pra_b
pre_b	pre_o	pri_b	pro_b	pru_b	prux_b	ps_b	psa_b	pse_b
psi_b	pso_o	psy_b	pu_b	pu_o	pu_s	pux_b	pux_o	qa_b
qa_s	qi_o	qi_s	qla_s	qu_b	qu_o	qu_s	qvi_o	ra_b
ra_o	ra_s	rba_o	rcd_b	rde_b	re_b	re_o	re_s	rfo_o
rhe_b	rhe_o	rho_b	ri_b	ri_o	ri_s	rix_b	rix_o	rix_s
rna_o	ro_b	ro_o	ro_s	rox_b	rox_o	rp_b	rpi_b	rs_b
ru_b	ru_o	ru_s	rux_b	rux_o	rwa_b	ry_b	ry_o	ryi_s
sa_b	sa_o	sa_s	sb_o	sba_b	sbe_b	sc_b	sc_o	sca_b
sce_b	sch_b	sci_b	scn_b	sco_b	scu_b	scxg_b	sde_o	sde_s
se_b	se_o	se_s	sga_b	sh_b	sha_b	she_b	shi_b	shi_o
shix_b	sho_b	sho_o	shp_b	shu_b	si_b	si_o	si_s	six_b
six_o	six_s	sk_o	ska_b	ske_b	ski_b	sko_b	sku_b	sky_b

sla_b	sle_b	sli_b	slo_b	sma_b	sma_o	sme_b	smi_b	smi_o
smo_b	smy_b	sne_b	sni_b	sno_b	so_b	so_o	so_s	sox_b
sox_o	sp_b	spa_b	spd_b	spe_b	spi_b	spi_o	spo_b	spo_o
spy_b	squ_b	sr_b	sru_o	ssa_b	ssc_b	sse_o	ssi_b	ssk_b
st_b	st_o	sta_b	sta_o	ste_b	ste_o	ste_s	sti_b	sti_o
sto_b	sto_o	stox_b	stu_b	stux_b	su_b	su_o	su_s	sux_b
sux_o	sux_s	sva_b	sva_o	sve_b	svi_o	swa_b	swa_o	swe_b
swi_b	swix_b	swo_b	sxa_b	sxa_o	sxe_b	sxe_o	sxe_s	sxi_b
sxi_o	sxi_s	sxix_b	sxix_o	sxix_s	sxne_b	sxo_b	sxo_o	sxox_b
sxox_o	sxu_b	sxu_o	sxux_b	sy_b	sye_s	sym_b	syn_b	sz_o
sza_b	sze_b	szy_b	ta_b	ta_o	ta_s	tbm_b	tbt_b	tc_b
tcd_b	tcxix_o	tda_b	tde_s	tdv_b	te_b	te_o	te_s	tff_b
tgc_b	tgr_b	th_b	th_o	tha_b	the_b	the_o	thi_b	thk_b
tho_b	thu_b	thux_b	thy_b	ti_b	ti_o	ti_s	tix_b	tix_o
tix_s	tja_b	tkb_b	tki_o	tkp_b	tl_b	tmo_b	tni_o	tnt_b
to_b	to_o	to_s	tox_b	tox_o	tp_b	tp_s	tpa_b	tr_b
tra_b	tra_o	tre_b	tre_o	tri_b	tri_o	tro_b	trox_b	trox_o
trt_b	tru_b	tru_o	trux_b	trux_o	ts_b	ts_s	tsa_b	tse_b
tsi_b	tsk_b	tt_b	tte_o	ttg_b	ttux_b	tu_b	tu_o	tu_s
tux_b	tux_o	tux_s	tv_b	twa_b	twe_b	ty_o	tyk_o	tys_b
tz_b	tze_o	tzu_b	ua_o	ua_s	ub_o	ub_s	uba_o	uba_s
ubb_o	ube_b	ube_o	ubi_o	ubo_o	ubr_o	ubs_b	ubu_o	ubux_o
ubux_s	uc_o	uca_o	uca_s	uce_b	uce_o	uch_o	uch_s	uci_o
uck_o	uck_s	uco_o	ucu_b	ucu_o	ucu_s	ucv_o	ucx_b	ucx_o
ucxa_b	ucxa_o	ucxa_s	ucxe_o	ucxi_o	ucxu_b	ucxu_o	ud_o	ud_s
uda_b	uda_o	uda_s	ude_b	ude_o	ude_s	udi_b	udi_o	udi_s
udj_o	udo_b	udo_o	uds_o	udu_b	udu_o	udu_s	udux_o	ue_b
ue_o	ue_s	uf_b	uf_o	uf_s	ufa_b	ufa_o	ufe_o	ufi_o
ufi_s	ufo_b	ufo_o	uft_o	ufu_b	ufu_o	ufu_s	ufux_o	ug_b
ug_o	ug_s	uga_b	uga_o	uga_s	uge_o	ugh_o	ugh_s	ugi_o
ugo_o	ugu_b	ugu_o	ugux_o	ugx_b	ugx_o	ugx_s	ugxa_o	ugxa_s
ugxix_o	ugxu_b	ugxu_o	ugxu_s	uh_b	uh_o	uha_o	uhe_o	uhe_s
uhg_o	uhi_o	uhi_s	uhr_o	uhu_o	uhu_s	ui_o	uj_o	uja_o
uji_o	uju_o	uk_b	uk_o	uk_s	uka_b	uka_o	uka_s	uke_o
uki_o	uki_s	ukk_o	uko_o	uko_s	ukt_s	uku_o	uku_s	ul_b
ul_o	ul_s	ula_b	ula_o	ula_s	uld_o	uld_s	ule_b	ule_o
ule_s	uli_b	uli_o	uli_s	ulix_o	ulk_o	ull_o	ulo_o	ulox_o
ulp_o	ulr_s	uls_o	ult_b	ult_o	ult_s	ulu_b	ulu_o	ulu_s
ulux_o	uly_b	uly_o	um_b	um_o	um_s	uma_b	uma_o	uma_s
umb_b	umc_o	ume_o	ume_s	umh_o	umi_o	uml_s	umo_o	ump_o
ums_o	ums_s	umu_b	umu_o	umu_s	un_b	un_o	un_s	una_b
una_o	una_s	unc_o	unc_s	uncx_o	uncx_s	und_o	und_s	une_b
une_o	une_s	ung_o	ung_s	unh_b	uni_b	uni_o	uni_s	unix_b
unk_o	unl_o	unl_s	unm_o	unn_o	uno_b	uno_o	uns_o	unt_o
unu_b	unu_o	unu_s	uo_o	up_b	up_o	up_s	upa_o	upa_s
upe_o	upi_o	upl_s	upo_o	upp_o	upu_o	upux_o	uq_s	uqu_o
ur_b	ur_o	ur_s	ura_b	ura_o	ura_s	urc_o	urcx_o	urd_o

ure_b	ure_o	ure_s	urf_o	urg_o	urg_s	uri_b	uri_o	uri_s
urk_o	url_o	urm_s	urn_o	uro_o	urp_o	urr_o	urs_o	urt_o
urt_s	uru_b	uru_o	uru_s	urux_o	ury_o	us_b	us_o	us_s
usa_b	usa_o	usa_s	usc_o	use_o	use_s	ush_o	ush_s	usi_o
usi_s	usix_o	uso_o	uss_o	uss_s	ust_o	ust_s	usu_b	usu_o
usu_s	usux_b	usux_o	usx_o	usx_s	usxa_b	usxa_o	usxa_s	usxe_o
usxi_s	usxt_o	usxu_o	usxu_s	usz_o	usz_s	ut_b	ut_o	ut_s
uta_b	uta_o	uta_s	utc_o	ute_o	ute_s	utf_o	uth_s	uti_o
uti_s	utk_o	utl_o	utm_o	uto_o	uts_o	utt_o	utt_s	utu_o
utu_s	utux_o	uu_o	uv_o	uva_o	uva_s	uve_b	uve_o	uvi_o
uvo_o	uvox_o	uvv_o	uwa_o	uwe_o	uwo_o	ux_o	ux_s	uxa_o
uxb_o	uxba_o	uxbe_o	uxbi_o	uxbo_o	uxbu_o	uxbux_o	uxbux_s	uxc_b
uxc_o	uxca_o	uxce_o	uxce_s	uxci_o	uxcu_o	uxcux_o	uxcux_s	uxcx_b
uxcx_o	uxcx_s	uxcxa_o	uxcxe_b	uxcxe_o	uxcxix_b	uxcxo_b	uxcxux_b	uxcxux_o
uxd_o	uxd_s	uxda_o	uxde_o	uxde_s	uxdi_o	uxdu_o	uxdux_o	uxdux_s
uxe_o	uxf_b	uxf_o	uxfe_o	uxfi_o	uxfr_o	uxfu_o	uxfux_b	uxfux_o
uxfux_s	uxga_o	uxgi_o	uxgux_o	uxgux_s	uxgx_o	uxgxe_s	uxgxu_o	uxgxux_o
uxgxux_s	uxh_o	uxha_o	uxhe_o	uxhi_o	uxhux_o	uxix_o	uxj_o	uxjux_s
uxk_o	uxk_s	uxka_o	uxke_o	uxke_s	uxki_o	uxkix_o	uxkk_o	uxko_o
uxks_o	uxkt_s	uxku_o	uxkux_o	uxkux_s	uxl_b	uxl_o	uxl_s	uxla_o
uxld_s	uxle_o	uxle_s	uxli_o	uxlk_b	uxlk_o	uxll_o	uxlo_o	uxlox_o
uxlt_b	uxlt_o	uxlu_o	uxlux_o	uxlux_s	uxm_b	uxm_o	uxm_s	uxma_o
uxme_b	uxme_o	uxme_s	uxmi_b	uxmi_o	uxmo_o	uxmox_o	uxmu_o	uxmux_o
uxmux_s	uxn_b	uxn_o	uxn_s	uxna_b	uxna_o	uxncx_o	uxncx_s	uxne_b
uxne_o	uxne_s	uxni_b	uxni_o	uxnk_s	uxnn_s	uxno_o	uxns_o	uxnu_o
uxnu_s	uxnux_b	uxnux_o	uxnux_s	uxp_b	uxp_o	uxp_s	uxpe_o	uxpi_o
uxpo_o	uxpu_o	uxpux_o	uxqux_o	uxr_b	uxr_o	uxr_s	uxra_b	uxra_o
uxrcx_o	uxre_b	uxre_o	uxre_s	uxri_o	uxrix_o	uxrk_b	uxrk_o	uxrk_s
uxrn_o	uxro_b	uxro_o	uxrp_o	uxrt_o	uxru_o	uxrux_b	uxrux_o	uxrux_s
uxrz_o	uxs_b	uxs_o	uxs_s	uxsa_o	uxse_o	uxsi_o	uxso_o	uxss_o
uxst_b	uxst_o	uxst_s	uxsu_o	uxsux_b	uxsux_o	uxsux_s	uxsx_o	uxsx_s
uxsxa_o	uxsxe_b	uxsxe_o	uxsxe_s	uxsxi_s	uxsxo_o	uxsxs_o	uxsxu_o	uxsxux_b
uxsxux_o	uxsxux_s	uxt_o	uxt_s	uxta_o	uxte_o	uxte_s	uxto_b	uxto_o
uxtt_o	uxtu_o	uxtux_b	uxtux_o	uxux_b	uxux_o	uxux_s	uxv_o	uxva_o
uxve_b	uxve_o	uxvi_o	uxy_b	uxy_o	uxya_o	uxye_b	uxye_o	uxye_s
uxyi_s	uxyo_o	uxyux_o	uxyux_s	uxz_b	uxz_o	uxz_s	uxza_o	uxze_b
uxze_o	uxze_s	uxzi_o	uxzo_o	uxzox_o	uxzs_o	uxzt_s	uxzu_o	uxzux_b
uxzux_o	uxzux_s	uxzy_o	uy_b	uy_o	uy_s	uya_b	uya_o	uya_s
uye_o	uyg_b	uyi_s	uyo_o	uyu_b	uyu_o	uyu_s	uz_b	uz_o
uz_s	uza_b	uza_o	uza_s	uze_o	uzh_o	uzi_o	uzi_s	uzo_o
uzu_b	uzu_o	uzu_s	uzux_o	uzz_o	va_b	va_o	va_s	ve_b
ve_o	ve_s	vi_b	vi_o	vi_s	vix_b	vix_s	vla_b	vlo_b
vo_b	vo_o	vri_b	vtux_o	vu_b	vu_o	vux_b	vux_o	vyu_b
wa_b	wa_o	wbc_b	we_b	we_o	we_s	whe_b	whi_b	whix_b
wi_b	wi_o	wla_b	wo_b	wo_o	wri_b	wro_b	wt_b	wu_b
wu_s	wux_b	wyn_b	wyt_o	xa_b	xe_b	xi_b	xi_o	xo_o
xsa_b	xu_o	ya_b	ya_o	ya_s	yde_o	yde_s	ydk_b	ye_b

ye_o	ye_s	yg_o	yi_b	yi_o	yi_s	yix_b	yix_o	yix_s
ykix_o	yl_s	yla_s	yle_o	yle_s	yli_o	ym_o	yn_o	yni_o
yns_o	yo_b	yo_o	yo_s	yox_b	yox_o	ypk_b	ys_o	ysi_s
ysk_b	yt_o	yu_b	yu_o	yu_s	yux_b	yux_o	yve_b	yye_s
yyi_s	za_b	za_o	zd_b	zda_b	ze_b	ze_o	ze_s	zi_b
zi_o	zix_b	zix_o	zix_s	zo_b	zo_o	zto_o	zu_b	zu_o
zux_b	zyk_s							

Appendix C- A List of words to produce all necessary diphones for a complete TTS

This is the list of words to produce all necessary diphones for a complete Turkish TTS and the diphones that should be recorded from these words. Repeated diphones are not written again.

ClGInIn : cxix_b ixgxix_o ixnix_o ixn_s	ClGIrlar : ixr_o la_o ar_s
ClGlIGInIn : ixgx_o lix_o	ClGlIklarI : ixk_o arix_s
ClGlIklarIyla : arix_o ixy_o la_s	ClGlardan : ar_o da_o an_s
ClbanIndan : ixba_o anix_o ixn_o	ClkISImIn : ixkix_o ixsxix_o ixmix_o
ClkISlarImIn : ixsx_o	ClkISlarIydI : dix_s
ClkISmasInI : ma_o asix_o ixnix_s	ClkIStIGImIz : tix_o ixz_s
ClkIStaydI : ta_o ay_o	ClkIIlr : ixlix_o ixr_s
ClkIlabilir : ixla_o abi_o ili_o ir_s	ClkIlamIyor : amix_o ixyo_o or_s
ClkIlamaz : ama_o az_s	ClkIldIkca : ixl_o dix_o ca_s
ClkIlmadIGI : adix_o ixgxix_s	ClkIlmasI : asix_s
ClkIlmayan : aya_o	ClkInda : da_s
ClkIntIlarIna : ixna_s	ClkIrken : ke_o en_s
ClkIveriyordu : ixve_o eri_o iyo_o or_o du_s	ClkIyorsa : sa_s
Clkaaar : ixka_o aa_o	ClkabileceGi : ile_o ece_o egxi_s
Clkabilmek : il_o me_o ek_s	Clkabilmesi : esi_s
Clkabilsin : si_o in_s	ClkacaGImIza : aca_o agxix_o ixza_s
ClkacaklarInI : ak_o	ClkacaksIn : six_o
ClkadI : adix_s	ClkalIm : alix_o ixm_s
Clkamamakta : ta_s	ClkamazdI : az_o
Clkamz : amz_s	ClkanlarImIz : an_o
ClkarIcIlar : ixcix_o	ClkarIlmIStI : mix_o tix_s
ClkarIlmam : am_s	ClkarIlsalar : sa_o ala_o
ClkarImla : ixm_o	ClkarIncaya : ca_o aya_s
ClkarIyorsun : su_o un_s	Clkarabilirim : ara_o iri_o im_s
Clkarabilme : me_s	Clkaracak : ak_s
ClkaramamIS : ixsx_s	ClkarcIlIGI : cix_o
ClkarmIyoruz : oru_o uz_s	ClkarmakIn : akix_o

CIkarmaIIdIr : ixdix_o	CIkarten : te_o
CIkartmIyor : art_o	CIkartmaktaki : aki_s
CIkartmamaII : alix_s	CIkarttIk : ixk_s
CIkmadaki : ada_o	CIkmamaIIsIn : ixsix_o
CIkmasaydI : asa_o	CIkmaylSIyla : ayix_o
CIkmazI : azix_s	CIktIGImIda : ixda_s
CIktIdaki : ixda_o	CIldIrIyorum : ixrix_o um_s
CIldIrtma : ixrt_o ma_s	CIlgInI : gix_o
CIlgInlaSan : asxa_o	CImacI : ixma_o acix_s
CInara : ixna_o ara_s	CInaroGlu : aro_o ogx_o lu_s
CIngIrakla : ixra_o	CInlatIn : atix_o
CInlatmIS : at_o	CIpasIydI : ixpa_o
CIplakIIk : ixp_o	CIrCIrlanmIS : cxix_o
CIrpISInI : pix_o	CIrpIndIkCa : cxa_s
CIrpInmayI : ayix_s	CIrpmIS : ixrp_o
CItIrdata : ixtix_o ata_s	CItakta : ixta_o
CItlakIn : ixt_o	CIvgInIn : ixv_o
COkUSUn : cxox_b oxkux_o uxsxux_o uxn_s	COkUSlerde : uxsx_o le_o er_o de_s
COkUnce : uxn_o ce_s	COkUntUnUn : tux_o uxnux_o
COkUtUye : uxtux_o uxye_s	COkebildiGini : oxke_o ebi_o di_o igxi_o ini_s
COkelek : ele_o	COkenler : en_o er_s
COkertemeyen : eme_o eye_o	COkertilemez : ti_o ez_s
COkertmiStir : ert_o mi_o isx_o	COkmUSler : oxk_o mux_o
COkmedilerse : edi_o se_s	COkmesine : esi_o ine_s
COkmeyecektir : ek_o	COktUGUnUn : uxgxux_o
COktUrdUler : uxr_o dux_o uxle_o	COlaSana : oxla_o ana_s
COlgeCenin : oxl_o ge_o ecxe_o eni_o	COlleSmesini : esx_o
COllerinden : in_o de_o	COpCUlere : oxp_o cxux_o ere_s
COpCatanlar : cxa_o ata_o	COplUGUne : lux_o uxne_s
COplUklerinde : uxk_o	COpteki : eki_s
COrekCinin : oxre_o cxi_o ini_o	COrtUkUn : oxr_o uxkux_o
COzUcUdUr : oxzux_o uxcux_o uxdux_o uxr_s	COzUlUp : uxlux_o uxp_s
COzUlUyormuS : uxyo_o mu_o usx_s	COzUleceGine : egxi_o
COzUlemediGi : igxi_s	COzUlemezken : ez_o
COzUlmUSler : uxl_o	COzUlmedi : edi_s
COzUmUmde : uxmux_o uxm_o	COzUmlemeyle : ey_o le_s
COzUmlenmeden : ede_o	COzUmlenmeye : eye_s
COzUmlenmiSti : ti_s	COzUmsUz : sux_o uxz_s
COzUverdik : uxve_o ik_s	COzdUGUnU : oxz_o uxnux_s
COzdUm : uxm_s	COzebildiniz : oxze_o iz_s
COzebilmiS : isx_s	COzelti : el_o
COzememiS : emi_o	COzemeyiz : eyi_o
COzerseniz : se_o	COzmUStUk : uxk_s
COzmede : ede_s	COzmeyenleri : eri_s
CUngUS : cxux_b gux_o uxsx_s	CUrUGUne : uxrux_o
CUrUkkaya : ka_o	CUrUmeleri : uxme_o
CUrUterek : uxte_o ere_o	CUrUtmeli : uxt_o eli_s

CUrUyeceGe : uxye_o egxe_s	CaGImIzda : cxa_b ixz_o
CaGIra : ixra_s	CaGIrmasa : asa_s
CaGaIlkoC : agxa_o ixko_o ocx_s	CaGdISlIlGI : agx_o
CaGdaSl : asxl_s	CaGdaSlIktIr : asx_o
CaGdakilerle : aki_o	CaGlayangilin : gi_o
CaGrISImdan : rix_o	CaGrIlacaGI : agxix_s
CaGteks : eks_s	CaballyordU : aba_o
CabuklaSma : abu_o uk_o	CabukluGunun : lu_o ugxu_o unu_o
CabukoGlu : uko_o	CadIrkent : ent_s
Cadorlardaki : ado_o	CahIrhanIn : ahix_o ha_o
CakIlllyall : ixya_o	CakIltaSI : asxix_s
CakIrbeyli : be_o li_s	CakIroGluda : ixro_o uda_s
Cakabey : aka_o abe_o ey_s	Cakaloz : alo_o oz_s
CakmakoGlunun : ako_o	Cakmallya : ixya_s
CakrazI : ra_o	CalISIciGim : ixci_o
CalISacaGIma : ixsxa_o ixma_s	CalISadursun : adu_o ur_o
CalISamayac : ac_s	CalISkaner : ane_o
CalISkanlIGa : ixgxa_s	CalISmIyorduk : du_o uk_s
CalISmanIzI : ixzix_s	CalISmaylSI : ixsxix_s
CalISye : ye_s	CalIsan : ixsa_o
CallyI : ixyix_s	CaldIGImI : al_o ixmix_s
CalgIcI : ixcix_s	CalkOye : kox_o oxye_s
CamaSIrIna : asxix_o	Camdibinin : am_o ibi_o
Camkoru : ko_o oru_s	CamlIbeli : ixbe_o
CamlIgOze : ixgox_o oxze_s	Camolukla : amo_o olu_o
Camurdur : amu_o ur_s	CamurluGunda : un_o
Camurumuzdan : uru_o umu_o uz_o	Camyurdu : yu_o
CanaGI : ana_o	Canakk : akk_s
Canakkalespor : ale_o es_o po_o	CankIrIdaki : kix_o
CapIna : apix_o	Capada : apa_o ada_s
CapanoGlunu : ano_o unu_s	CapkInIn : ap_o
Capulcuya : apu_o ul_o cu_o uya_s	CarSIda : sxix_o
CarSafll : sxa_o af_o lix_s	CarSambadaki : ba_o
Careler : are_o	CaresizleSen : iz_o esxe_o
Caresizlikten : li_o ik_o	CarkIfelekle : ixfe_o
Carketti : et_o	Carklara : ark_o
Carpacak : pa_o	CarpmISIm : arp_o
CatIrel : ixre_o el_s	Catakdibi : ibi_s
CatalaGzIna : zix_o	CatalhOyUke : hox_o oxyux_o uxke_s
Cavdara : av_o	CavuSbaSInIn : avu_o usx_o
CavuSi : usxi_s	CayOzU : ayox_o oxzux_s
Caykovskinin : ovs_o ki_o	CeCenin : cxe_b
CeCenyaya : ya_o	CeSidinde : esxi_o idi_o
CeSitinde : iti_o	CeSitlenip : it_o ip_s
CeSmibUlbUl : ibux_o bux_o uxl_s	CebelitarIkta : ebe_o eli_o ita_o
Ceheltan : ehe_o	Cehreli : eh_o re_o
Cekebilirsek : eke_o ir_o	Cekedursun : edu_o

Cekemezlerdi : di_s	Cekene : ene_s
CekiCkIranIn : eki_o icx_o	CekiCte : te_s
CekiSiyor : isxi_o	CekiSmeliydi : iy_o
CekiciliGe : ici_o igxe_s	CekildiGimizi : imi_o izi_s
Cekiliveriyor : ive_o	Cekilmeseydi : ese_o
Cekimler : im_o	Cekincelerim : ce_o
Cekinecekleri : ine_o	Cekmeliyim : iyi_o
CekmeyiSi : isxi_s	Cekoslavakya : eko_o os_o ava_o ya_s
Cektirebilir : ire_o	Cektirmem : em_s
Cekveriyor : ve_o	Celebice : ice_s
Celenkleri : enk_o	CeliSkisidir : isi_o
CelikdoGan : do_o ogxa_o	Celikeri : ike_o
Celikkort : ort_s	Cemberi : em_o
Cemberinize : ize_s	CemiSgezekin : eze_o
Cenelerin : ene_o	Ceneni : eni_s
Ceperinin : epe_o	CerCevededir : cxe_o eve_o
CerCevisinden : evi_o	Cerceve : eve_s
CerkeS : esx_s	Cerkezi : ezi_s
CerniSev : ni_o isxe_o ev_s	CernomIrdIne : no_o omix_o ixne_s
Cerveciler : eci_o	Cetecilerden : ete_o
Cetindi : eti_o	Cetinkale : ale_s
Cetinkolu : olu_s	CetinyUrek : yux_o uxre_o
Cetrefilli : efi_o	CevikCe : cxe_s
Ceviri : iri_s	Cevirmeyi : eyi_s
Cevlik : ev_o	Cevreme : eme_s
Cevril : ri_o il_s	Ceyizin : izi_o
CeytUrk : uxrk_s	CiCeGinin : cxi_b icxe_o
CiGdemi : igx_o emi_s	CiGkOfteli : oxf_o
CiGnediGinden : ne_o	Cicekin : ice_o
CifCileriyle : if_o	CiftCiler : ift_o
CiftCilerinki : ki_s	CiftCiye : iye_s
Ciftekavak : eka_o	Ciftkurtlar : ku_o urt_o
Cikaya : ika_o	Cikolatalarla : iko_o ola_o
Cileeeeeeyi : ee_o	Cilller : ill_o
CimenderoGlu : ime_o ero_o	CimentaS : asx_s
Cimentonun : to_o onu_o	Cindogu : ogu_s
Cipine : ipi_o	Ciplerinin : ip_o
CiriCin : icxi_o	CirkefliGe : ef_o
Cirozu : iro_o ozu_s	Citiciden : ide_o
Citimi : imi_s	Civileme : ivi_o
Civiyi : iyi_s	CizakCa : iza_o
CizebildiGini : ize_o	CoCuGun : cxo_b ocxu_o
CoGaltma : alt_o	CoGullaSmasI : ogxu_o
CoGunluGu : ugxu_s	CoGunuzun : uzu_o
CoSkulu : osx_o ulu_s	CoSmuStuk : tu_o
Cobandan : oba_o	CocuGa : ocu_o ugxa_s
CocuGumsu : um_o su_s	CocuGuydum : uy_o

Cocukkken : ukk_o	Cocuklular : ula_o
Cohacopoulos : oha_o aco_o opo_o ou_o ulo_o os_s	Cohecopulosun : ohe_o eco_o opu_o osu_o
CokeSliliGin : oke_o	CokkUltUrlU : ok_o kux_o lux_s
CoktuG : ugx_s	Colpan : ol_o
CorabIndan : ora_o abix_o	CorbacIda : acix_o
Corlusporu : us_o	Coruhta : uh_o
CotuksOken : otu_o sox_o	CubakIn : cxu_b uba_o
CubuGumuz : ubu_o	Cubucakta : uca_o
Cuhacopoulosu : uha_o osu_s	CukorovasInI : oro_o ova_o
Cukurbaston : uku_o as_o on_s	Cukuru : uru_s
CulfazIn : fa_o azix_o	Curpuk : pu_o
Cuvallyla : uva_o	Cyddye : cxyd_b dye_s
IGdIrI : ixgx_b ixrix_s	IIssin : ixix_b ixs_o
ISIGInI : ixsxix_b	ISIkgOzUn : gox_o
ISIktaC : acx_s	ISIldama : ama_s
Ibmden : ixbm_b	Iceberge : ixce_b ge_s
Ideaplu : ixde_b ea_o ixu_s	Ifunun : ixfu_b
Iglesiasa : ixg_b ia_o	Ignatowicz : na_o ato_o owi_o icz_s
Ihlamurlar : ixh_b	IIIcadaki : ixlix_b ixca_o
IldIrtenin : ixl_b	Ilgazl : ga_o
Iliada : ixli_b	Ilieden : ie_o
Illuminado : umi_o ina_o ado_s	Imbruglia : ixmb_b ru_o ug_o
Imetle : ixme_b	Immanuel : ixm_b anu_o ue_o
ImpexbankI : pe_o ex_o kix_s	Independence : ixn_b
Indianapolis : apo_o oli_o is_s	Industri : ust_o ri_s
Inernen : ixne_b	Infinity : fi_o ity_s
Infoshop : fo_o ho_o op_s	InkIlap : ap_s
Innsbruck : ixnn_b sb_o uck_s	Instantaneous : ixns_b eo_o us_s
Instituteun : itu_o ute_o eu_o	InsuranceI : ura_o
Intenet : et_s	Interbankta : ank_o
Interesting : ing_s	Intergraph : erg_o aph_s
IntermedIa : edix_o ixa_s	InterpolUnden : olux_o
Intersport : ers_o	Interviu : vi_s
Intstituteun : ixnt_b sti_o	Investment : est_o
Ioannidisin : ixo_b	Iordanov : ov_s
Iplerini : ixp_b	IrIdyumun : ixrix_b ixd_o
IrakIn : ixra_b	Irakereli : ake_o
Irgalamaz : ixr_b	IrkCIIlkla : ixrk_b
Irvingin : vi_o	IsIlarInI : ixsix_b
Isaacman : ixsa_b ac_o	Isaiah : ai_o ah_s
IskalIyor : ixs_b	Islaheevi : ahe_o evi_s
Issler : ixss_b	Istihbarat : ih_o at_s
Istwan : ixst_b wa_o	Ithakaya : ixt_b
Itzhak : ixtz_b	Ivanka : ixva_b ka_s
IzdIrapla : ixz_b	Izouierda : ixzo_b
OGUdUnU : oxgxux_b	OGUnUrdU : dux_s
OGUttU : tux_s	OGeden : oxgxe_b

OGleyi : oxgx_b	OGrencileirim : ci_o ei_o
OGrencilyerin : ye_o	OGrenitm : itm_s
OGrenmiSe : isxe_s	OGrtemenin : oxgxr_b
OatandayIn : oxa_b	ObUrUyse : oxbux_b uxy_o
ObeGinde : oxbe_b	OcUler : oxcux_b
Ocalalan : oxca_b	OdUlUnU : oxdux_b
OdUllleri : uxll_o	OdediGi : oxde_b
OdemiSege : ege_s	Odiyicez : oxdi_b
Odpliler : oxdp_b	OfkelendiGi : oxf_b
Ogelerden : oxge_b	Ogleden : oxg_b
Oibden : oxi_b ib_o	OjlCUlU : oxjl_b uxlux_s
OkUzUyUm : oxkux_b uxzux_o uxyux_o	Okdener : oxk_b
OklUyU : uxyux_s	OksUzoGlu : uxzo_o
OlCUSemez : oxl_b uxsxe_o	OlCUdedir : uxde_o
OlCUle : uxle_s	OlCUlerime : ime_s
OlCUsUnde : uxsux_o	OlCUsUzlUGUnU : uxz_o
OlCmen : oxlcx_b	OlUdenizde : oxlux_b
OlUmiyle : uxmi_o	OlUmyIldOnUmU : yix_o dox_o oxnux_o uxmux_s
OlUnen : uxne_o	OldUrUldUgU : uxgux_s
OldUrdUGUmUze : uxze_s	OldUrmese : ese_s
OldUrtUldUGU : uxgxux_s	OldUrtme : uxrt_o
Olebiliyorsun : oxle_b	OmUrboyu : oxmux_b bo_o oyu_s
Omercik : oxme_b	OmrUmsUn : oxm_b rux_o
OnSartInI : oxn_b	OnUmUzdeki : oxnux_b
OnadInIn : oxna_b	Onbilginin : bi_o
OncUlUGUnU : cux_o	Oneclikle : oxne_b ec_o
OngOrUS : oxrux_o	OngOre : oxre_s
OnkoSula : osxu_o ula_s	OnkuSulu : usxu_o
Onleyicisi : isi_s	Onplana : oxnp_b
OnsUzU : uxzux_s	Onsezisiyle : ezi_o
OnzelleStirme : ze_o	OpUSUrler : oxpux_b
Opecekti : oxpe_b	Opmekle : oxp_b
OrUgUte : oxrux_b uxgux_o uxte_s	OrUntUsU : uxsux_s
OrdUklerini : oxr_b	Ordeke : eke_s
OreceGiz : oxre_b	OrgUtUImo : uxix_o ixmo_s
Orikle : oxri_b	Ormeci : eci_s
Ornegin : egi_o	OrtmediGimiz : oxrt_b
Ostrojen : oxst_b ro_o oje_o	Osymden : oxsy_b mde_o
Osysye : sye_s	OtUken : oxtux_b uxke_o
Otanazinin : oxta_b azi_o	Oteberinizin : oxte_b
Otenaziye : ena_o	OtmUyor : oxt_b
OvUlUn : oxvux_b	OvdUrecek : oxv_b
Ovenlere : oxve_b	OyUtUcU : oxyux_b uxcux_s
OykUcUlUGU : oxy_b	OykUce : uxce_s
Oysyle : oxys_b yle_s	OzCetin : oxz_b
OzCukurlu : cxu_o	OzSahinoGlu : ahi_o ino_o
OzUCler : oxzux_b uxcx_o	OzUnal : uxna_o al_s

OzUpekin : uxpe_o	OzakIncIdan : oxza_b
OzbeGenle : egxe_o	Ozbekistana : is_o
Ozberk : erk_s	Ozbulut : bu_o ulu_o ut_s
Ozderici : ici_s	OzdinC : incx_s
Ozelci : oxze_b ci_s	Ozergun : gu_o
OzerkliGinin : erk_o	OzfIrat : fix_o
Ozfinans : ans_s	OzgUnlUGe : uxgxe_s
OzgeCmiSinde : ecx_o	OzgentUrkle : uxrk_o
Ozgiray : ira_o ay_s	Ozhasekiyi : ase_o
Ozilin : oxzi_b	OzkabakCI : cxix_s
Ozkalp : alp_s	Ozkasnaka : aka_s
Ozkonak : ona_o	Ozmumcu : cu_s
OzokCu : oxzo_b cxu_s	Ozsaruhan : aru_o
Ozsoydan : so_o oy_o	OztUrkU : kux_s
Oztermiyeci : iye_o	Oztoruna : una_s
OzvarlIGI : va_o	Ozverili : ili_s
OzyOnetim : yox_o oxne_o	SIkIdImInI : sxix_b
SImarmaylp : ixp_s	SOfOrUnU : sxox_b oxfox_o
SOhret : oxh_o	SOlene : oxle_o
SOvalyenin : oxva_o	SOyledir : oxy_o
SUhpesiyle : sxux_b uxh_o	SUphayla : uxp_o
SUpheden : he_o	SaSIlasI : sxa_b
Saaakkk : akk_o	Sabdurasulov : ab_o asu_o
SablonlarI : lo_o on_o	Sadiye : adi_o
Safakta : afa_o	SagSener : ag_o sxe_o
Sahadetiyle : aha_o ade_o	Sahbaba : ah_o aba_s
Sahnur : nu_o	Sahzade : za_o ade_s
Saibelerin : ibe_o	Saiirin : ii_o
SajdIm : aj_o	Samanist : ani_o ist_s
Samile : ami_o ile_s	Sampiyonalar : pi_o
SampiyonasnIn : nix_o	Sampqiyonlar : amp_o qi_o
Sanghaya : ang_o	SanlIurafa : afa_s
SanslInIn : ans_o	SantajIyla : ajix_o
SaoCiden : ocxi_o	Sapelin : ape_o
SarabI : abix_s	SarhoS : osx_s
SarjOrde : jox_o	SarjlarIn : arj_o
SarIkenin : arl_o	Sartnameden : ame_o
Sayialar : ayi_o	SeSbeSin : sxe_b
Sefaat : efa_o	Sefikin : iki_o
Sefkatiydi : ati_o	Seftaliler : ali_o
Sehabettin : eha_o	Sehidi : ehi_o idi_s
SehrazatIn : aza_o	SekUreye : ekux_o
Sekeroba : oba_s	Seklnde : ekl_o nde_s
SelalebaSar : ela_o eba_o	SemalarInIn : ema_o
Senele : ele_s	SengOr : oxr_s
Senghey : eng_o	SenkOy : oxy_s
Senoba : eno_o	Senses : es_s

Senuslu : enu_o	Senyuva : uva_s
Serafet : era_o afe_o	Serbetly : etl_o
Serhindeki : hi_o	Serhlerinin : erh_o
Serifini : ifi_o	Seriti : iti_s
Sevarnadzeye : eva_o ad_o	Sevkete : ete_s
SeyhUlislam : hux_o uxli_o	Seyhlerinin : eyh_o
Sezlonglar : ong_o	SiSebileceGi : sxi_b
Siaopingi : ao_o opi_o gi_s	Siddete : id_o
SifalI : ifa_o	Sifodaki : ifo_o oda_o
Sifoya : oya_s	Sifzofreni : zo_o of_o
Sikagoda : ago_o oda_s	Sikayet : aye_o
Silide : ide_s	Siltler : ilt_o
SimSirin : sxi_o	Sirketne : ne_s
Sirkettten : ett_o	Sizofreni : izo_o
Sneyderman : sxne_b	SofOrU : sxo_b ofox_o oxrux_s
Sohini : ohi_o	Sokunun : oku_o
SonuClarI : ucx_o	Sortlarla : ort_o
SostakoviCin : ovi_o	Sovenizmiyle : ove_o
SovlarInda : ov_o	Sovunuda : ovu_o
SuSkeviC : sxu_b icx_s	SubeleSirken : ube_o
SubhamI : ub_o amix_s	Suhubinin : uhu_o ubi_o
SunlrI : unl_o rix_s	SutlanIyor : ut_o
Sutunda : utu_o	Suurluca : uca_s
SuyulandIrma : uyu_o	UCISIkIn : uxcxix_b
UCUnCU : uxcxux_b cxux_s	UCerine : uxcxe_b
UCgenden : uxcx_b	UCokun : uxcxo_b
UCtUUUU : uxux_s	USUSme : uxsxux_b
USeniyormuS : uxsxe_b	UUUUUC : uxux_b uxux_o uxcx_s
Ucreti : uxc_b eti_s	UfUrUkCUler : uxfux_b
UflUyor : uxf_b	UlkUcUleri : uxl_b
Ulkmizde : uxlk_b	Ultimatomdan : ima_o om_o
Ultkemizdeki : uxlt_b	Umekkanla : uxme_b
Umidimizi : uxmi_b	Ummetimden : uxm_b
UnUnde : uxnux_b	UnUversitesi : ite_o
Unalan : uxna_b	UncUlUkle : uxn_b
Unetmekle : uxne_b	UniformalIdIr : uxni_b
Univers : ers_s	Uprertici : uxp_b
UrUmCiye : uxrux_b	Uranyumla : uxra_b
UrdUnlUler : uxr_b	Urediler : uxre_b
UrkmUS : uxrk_b	Uroloji : uxro_b olo_o oji_s
UsUste : uxsux_b uxs_o	UskUdUrda : uxs_b
Uslubumu : umu_s	Usluplar : up_o
UstUnsoyluyu : uyu_s	UsteSar : esxa_o
Ustlendikten : uxst_b	UtUleme : uxtux_b
Utopik : uxto_b	UtopyalarI : op_o
UveybabasI : uxve_b	Uyelerden : uxye_b
UyleliGine : uxy_b	UzUlUrUm : uxzux_b

UzdUGUnU : uxz_b	UzeceGi : uxze_b
Uzermlerine : erm_o	aCIGImI : acxix_b
aCIkOGretime : ixkox_o oxgx_o	aCIkgOz : oxz_s
aCIklaGa : agxa_s	aCIklamanIzIn : ixzix_o
aCIklmaya : ixkl_o	aClyora : ora_s
aCabildi : acxa_b	aCelikin : acxe_b
aCgOzlUlUkten : acx_b	aCkurt : urt_s
aCmicaksIn : ica_o	aGIdaki : agxix_b
aGIrbaSII : ixix_s	aGIrlIkea : ixke_o ea_s
aGaCdelen : agxa_b acx_o	aGbektaS : agx_b
aGustasta : agxu_b	aIdsliler : aix_b ixds_o
aIdsvax : ax_s	aIocdeki : oc_o
aSCIelin : asx_b	aSIGIydIm : asxix_b
aSaGIdadIr : asxa_b	aSevlerine : asxe_b
aSiret : asxi_b	aSkIner : ixne_o
aSklarI : asxk_b	aaGabeyini : aa_b
aarhus : hu_o	aassoe : so_s
abaCIn : aba_b acxix_o	abarelixin : ixi_o
abasIye : ixye_s	abbasiye : ab_b asi_o
abbate : ate_s	abbrightIn : abb_b igh_o
abdUlazize : uxla_o	abdUlhamit : it_s
abdUlkadire : ire_s	abdUlmucid : uci_o id_s
abddaki : abd_b	abdela : ela_s
abdolkarim : ari_o	abdulali : ali_s
abdulhaluk : alu_o	abdullaha : aha_s
abdurrahimov : imo_o	abdurrezak : eza_o
abiSevin : abi_b	ablukanIn : uka_o
abonelerimiz : abo_b one_o	aboriginlere : ori_o igi_o
abramowitzin : zi_o	abromowits : omo_o its_s
absulot : ot_s	abubekir : abu_b
abuzabiye : uza_o	acIbademde : acix_b
acIselsan : ixse_o	aclylp : ixyix_o
academianIn : aca_b	acapulcoda : co_o
acausality : au_o usa_o	accentlar : ac_b ent_o
accord : ord_s	acelecilerden : ace_b
acheson : eso_o	achtung : ach_b ung_s
acisindan : aci_b	ackenhausem : use_o
acullUGUnUn : acu_b	acuneri : une_o
aczmendi : acz_b	adCekimi : ad_b
adIdIr : adix_b	adImilyon : ixmi_o yo_o
adIsOnmez : ixsox_o oxn_o	adaCaylnI : ada_b acxa_o
adabank : ank_s	adamsI : six_s
adamsla : ams_o	addedmiS : ed_o
adefarasin : ade_b	ademoGlu : emo_o
adenozin : ozi_o	adiniza : adi_b iza_s
adjacent : ja_o ace_o	adliyece : ece_s
adolphe : ado_b olp_o he_s	adriatic : ic_s

adriyatikden : iya_o	aecnin : ae_b
aegnin : eg_o	aelvoet : vo_o
aerobik : obi_o	aerospace : ace_s
afSinden : af_b	afacanlIGIyla : afa_b
afedersiniz : afe_b	affedebilir : fe_o
afgnistanIn : afg_b	afiSini : afi_b
aflotoksini : oto_o	aforozu : afo_b
afrikalIsI : ixsix_s	afroditte : odi_o
agacinskiye : aga_b aci_o ins_o	agcaganat : ag_b aga_o
agence : age_b	aghhhh : agh_b hhh_s
agitteki : agi_b	agratur : atu_o
agridia : ia_s	aguarius : agu_b ua_o iu_o
ahCIIIk : ah_b	ahIrkapI : ahix_b apix_s
ahadolu : aha_b	aharonota : ono_o ota_s
ahhhggg : ahh_b hgg_o	ahistorik : ahi_b
ahmedovun : edo_o	ahtapotlarIn : ot_o
ahumizi : ahu_b	aidatlarI : ai_b ida_o
aihkna : ihk_o na_s	aihmle : ihm_o
ainsworthden : wo_o hde_o	airbagin : agi_o
aiskhylos : isk_o hy_o	ajanIydI : aja_b
ajitasyon : aji_b	ajjaccioda : aj_b
akCabUk : ak_b abux_o	akCakocadan : oca_o
akISIna : akix_b	akSamcI : cix_s
akSite : ite_s	akUrekin : akux_b
akabindeki : aka_b	akayeva : eva_s
akbIyIkIn : bix_o	akcanI : anix_s
akciGeri : igxe_o	akdIvarla : ixva_o
akdtykya : akd_b tyk_o	akedemisinden : ake_b
akhisardan : isa_o	akibete : aki_b
akkaSoGlu : asxo_o	akkoyunlular : oyu_o
akmeSe : esxe_s	akmnin : akm_b
akolun : ako_b	akordiyona : ona_s
akotanIn : ota_o	akpoborie : obo_o ie_s
aksakIIok : ok_s	aksesuarla : esu_o
aktOrdU : tox_o	aktepe : epe_s
aktife : ife_s	aktrisleriyle : akt_b
aktulga : ga_s	aktunadan : una_o
akurgala : aku_b ala_s	alCIya : al_b
alISIkIn : alix_b	alISIlagelen : age_o
alIdcanovu : ovu_s	alIkonup : up_s
alIkoyamadI : oya_o	alInmnasInIn : ixnm_o
alUminyumdan : alux_b	alaCatIdaydI : ala_b
alaboranIn : abo_o	alacaGiz : agxi_o
alagOze : agox_o	alakart : art_s
alakurt : aku_o	alarmlarI : arm_o
alborz : orz_s	albrighta : alb_b
alcyone : alc_b one_s	aldinCse : incx_o

aldrich : ald_b ich_s	aleander : ale_b
alegorisiyle : ego_o	aleksandranIn : and_o
alemany : any_s	alerjide : ji_o
alexander : exa_o	alexandras : as_s
alexios : exi_o io_o	aleyhi : hi_s
alfred : alf_b ed_s	alghit : alg_b
aliSan : ali_b isxa_o	aliSmamiSuk : isxu_o
alianz : anz_s	alibeykOyU : oxyux_s
alibeyoGlu : eyo_o	alimUnyum : imux_o
alipaSa : ipa_o asxa_s	alison : iso_o
alivyonlu : iv_o	alkaloit : oi_o
alkulaCa : acxa_s	allegheny : eny_s
almodovarda : mo_o odo_o	almusun : usu_o
alnoudjI : ud_o jix_s	alpSanlInIn : alp_b
alpphonse : pho_o	alsgaard : als_b ard_s
altIkulaCta : ixku_o	altInokla : ixno_o
altSehrinde : alt_b	alternaif : if_s
althropa : hro_o opa_s	altmia : mi_s
altunbaG : agx_s	altunokla : uno_o
alvand : and_s	amIantIt : amix_b ixa_o ixt_s
amaCIn : ama_b	amacIlyla : ixly_o
amariga : iga_s	amatOrce : atox_o
amatemden : ate_o	amazonlarI : azo_o
ambUlansIn : am_b	ambargolanmIS : go_o
ambassadors : ors_s	amblemi : amb_b
ameleliGi : ame_b	amelio : io_s
amerIcans : erix_o	amerika : ika_s
amfetamin : eta_o	amgden : amg_b
amicis : ami_b	amigolar : igo_o
ammanndan : ann_o	amocoya : amo_b oco_o
amokachili : oka_o	amokrani : ani_s
ampUtasyonlu : pux_o uxta_o	amplifikatOre : amp_b
amsterdamdaki : ams_b	amudiye : amu_b udi_o
anIlIn : anix_b	anIlarInIx : ixx_s
anaSsit : ana_b	anadol : ol_s
anafikir : afi_o	anaforunda : afo_o
anakUltUr : akux_o	anakronizm : oni_o izm_s
analistlerin : ist_o	analyzer : aly_o
anarSiStleri : isxt_o	anasInIfI : ixfix_s
anasola : aso_o ola_s	anastasiya : iya_s
anatomisini : omi_o	anayasaca : aca_s
anayoldaki : ayo_o	anayurdumuza : ayu_o uza_s
ancaaak : an_b	ancolettinin : ole_o
andereu : eu_s	andlaSmasInda : and_b
andorra : ra_s	andreae : ae_s
andrei : re_s	andrewUn : ewux_o
anekdotla : ane_b	anektodla : od_o

anemeriuma : uma_s	angell : ell_s
angelopulosla : elo_o	angelu : elu_s
angina : ina_s	anglesta : ang_b
anidir : ani_b	aniqueart : iqu_o
ankaravi : avi_s	ankebut : ebu_o
anketOrlerin : etox_o	anlamSmayl : amsx_o
anlaqSlya : aq_o	anodolunun : ano_b
anonslar : ons_o	ansiklopedide : ope_o
answer : ans_b we_o	anteple : ep_o
antepsporun : eps_o	antero : ero_s
anthony : ant_b ony_s	antibiyotik : oti_o
antioch : och_s	antique : ue_s
antiterOr : erox_o	antolojilere : oji_o
antrOnOr : rox_o oxnox_o	antraktta : akt_o
antrenOrU : enox_o	antrepo : epo_s
antropolg : olg_s	aoraki : ao_b
apaktl : apa_b	apartheidl : idix_s
apatow : ow_s	apertheid : ape_b
aplilerin : ap_b	apoletli : apo_b
apoyevmatini : oye_o	appeldornda : orn_o
appleda : app_b eda_s	apslerin : aps_b
aquatoriumun : aqu_b	arCebil : ar_b
arIcIllGI : arix_b	arIoGulun : ixo_o
arIsoy : ixso_o oy_s	arIzada : ixza_o
arSive : ive_s	araCgereC : ara_b ecx_s
araSItrma : ixtr_o	araStIrnmaya : ixrn_o
arabuluculara : ucu_o	aracIllGIy : ixy_s
aranjmanInI : anj_o	arapiye : api_o
arasOzU : asox_o	arcayUrek : ayux_o
archeologia : arc_b ogi_o	ardICll : ixcx_o
ardnin : ard_b	arefesindeki : are_b efe_o
argUmanI : uxma_o	argumenty : ume_o
arielmatik : ari_b	arifesinde : ife_o
aristoteles : ote_o	arkeleog : og_s
arllhanIn : ixha_o	arlberg : arl_b erg_s
armory : ory_s	arnatt : att_s
arnknIn : arn_b knix_o	arnould : uld_s
arsazedeye : aze_o	arslanalpin : ars_b
artISInn : ixnn_s	artaud : ud_s
arthura : art_b ura_s	arttIrIdI : ixdix_s
arundhati : aru_b und_o ati_s	arzdan : arz_b
arzuhali : zu_o	arzuluyor : uyo_o
arzuman : uma_o	asIllSInI : asix_b
asIlnda : ixln_o	asabiliyor : asa_b
asamblesinin : amb_o	asanoviCe : icxe_s
asbaSkansIz : as_b	aselsandIr : ase_b
aseton : eto_o	asfurun : fu_o

ashdownI : ash_b ow_o nix_s	asilin : asi_b
asimilasyonu : ila_o onu_s	aslItUrkU : ixtux_o
aslannewruz : ew_o	asmallIepede : ixte_o
asosiye : aso_b osi_o	asprillaya : asp_b
assicurazioni : icu_o oni_s	associates : oci_o
assosa : osa_s	asteGmenliGe : egx_o
astigmatizma : ig_o	astlarIn : ast_b
asturias : uri_o	asutay : asu_b uta_o
atCIIIGI : at_b	atIGInIn : atix_b
atIfla : ixf_o	atOlyeden : atox_b
atUtUrk : atux_b	ataCtan : ata_b
ataSelere : asxe_o	ataerkilliGin : ae_o
atakOyden : akox_o	atarakr : akr_s
atasUzU : asux_o	atatOv : oxv_s
atatUreyle : atux_o	ateSeliGi : ate_b
atempo : po_s	athletic : ath_b
atikkanIn : ati_b	atlantike : ike_s
atlatmISa : ixsxa_s	atmlerini : atm_b
atomize : ato_b	atroskopi : opi_s
atsuko : uko_s	attack : ack_s
attenborough : ugh_s	atttIGI : att_b
aubinle : au_b	aucoinin : uco_o
audoitorium : udo_o ito_o	augusttan : ugu_o
aureus : ure_o	ausburgdaki : urg_o
ausschwitz : uss_o ch_o wi_o itz_s	autonoma : uto_o oma_s
auversde : uve_o	avInIn : avix_b
avSarla : av_b	avanaklar : ava_b
avantgarda : ant_o	avenuede : ave_b
avignonda : avi_b	avromapulos : oma_o
avrupadaki : upa_o	avrupqa : qa_s
avuClarImIn : avu_b	avuCunu : ucxu_o
avucunuzu : uzu_s	awardsa : awa_b ard_o
awshat : aws_b	axioma : axi_b
ayCOreGinin : ay_b cxox_o	ayIbIm : ayix_b ixbix_o
aySegUlUn : egux_o	ayaGImIzdaki : aya_b
aybaSIII : ixlix_s	aydInarslan : ars_o
ayenler : aye_b	aygaza : aza_s
ayilkin : ayi_b	aykaCI : acxix_s
aysberg : ays_b	aytnin : ayt_b
ayzenStaynIn : ensx_o	azInIIk : azix_b
azabilir : aza_b	azdIlar : az_b
azerbaycanmIS : aze_b	azilname : azi_b ame_s
aznavourun : avo_o	azotlu : azo_b
bICaGIyla : bix_b ixcxa_o	bIraklmayan : akl_o
bOGUrtleni : box_b oxgxux_o	bObUrlenenler : oxbux_o
bObreGindeki : oxb_o	bOceGin : oxce_o
bOlGesine : gxe_o	bOlUSUlmesi : oxlux_o

bOlUgirayIn : uxgi_o	bOlgsinde : oxlg_o
bOlygesine : oxly_o	bOttcherin : oxtt_o che_o
bUfelerden : bux_b uxfe_o	bUrUdU : uxdux_s
bUrokatlar : uxro_o	bUrokratI : atix_s
bUstlerine : uxst_o	bUyUkadaya : uxka_o
bUyUkbOcek : box_o	bUyUkorta : uxko_o
bUyUme : uxme_s	bUzesiniz : uxze_o
baCSkan : ba_b acxsx_o	baGlIdiye : ixdi_o
baGmsIz : agxm_o	baGrIaCIka : ixka_s
baSCavuSa : usxa_s	baSIboS : ixbo_o
baSIhoSun : ixho_o	baSOrUtUsU : asxox_o
baSOrtme : oxrt_o	baSUstUne : asxux_o
baSboGa : ogxa_s	baSfiguran : igu_o
baSgOstermiS : oxs_o	baSganlIg : ixg_s
baSgomudandIr : omu_o uda_o	baSharflerle : arf_o
baSkanlGIndan : anl_o gxix_o	baSkontrolOrU : ont_o olox_o
baSkuttu : tu_s	baSmurakIbI : ixbix_s
baSpehlivanIn : iva_o	baStabib : ib_s
baSucundaki : asxu_o	baSvurabilir : vu_o
baSyapItI : ixtix_s	baSyavere : ave_o
babiSko : ko_s	bacIIImmm : ixix_o ixmm_o
bacall : all_s	bachIn : hix_o
baconIn : onix_o	bagajI : ajix_s
bahCekOye : ekox_o	bahCenIn : enix_o
bahCesarayda : esa_o	baharmast : ast_s
bahreyn : eyn_s	bahtawer : awe_o
bailiff : iff_s	bairnsonun : irn_o
bakIrkOyspor : oxys_o	bakanlGI : gxix_s
bakanlarUstU : arux_o	bakera : era_s
baktIGImzda : ixmz_o	bakterisel : ise_o
balIkCIl : ixl_s	baldrigein : ald_o ige_o
baliCi : icxi_s	balklarIn : alk_o
ballanchinein : anc_o	ballmera : all_o
baltIca : ixca_s	baluszynski : usz_o yns_o
banaaaa : aa_s	bangash : ash_s
banjeerinin : je_o	bankwatchIn : atc_o
banliyOleri : iyox_o	banliyo : iyo_s
barafInI : afix_o	baramuli : uli_s
barcodelarIn : ode_o	barflyda : ly_o
barryl : arr_o yl_s	barsonynin : ony_o
barthels : els_s	bartholomeosa : ome_o
bartoons : ons_s	baruch : uch_s
barvikha : ha_s	basingerI : erix_s
baskla : ask_o	basque : qu_s
batIni : ixni_s	batgirl : irl_s
batkom : om_s	battleI : att_o
baulykine : uly_o	bausch : usc_o

baxter : ax_o	bayIltmak : ixlt_o
baybaSini : asxi_o	bayernli : ern_o
bayttan : ayt_o	bazuka : azu_o uka_s
beGendi : be_b	beachten : ach_o
beatuy : uy_s	beaute : ute_s
beavIs : avix_o ixs_s	beckhama : eck_o
bedUkU : edux_o uxkux_s	bedavIcI : eda_o
bedulin : uli_o	behorun : eho_o
beksavI : avix_s	belamyye : amy_o
belcekIza : ekix_o	belevue : evu_o
belgrada : elg_o	belirgign : ign_s
belirtilirekn : ekn_s	belirtmede : irt_o
bellde : ell_o	bellhowell : owe_o
bellucci : uc_o	belmont : ont_s
beluga : elu_o uga_s	benarbia : bi_s
benchmarking : enc_o hma_o	benedick : ick_s
benfica : ica_s	benjaminn : inn_s
benloa : lo_s	bennnet : enn_o
benzeyomu : omu_s	bergkamp : amp_s
bergstrOm : st_o oxm_s	bermaye : aye_s
bermudez : ude_o	berrynin : err_o yni_o
berzeg : eg_s	bestenigar : iga_o
bettega : ega_s	bewerage : ewe_o age_s
beyamcaya : eya_o	beybidol : ido_o
beydude : ude_s	beykozspor : ozs_o
beysukent : uke_o	beytullahoGlu : aho_o
bggnin : bgg_b	bhazar : bha_b
biCareleri : bi_b icxa_o	bibliyografya : og_o
bidasoa : oa_s	bielsko : els_o
bihaberler : iha_o	bijedic : ije_o
bilanCoda : cxo_o	bilardo : do_s
bilbao : ba_s	bildmanIn : ild_o
bilebilur : ilu_o	bilefeld : eld_s
bilhare : are_s	bilondey : ilo_o
bilvasIta : ixta_s	bindman : ind_o
bioenerji : oe_o ji_s	biokimya : oki_o
bioreaktOr : ore_o	birUlke : irux_o ke_s
birdane : ane_s	birilkte : ilk_o
birknez : irk_o	birminghamda : ing_o
biskUvideki : uxvi_o	biteksten : eks_o
biyokUtle : okux_o	bjelis : bje_b
blUmle : blux_b	blacki : bla_b
blackpoolda : ack_o	blanco : co_s
blendax : ble_b	bligein : bli_b
bloGundaki : blo_b	blokOr : okox_o
bloomun : oo_o	blucinleri : blu_b
blyton : bly_b	bmgknin : bmg_b kni_o

bmwlerle : bmw_b	boGacaktIm : bo_b
boSalImlara : osxa_o	bobsled : obs_o
bodiroganIn : oga_o	boduru : odu_o
bodyguardInIn : ody_o	boeIngden : eix_o ixng_o
bohCada : oh_o	bohumil : ohu_o
boitano : ano_s	bolSoy : sxo_o
bonafi : afi_s	bondlardan : ond_o
bonhoff : off_s	bonjur : ju_o
borCka : orcx_o	boratav : av_s
bordrosunun : ord_o	bornozun : ozu_o
borqueun : qu_o	bortaCinayla : acxi_o
borusudur : udu_o	bostvana : ost_o
botilinum : inu_o	botswananIn : ots_o
bouila : ui_o ila_s	boxeri : oxe_o
boykotu : otu_s	boyslarIn : oys_o
boyutu : utu_s	bozOmer : ozox_o oxme_o
bozabilecek : oza_o	bozboGan : oz_o
bozerin : oze_o	bozorg : ozo_o org_s
bppden : bpp_b	brOtanyaII : brox_b oxta_o
brUcke : brux_b uxc_o	braSovla : bra_b
braems : ems_s	bragstad : ags_o ad_s
brahms : ahm_o	branSlarIn : ansx_o
brancanato : ato_s	brazoswood : od_s
breaks : bre_b aks_s	brechtten : ech_o tte_o
breganadan : ega_o	brejnevi : ej_o
brezenski : ens_o	brifiginde : bri_b
brityrex : ity_o ex_s	broSUrUn : bro_b osxux_o
broadwaydan : oa_o	brockelmann : ann_s
broeck : eck_s	broeku : eku_s
bronzla : onz_o	brooklynde : okl_o yn_o
brownda : own_o	bruggeUn : bru_b
brunchlarI : unc_o hla_o	bryson : bry_b
brzezinsksy : br_b ksy_s	buGday : bu_b ugx_o
buchenwald : ald_s	buckhingham : uck_o
bufarikte : ufa_o	bugUnUnUzU : ugux_o
bugayIn : uga_o	bugiyi : ugi_o
buhgteethi : uhg_o	buisiness : ess_s
bujsaim : uj_o	bukalski : als_o
bullock : ock_s	bullsu : ull_o
buluSabilec : usxa_o ec_s	bulucusu : usu_s
bunutest : est_s	burClarIn : urcx_o
burchard : urc_o	burnsden : urn_o sde_o
burslarIna : urs_o	burujuva : uju_o
bushnell : ush_o	businessa : usi_o
butiGini : uti_o	butterflyIn : erf_o lyix_o
buttle : utt_o	buutanC : ancx_s
buyuleyici : ule_o	buziki : uzi_o iki_s

byckovun : byc_b	byrdIn : byr_b
byzantine : by_b	cIGlIGIdIr : cix_b
cInIkI : ixkix_s	cIvIklIGI : ixvix_o
cOmertliGin : cox_b	cUbbelerimiz : cux_b uxb_o
cUcedir : uxce_o	cUhela : uxhe_o
cUmbUSe : uxsxe_s	cUrufunu : uxru_o ufu_o
caGIzII : ca_b	caddebostanda : ebo_o
caddylikten : add_o yli_o	caldeira : ira_s
calibe : ibe_s	calvert : ert_s
calypsoyla : pso_o	campaigns : ign_o
canOzkan : anox_o	candido : ido_s
cangahI : ahix_s	cannesa : esa_s
cantemur : emu_o	caramitru : ru_s
cardiffde : iff_o	carneiro : iro_s
carpoint : int_s	carrefoure : efo_o ure_s
cashmerei : ash_o ei_s	castle : ast_o
cavanaughnun : ugh_o	caviranda : avi_o
ccilerin : cci_b	cdlerde : cd_b
cdununkinden : cdu_b	cebelleSen : ce_b
cebren : eb_o	cecchiyi : ecc_o
cedars : ars_s	celbnamenin : elb_o
celepin : epi_o	celticsi : ic_o si_s
cemaluri : uri_s	cembalo : alo_s
cendrine : end_o	cevahirul : iru_o ul_s
cevizlibaG : iba_o	ceyhunc : unc_s
cezayird : ird_s	chIcago : chix_b ago_s
chabovta : cha_b	chaffateaux : ux_s
charlesI : esix_s	charlottetown : own_s
chealle : che_b	cherooke : oke_s
cherynin : ery_o	chiaie : chi_b
childrens : ens_s	chlamedia : ch_b
chocopulos : cho_b	chopard : opa_o
choulepov : epo_o	chpliden : chp_b
chreyslere : eys_o	chryslerin : chr_b ys_o
churchIll : chu_b ixll_s	ciGerimdi : ci_b
cibonanIn : ibo_o	cihazlari : ari_s
cindyden : yde_o	cinuCen : ucxe_o
ciorbea : be_s	cipollini : ipo_o
cipsleri : ips_o	civciv : iv_s
claesin : cla_b	clearplan : cle_b
climate : cli_b	clochardlar : clo_b
cluadia : clu_b	cmukunu : cmu_b
cnlandIrdIGI : cn_b	cnrdan : cnr_b
coGrafayada : co_b	cobhamIn : ob_o
cochranla : och_o	cogito : ito_s
cointra : int_o	colibaly : aly_s
collegeIn : ege_o	collins : ins_s

colorIn : orix_o	columbo : bo_s
comics : ics_s	comitee : ee_s
compaqa : aqa_s	composants : osa_o
compusa : usa_s	computerwold : old_s
conceicao : ao_s	concerto : to_s
confedereacy : acy_s	conkbaylrI : onk_o
connie : ni_s	coousteau : au_s
coqueran : oqu_o	corchiani : orc_o
corrdovez : orr_o	cosentino : ose_o ino_s
cosmogonia : ogo_o	couger : uge_o
countryler : unt_o ry_o	couperin : upe_o
crabbe : cra_b	craioveanu : anu_s
crawforddan : aw_o	crdinanIn : cr_b
credIt : cre_b	criminal : cri_b
crochemore : cro_b ore_s	cruestyden : cru_b
csIsden : csix_b	cskanIn : cs_b
cubzac : cu_b	cumhpuriyeti : umh_o
cumhuniyette : uni_o	cutlass : ass_s
cylospera : cy_b	cyprus : cyp_b
dISIIIGIn : dix_b	dISiSleri : ixsxi_o
dOGUSen : dox_b	dOSeGe : oxsxe_o
dOmOtOrUn : oxmox_o oxtox_o	dOndUkt : uxkt_s
dOvUSUnU : oxvux_o	dOvdUGU : oxv_o
dOveceGim : oxve_o	dOvize : oxvi_o
dUGUmU : dux_b	dUGUnn : uxnn_s
dUGmelerini : uxgx_o	dUSUnmemkten : emk_o
dUqUnmeden : uxqux_o	dUrbUncU : cux_s
dUzayaktIr : uxza_o	dUzeltmek : elt_o
dUzenldikleri : enl_o	dUziCi : uxzi_o
daGIIIS : da_b	daaayiii : ii_s
dacewicz : ewi_o	dadaSef : ef_s
daewooda : ewo_o	dalemo : emo_s
dalgICa : ixcxa_s	dalkIIICI : ixcxix_s
dalmeida : ida_s	danema : ema_s
daniSmend : end_s	dannysi : ysi_s
daphne : aph_o	darUlfUnununa : fux_o uxnu_o
dariush : ush_s	daugavpils : ils_s
davaro : aro_s	daxiong : axi_o ong_s
deGStkirip : de_b egxsx_o tki_o	deGiSikliG : igx_s
deGiStirm : irm_s	deSarjIn : jix_o
decani : eca_o	decouflenin : uf_o
dedikoducu : ucu_s	default : ult_s
delegraaf : af_s	deligOz : igox_o
demirOrenin : irox_o	demirdOGer : oxgxe_o
democracynin : acy_o	demokraasi : asi_s
demokratk : atk_s	denhSete : enh_o
denizun : izu_o	depardieu : epa_o

deportivodan : ivo_o	derekt : ekt_s
derviSoGlunu : isxo_o	deschampsa : esc_o
deutsche : uts_o che_s	devremUlkte : emux_o uxlk_o
dgmden : dgm_b	dhkcnin : dhk_b cni_o
dhmide : dh_b	dhonneurUnU : dho_b urux_o
diGerin : di_b	dickson : ick_o
dictionary : ary_s	dijtal : ij_o
dimbleby : imb_o eby_s	dinamizmleri : izm_o
direct : ect_s	direnCli : encx_o
diskCi : cxi_s	district : ict_s
diubango : go_s	diyorb : orb_s
dizaynla : ayn_o	djakovica : dja_b
djerleke : dje_b	djordceviC : djo_b
djukicten : dju_b uki_o	dmitri : dmi_b
dnalarIn : dna_b	dnemini : dne_b
doCente : do_b ocxe_o	doGrudUrUst : udux_o uxst_s
doGrultmasI : ult_o	doGutUrk : utux_o
doktrinel : okt_o	dokuyacaGIz : uya_o
dolarImtrak : ixmt_o	dollydeki : oll_o
domInIkovIc : ovix_o ixc_s	dombra : omb_o
donOrlUGU : onox_o	donnynin : onn_o
doomsday : oms_o	doppler : opp_o
dorphee : orp_o	doruku : uku_s
dostoyevsky : evs_o ky_s	douceur : uce_o
drabikevsky : dra_b	dramaturg : urg_s
drankkkk : kkk_s	drazdova : ova_s
dreamland : dre_b	drenaj : aj_s
driplingiyle : dri_b	drobnyler : dro_b obn_o yle_o
drucker : dru_b	drumsda : ums_o
dspdeki : dsp_b	dtmden : dtm_b
dtpdir : dtp_b	duSanbe : du_b
dublOrU : lox_o	dubovik : ubo_o
dubryyi : ubr_o yyi_s	dufourcqla : ufo_o qla_s
dumcree : umc_o	dupuis : upu_o
durdurm : urm_s	durgunl : unl_s
durmuSu : usxu_s	durusupark : ark_s
dusseldorfda : orf_o	duzelecek : uze_o
dvereden : dve_b	dygusal : dy_b
dyplileri : dyp_b	dzhanashia : dz_b
eCcinsel : ecx_b	eGdiGinizde : egx_b
eGelence : egxe_b	eGiSinde : egxi_b
eGitimI : imix_s	eGitimv : imv_s
eSSoGlu : esx_b	eSantiyon : esxa_b
eSeGini : esxe_b	eSiGidir : esxi_b
eSofmanInI : esxo_b	ealing : ea_b
earthwatch : hwa_o	eastern : ern_s
ebUzziyanIn : ebux_b	ebedidir : ebe_b

ebeveynleri : eyn_o	ebiyle : ebi_b
ebrahim : eb_b	ebulhuda : ebu_b
ecclestoneun : ecc_b	ecelinden : ece_b
ecinniler : eci_b	economi : eco_b omi_s
economicsten : ics_o	eculIk : ecu_b ulix_o
eczacIbaSIdan : ec_b	edGerli : ed_b
edasInda : eda_b	edebildiGimiz : ede_b
edecekmlerini : ekm_o	ediSimin : edi_b
edilGini : gxi_o	editOre : itox_o
edoGandan : edo_b	education : edu_b
efeden : efe_b	efektlerin : ekt_o
effect : ef_b	eforlar : efo_b
efraimsson : ims_o	egedekilerden : ege_b
egilim : egi_b	eglise : eg_b ise_s
egoist : ego_b	eguavoen : egu_b
ehemniyetine : ehe_b	ehildir : ehi_b
ehlibeyt : eh_b eyt_s	ehrlich : ehr_b
eichmann : ei_b ich_o	eigtveds : igt_o eds_s
einsteinI : inix_s	ejdadImIz : ej_b
ekSide : ek_b	ekalliyetin : eka_b
ekblom : ekb_b	ekeceGimizi : eke_b
ekibimiz : eki_b	ekolUnU : eko_b
ekonoUmilere : oux_o	ekonomou : ou_s
ekskavatOrUn : eks_b	ekspresindeki : pre_o
ekspresste : ess_o	ekstrOm : trox_o
ekstralarInIn : tra_o	ekstremist : tre_o
elCibeyi : el_b	elStirmenleri : elsx_b
elalemi : ela_b	eleGin : ele_b
eleStrilere : esxt_o	elecroluxta : ux_o
electrocomu : ect_o	elfmeter : elf_b
eliCeyle : eli_b	elitism : ism_s
elktrik : elk_b tri_o	ellmann : ell_b
eloGlundan : elo_b	elyahu : ahu_s
elyseedeki : ely_b	emanetCilerle : ema_b
emballages : em_b	embrio : emb_b
emeCler : eme_b	emilio : emi_b
eminOnUnU : inox_o	emirgazi : azi_s
emlakspor : aks_o	emotions : emo_b
enIactan : enix_b	enayatullah : ena_b
encUmene : en_b	enckelmanI : enc_b
endorUloji : orux_o uxlo_o	enektiriik : ene_b
enerijili : iji_o	enfarktUs : uxs_s
enflasy : enf_b asy_s	engler : eng_b
eniSteler : eni_b	enlfasyona : enl_b
enqvist : enq_b	ensititUsU : itux_o
enstalasyon : ens_b	enstitU : itux_s
enstrUmandIr : trux_o	entgrasyon : ent_b gra_o

eokacIlardan : eo_b	epaSIn : epa_b
epeydir : epe_b	epikmandan : epi_b
erCelde : er_b	erCman : ercx_b
eradication : era_b	erchler : erc_b hle_o
ereGilsinde : ere_b	ergsanIn : erg_b
eriSecektir : eri_b	erkmen : erk_b
ernkyl : ern_b kyix_s	eroGlundan : ero_b
eroksporun : oks_o	eruGrul : eru_b
esaretin : esa_b	escada : es_b
eseceGim : ese_b	esinlendi : esi_b
esknIn : esk_b	espriden : esp_b
estrellos : est_b	etUdUnUn : etux_b
etadan : eta_b	eteGinden : ete_b
etfale : et_b	etiGin : eti_b
etklimeyecek : etk_b	etunun : etu_b
eubanks : eu_b	eurobondu : uro_o
eurodm : odm_s	eurythmicsin : ury_o th_o
evangelia : eva_b	evcille : ev_b
evelallah : eve_b	evideks : evi_b
evorya : evo_b	examiner : exa_b
exchange : exc_b	exeter : exe_b
eximbankIn : exi_b	explorerI : exp_b
export : ex_b	exspress : exs_b
extranet : ext_b	exxonun : xo_o
eyUlUne : eyux_b	eyUpoGlunun : uxpo_o
eyaletinde : eya_b	eyfeli : ey_b
eyiceden : eyi_b	eyyUbiler : uxbi_o
ezaCIbaSI : eza_b	ezberciliGe : ez_b
ezecek : eze_b	eziSine : ezi_b
ezuero : ezu_b	fICIsI : fix_b ixcxix_o
fIfaya : ixfa_o	fIIIpescuda : ixpe_o
fIrsatCIlGIn : atcx_o	fUgUrUnU : fux_b
fUreya : eya_s	fUtUrist : uxri_o
fUtuhatI : uxtu_o	faSiSt : fa_b isxt_s
faazeh : eh_s	fahrUnnisa : isa_s
fahrigUl : igux_o	faogqhI : ogq_o hix_s
farnsa : arn_o	farrelIn : elix_o
fatihini : ihi_o	faulUnU : ulux_o
faulkner : ulk_o	favori : ori_s
feSmekan : fe_b	federico : ico_s
felCten : elcx_o	feldmanIn : eld_o
fergusonda : uso_o	feriha : iha_s
feritkOSkUnde : oxsx_o	fetUsteki : etux_o
fiSekler : fi_b	fierro : ro_s
figUranlarIn : uxra_o	fikstUrUmUzUn : iks_o
filipescuyu : ipe_o	filippe : pe_s
filmbUhne : ilm_o	filozofik : ofi_o

finanmsmanI : anm_o sma_o	fincherdan : inc_o
fischerden : isc_o	fiyatn : atn_s
fiyonk : onk_s	fIIpescu : flix_b
flOrtUnUzU : flox_b	flaSIn : fla_b
fleischeri : fle_b	flipperIn : fli_b
florasI : flo_b	fludex : flu_b
fnacda : fna_b	foCada : fo_b ocxa_o
fokotopi : oko_o	folklar : olk_o
fonseca : eca_s	forklift : ork_o ift_s
formdaylz : orm_o	foroozesh : esh_s
forster : ors_o	forsythe : yt_o
forums : ums_s	fplilerin : fp_b
frIedrIch : frix_b ixe_o ixch_s	frakla : fra_b
frearsIn : fre_b	freeze : eze_s
frepaso : aso_s	friborg : fri_b
friendship : shi_o	frischtak : hta_o
frlayp : fr_b ayp_s	frojeeeeye : fro_b
frunkfurt : fru_b unk_o	fuarImIzda : fu_b
fuchsun : uch_o	fujian : uji_o
gIcIrdadI : gix_b	gIIIIgISII : ixgix_o
gOCUnden : gox_b oxcxux_o	gOCebe : oxcxe_o ebe_s
gOClerden : oxcx_o	gObeGinden : oxbe_o
gOkalpIn : oxka_o	gOkovadIr : oxko_o
gOkyiGiti : yi_o	gOllner : oxll_o
gOmUlUr : oxmux_o	gOmdUkten : oxm_o
gOnUllUde : uxde_s	gOnderdiGinz : inz_s
gOnlUbolun : uxbo_o	gOralIn : oxra_o
gOrmUSUlGU : gxux_s	gOsetriliyor : oxse_o
gOtUceGi : oxtux_o	gOteborga : oxte_o
gOtebourgu : gu_s	gOyUnC : uxncx_s
gOzOrenin : oxzox_o	gOzUyaSII : uxya_o
gOzaGrIsIdIr : oxza_o	gUCalp : gux_b uxcxa_o
gUClUsoy : uxso_o	gUftelerine : uxf_o
gUlOren : uxlox_o	gUlUnCtU : uxncx_o
gUlUnoGlu : uxno_o	gUmUSi : uxsxi_s
gUneSi : esxi_s	gUniziyle : uxni_o
gUrISIk : uxrix_o	gaCici : ga_b
gallupa : upa_s	gangsterlerin : ste_o
gapple : app_o	gardIrobu : obu_s
gardrobumun : obu_o	garnett : ett_s
garvaghy : agh_o	gaspCIlar : asp_o
gassmanI : ass_o	gayrImenkule : ixme_o ule_s
gayrImubah : ixmu_o	gazetesndeki : esn_o
gazezoGlu : ezo_o	gazpromla : azp_o
geCeCek : ge_b	geCiSimi : ecxi_o
geaCen : acxe_o	gebrselassie : ebr_o
gehrigs : igs_s	geniSliGIi : igxix_o ixi_s

geoghraphical : ogh_o	gepgenC : encx_s
gerUstbau : erux_o	geturdi : etu_o
ghazali : gha_b	gherasim : ghe_b
ghinva : ghi_b va_s	giSede : gi_b
girlste : irl_o ste_s	gitsbayla : its_o
gjallIcanIn : gja_b	gkryye : gkr_b yye_s
glades : gla_b	gleecGi : gle_b gxi_s
gligorovun : gli_b	globale : glo_b
gmbhye : gmb_b hye_s	gmyoya : gm_b
gnesin : gne_b	goadaki : go_b
gogoladze : ze_s	golUnu : uxnu_s
goldberg : old_o	goldenblom : enb_o
goldsmith : smi_o ith_s	gopinath : ath_s
gorbaCovadan : acxo_o	gornje : je_s
gotcheve : otc_o	gottliebe : ott_o
gowaili : owa_o	goytisolo : olo_s
grOnlanddaki : grox_b	grUndung : grux_b
gracelanddeki : gra_b	grammyde : amm_o yde_s
gramofonla : ofo_o	gravUrleri : avux_o
grdUGUm : gr_b	greatse : gre_b
gretchen : etc_o	gribinin : gri_b
groenlanddaki : gro_b	groove : ove_s
grossmana : oss_o	grotesk : esk_s
groznyde : ozn_o	grubumdaki : gru_b
gslilerin : gs_b	gsmhdeki : gsm_b
gsmhsInI : hsix_o	gsmhyl : hyix_s
gtUrmeye : gtux_b	gualtieri : gu_b
gubbskjukt : ubb_o sk_o ukt_s	gunnery : ery_s
gustave : ave_s	gutersloh : oh_s
gwynneth : gwy_b nne_o eth_s	gyulay : gyu_b
hICkIra : hix_b	hInClarIyla : ixncx_o
hIrant : ant_s	hIrhIrik : ixri_o
hIrslIdIr : ixrs_o	hOchsaya : hox_b oxch_o
hOghun : oxg_o	hUcUmuna : hux_b uxmu_o
hUcumbotlarI : uxcu_o	hUdainin : uxda_o
hUdusu : uxdu_o	hUkumetlere : uxku_o
hUsamettindir : uxsa_o	hUseverin : uxse_o
hUsiyne : uxsi_o	hUznUyse : nux_o
haCInIlyanIn : ha_b	haSimoto : oto_s
habibullah : ibu_o	habsburglarI : abs_o
hacIUmran : ixux_o	haciloizu : izu_s
hagiyl : iyix_s	haguede : agu_o
hainzlIn : inz_o	hakkInrda : ixnr_o
hakuba : uba_s	halIdere : ixde_o
halayi : ayi_s	halberstadt : adt_s
hamitoGllarI : ogxl_o	hammudi : udi_s
hampetrolU : olux_s	hamuCaylr : ucxa_o

hannofer : ofe_o	harClIGImI : arcx_o
harlly : ixly_s	harbda : arb_o
hareketIna : etix_o	harikuladedir : iku_o
harmoko : oko_s	harryi : yi_s
hasIlagsyih : ih_s	haselCiimkb : imk_o
hawaide : awa_o	hazIrladIG : ixgx_s
hdknIn : hdk_b	heSkeltraS : he_b
hedefe : efe_s	helfried : elf_o
hepimizn : izn_s	herCUmerC : ercx_s
hercke : erc_o	hiCanIn : hi_b
hillaryyla : ary_o yla_s	hillsde : sde_s
himmetfakI : akix_s	hipnoza : oza_s
hiraoka : oka_s	hiroSimalar : osxi_o
hiroyasu : asu_s	hitchcockdan : itc_o hco_o ock_o
hizzmet : izz_o	hlavacova : hla_b
hoSbulduk : ho_b	hoffmann : off_o
hohlbrookeun : ohl_o bro_o	holbach : ach_s
holbrooketan : olb_o	holtmannIn : olt_o
holzman : olz_o	homogenic : oge_o
howlnIzI : owix_o	hpdeki : hp_b
hrIstiyanlIk : hrix_b	hrisostomos : hri_b
hsykya : hsy_b kya_s	huasun : hu_b
huckbaby : aby_s	hugodan : ugo_o
hukuki : uki_s	humphry : ump_o hry_s
huntingO : gox_s	huntsville : svi_o
husUmet : usux_o	hutchence : utc_o
hvidtin : hvi_b	hydeIn : hy_b
hyundaI : hyu_b	iCaCIcI : icxa_b
iCebilirsin : icxe_b	iCgUdUlerini : icx_b
iCiCeyim : icxi_b	iCtimaInda : aix_o
iGnelerine : igx_b	iIginiz : iix_b ixgi_o
iSCilerce : isx_b	iSadamInIn : isxa_b
iSemekte : isxe_b	iSimin : isxi_b
iStihInI : ihix_o	iadeleri : ia_b
ibadete : iba_b	iberian : ibe_b
ibiSliklerini : ibi_b	ibneliGe : ib_b
icabInIn : ica_b	iceberg : ice_b
ickesin : ic_b	idaSIn : ida_b
iddailarI : id_b	idealdi : ide_b
ideology : ogy_s	idialarla : idi_b
idolleri : ido_b	iettye : ie_b
ifSaattIr : if_b	ifadeden : ifa_b
igdaSda : ig_b	ihOlUlerin : ihox_b
ihalatCI : iha_b	ihbarInda : ih_b
ihlden : ihl_b	ihsanoGu : ogxu_s
iiSkisini : ii_b	ikametgahIdIr : ika_b
ikbali : ik_b	ikemetgahIdIr : ike_b

ikibin : iki_b	ikiyUzyll : iyux_o
ikonasl : iko_b	iktdarInl : ikt_b
iktisadi : adi_s	ikvnin : ikv_b
ilCelerde : il_b	ilCleerde : ilcx_b
ilUzyonistin : ilux_b	ilaCladIk : ila_b
ileSitim : ile_b	iliSiGi : ili_b
ilkbaharIdIr : ilk_b	illerd : erd_s
ilmUhal : uxha_o	imCnin : imcx_b
imaginery : ima_b	imbatl : im_b
imececiler : ime_b	imiSim : imi_b
imkbda : imk_b bda_s	imonun : imo_b
inOnUde : inox_b	inOnizmi : oxni_o
inSaasInl : in_b	inaClara : ina_b
inanCIllara : ancx_o	inanCyl : yix_s
including : inc_b	ineGiydi : ine_b
inegOle : egox_o oxle_s	ingrauya : ing_b
iniSiyle : ini_b	inkIlp : ixlp_s
insanl : anl_s	internetcafe : afe_s
interpole : ole_s	intibal : aix_s
intizami : ami_s	intranetin : int_b
ipbUken : ip_b	ipekCiden : ipe_b
ipiltilere : ipi_b	ipoteGinde : ipo_b
irSadi : ir_b	iradInIn : ira_b
iranja : ja_s	irepoGlu : ire_b
iridyum : iri_b	ironiye : iro_b
irticai : ai_s	isabet : isa_b
isbiri : is_b	isederginin : ise_b
isidro : isi_b	iskenderunda : eru_o
iskoClarl : ocx_o	ismmmo : ism_b mmo_s
istanbu : bu_s	isthihbarat : ist_b
istihdamIniS : ixni_o	istilahi : ahi_s
itaata : ita_b	itebilir : ite_b
itfaiyeciliGe : it_b	itiSine : iti_b
itmgyle : itm_b gy_o	itochu : ito_b hu_s
iuSCilere : iu_b	ivanCeviC : iva_b
ivcanCeviCi : iv_b	ivediliGini : ive_b
iyUzde : iyux_b	iyidereden : iyi_b
iyonuydu : iyo_b	izahInda : iza_b
izdUSUmU : iz_b	izindeki : izi_b
izobilnoyeden : izo_b	jOrgen : jox_b
jUbilemden : jux_b	jabbarIn : ja_b
jacksonl : onix_s	jacqie : qi_s
jakobenlerin : obe_o	janitschin : chi_o
jaques : aqu_o	jeanmaire : je_b
jerichowa : owa_s	jetskilerin : ets_o
jiangl : ji_b gix_s	joachn : jo_b
jocshka : ocs_o hka_s	johnsenden : ohn_o

johnstone : sto_o	jovonovska : ovo_o
jubgaya : ju_b	jungcu : ung_o
juninho : ho_s	jupiter : upi_o
kICIkIrIk : kix_b	kIblesini : ixb_o
kIbrIsi : ixsi_s	kIIIfInda : ixfix_o
kIpIrd : ixpix_o ixrd_s	kIrcaaIlC : ixcx_s
kIrkdokuzuncu : ixrk_o	kIsagUn : agux_o
kIvrIla : ixla_s	kIzIlOtesi : ixlox_o
kIzIlelma : ixle_o	kIzIlorduyu : ixlo_o
kOCekCelerin : kox_b	kOSkden : oxsxk_o
kOlnden : oxln_o	kOpUGU : oxpux_o
kOpeGinde : oxpe_o	kOprUlUkIlIC : uxkix_o
kOrdOGUSU : uxsxux_s	kOroGlundan : oxro_o
kOsice : oxsi_o	kOyaltI : oxya_o
kOyiCi : oxyi_o	kUCUCUk : kux_b uxcxux_o
kUCUltmemeli : uxlt_o	kUbaIIdan : uxba_o
kUfUrbazlar : uxfux_o	kUfrde : uxfr_o
kUlUbU : uxbux_s	kUlUnk : uxnk_s
kUlupleri : uxlu_o	kUnUCenin : uxcxe_o
kUpUrU : uxpux_o uxrux_s	kUpurdeki : uxpu_o
kUsUfuna : uxfu_o	kUsurunda : uxsu_o
kaCISInIn : ka_b	kaCtIkmlarI : ixkm_o
kaczyaski : acz_o	kadInbudu : udu_s
kadaylfiyi : ixfi_o	kadrdo : adr_o
kajegeldinin : aje_o	kaIIba : ixba_s
kalashnikof : of_s	kalisz : isz_s
kalkInm : ixnm_s	kalpler : alp_o
kamuoylarInda : uo_o	kapsamIhda : ixh_o
kapuCino : ucxi_o	karabUkspora : uxks_o
karamUrsele : amux_o	karayolub : ub_s
kardUzt : uxzt_s	kardeSoGlu : esxo_o
karlsruhe : sru_o uhe_s	kasImcOmert : cox_o
kaslowskinin : ows_o	katIldGInI : ixld_o
katadreuffe : fe_s	kathrin : ath_o
katkda : atk_o	katzrinde : atz_o
kayltl : ixtl_s	kazIICeSmenin : ixcxe_o
kdpliler : kdp_b	kdvler : kdv_b
keCecilere : ke_b	keCiOeren : iox_o
keeehhh : ehh_o	kehnemuyi : uyi_s
kenedy : edy_s	kennedynin : edy_o
kerckhovenIn : kho_o	kesinleSeGn : egxn_s
khabar : kha_b	khlaiwi : kh_b iwi_s
khomitzerin : kho_b	khumalo : khu_b
kiSibaSIna : ki_b	kimberly : erl_o
kinetix : ix_s	kingstar : sta_o
kirchbergerin : irc_o hbe_o	kirstene : irs_o
kkadInla : kka_b	kkkdan : kkk_b

kktcdeki : kkt_b cde_o	kktcyi : cyi_s
klUbUnU : klux_b uxbux_o	klUbede : uxbe_o
klakete : kla_b	kleinin : kle_b
kliSelerle : kli_b	kllanIlan : kl_b
klonlama : klo_b	klubUnde : klu_b ubux_o
kmamami : kma_b	knOsel : knox_b
kndisine : kn_b	knicksde : kni_b
knokeun : kno_b	koCCoban : ko_b
koCoGlunun : ocxo_o	koSllarI : osxl_o
kojima : ima_s	kokoschka : osc_o
kokteyl : eyl_s	kokteyllerin : eyl_o
kolejine : eji_o	kolodziejczyk : ejc_o zyk_s
komSularI : sxu_o	komUncUlerin : omux_o
komisyonunnda : unn_o	kompakt : akt_s
komple : omp_o	komplesklerin : esk_o
kompresOrleri : esox_o	konjOnktUre : oxnk_o uxre_s
konjoktUrUn : jo_o	konnblum : blu_o
konseptiyl : iyl_s	konseptlerini : ept_o
konsersiyumun : iyu_o	konstruktiv : tru_o
konulr : ulr_s	kooperatifi : ifi_s
koreografI : afix_s	korkunC : uncx_s
korkunCsun : uncx_o	korkuta : uta_s
korolyo : yo_s	korsch : ch_s
koskleri : osk_o	kosovada : oso_o
koyiCi : oyi_o	kozlIha : ixha_s
krIvoS : krix_b ixvo_o	krabbe : kra_b
kreSin : kre_b	kriakov : kri_b
krlarla : kr_b	krokilere : kro_b
kruSCeve : kru_b	krushevc : evc_s
kryztof : kry_b zto_o	ksIyla : ksix_b
ksinden : ksi_b	ksslerde : kss_b
ktarSI : kta_b sxix_s	ktiten : kti_b
kuCaGIna : ku_b	kuSetli : usxe_o
kuafOrUne : afox_o	kucvvetle : ucv_o
kullanm : anm_s	kulpsuz : ulp_o
kulubU : ubux_s	kumbernuss : uss_s
kuopIodaki : opix_o	kupUrleri : upux_o
kuponla : upo_o	kurita : ita_s
kurllarI : url_o	kurukahve : ve_s
kuruluunda : uu_o	kuruyemiSCi : uye_o
kutlmalara : utl_o	kuttab : ab_s
kuvOze : uvox_o	kuveyk : eyk_s
kuveytliye : eyt_o	kuvvetimle : uv_o
kuvvvet : uvv_o	kviraya : kvi_b
kybele : ky_b	kyotoya : kyo_b
kyrkostas : kyr_b	lOsemiden : lox_b
lUbnanI : lux_b	lUgatInIn : uxga_o

lUtUfU : uxfux_s	lUzumuyla : uxzu_o
laCkalaSmIS : la_b	ladyliGi : ady_o
lahmacuncular : acu_o	lakayt : ayt_s
lamborghini : org_o	languedoc : oc_s
lapovo : ovo_s	laszloszabo : asz_o abo_s
lavoirIn : irix_o	lbsnin : lbs_b
ldpnin : ldp_b	leIxlIp : le_b ixx_o
leeuwerden : uwe_o	lemekh : ekh_s
lequertier : equ_o	letchkovun : hko_o
levhden : evh_o	levinskynin : ky_o
levotIron : evo_o otix_o	levyyle : evy_o
lewinky : ink_o	lgcteeshde : lgc_b esh_o
lhermitte : lhe_b	liability : li_b
libbynin : ibb_o	liddye : idd_o
liedholm : olm_s	lifshitzdi : ifs_o itz_o
lights : ts_s	limuzinin : imu_o
lipawskide : aws_o	little : itt_o
ljubiC : lju_b	llacer : lla_b
llisini : lli_b	llyods : ll_b ods_s
lobiciliGimiz : lo_b	locarno : no_s
lockeCu : ecxu_s	lojmalarla : oj_o
lokvenc : enc_s	lombrozo : ozo_s
lonely : ely_s	lpgyle : lpg_b
lubich : lu_b	ludwigshafen : igs_o
lufthansadaki : uft_o	luhrmannIn : uhr_o
lutfhansa : utf_o	luxemburgda : uxe_o
luzhkovdan : uzh_o	lybrant : lyb_b
lyngby : lyn_b gby_s	lysaridesin : ly_b
mIchael : mix_b ixc_o	mIrsevInI : evix_o
mOdUlUnUn : mox_b oxdux_o	mUCtehid : mux_b
mUSahhas : uxsxa_o	mUSsteSarlIGI : uxsxs_o
mUStiru : iru_s	mUcadaleyi : uxca_o
mUcidi : uxci_o	mUdUrUlGUnce : gxux_o
mUddei : uxd_o	mUdiresini : uxdi_o
mUfite : uxfi_o	mUhUrlediGin : uxhux_o
mUhimmatlarIn : uxhi_o	mUjdeledi Gin : uxj_o
mUkteseb : eb_s	mUnster : uxns_o
mUrUvvetini : uxv_o	mUrekkep : ep_s
mUvacir : uxva_o	maCImda : ma_b
maCIndakind : ind_s	maCtda : acxt_o
maastrichtde : tde_s	maddox : ox_s
majanlIGI : aja_o	majorIn : ajo_o
makeba : eba_s	makhlufu : akh_o ufu_s
makoveckiy : iy_s	malUllerinin : alux_o
malchenin : alc_o	malmOyU : mox_o
maloku : oku_s	mammoth : oth_s
manUpilasyon : anux_o uxpi_o	maniacs : acs_s

marSlarInIn : arsx_o	marceta : eta_s
marchetti : arc_o	marihuna : ihu_o
markaja : aja_s	marliyn : iyn_s
marxizmden : xi_o	marylhurts : lhu_o
masejInI : ejix_o	masimo : imo_s
massachussets : ets_s	masume : ume_s
matarena : ena_s	matogawa : awa_s
matteoli : oli_s	matthewun : ewu_o
mauriziu : iu_s	maxxum : xu_o
mazeppa : pa_s	mazruf : uf_s
mcaleese : mca_b	mcbridenin : mcb_b
mccarthyci : mc_b	mcclure : mcc_b
mccurryden : urr_o	mcgrath : mcg_b
meChulUn : me_b	meSruti : uti_s
mebuse : use_s	meclistbmm : bmm_s
meghnad : egh_o	melkpoorun : elk_o
menSei : sxe_s	menUlerinin : enux_o
mengiliyIldIz : iyix_o	menocchio : occ_o
mensupl : upl_s	merfua : fu_s
merill : ill_s	mesajiInI : aji_o iix_o
mesihi : ihi_s	mevlUd : uxd_s
mexicosunu : ico_o	mezuna : ezu_o
mfOden : mfox_b oxde_o	mgdnin : mgd_b
mgklarIn : mgk_b	mhplilik : mhp_b
mhzden : mhz_b	miCooGullarI : mi_b icxo_o
michigi : igi_s	micijanIn : ija_o
microsoftta : oft_o	mightyde : ty_o
mihoplos : iho_o	miloSeviCi : osxe_o
minUbUslere : inux_o	minskli : kli_s
miodrag : ag_s	miracl : acl_s
misplaced : isp_o	mitchte : hte_s
mixler : ix_o	mkardie : mka_b
mkrtClyan : mkr_b tcxix_o	mkyksIyla : mky_b ksix_o
mladost : mla_b ost_s	mlkpli : mlk_b pli_s
mnouchkinein : mno_b	moGalistan : mo_b
moGolkoC : ogxo_o	modUldeki : odux_o
molfiks : iks_s	monaco : aco_s
montclair : cla_o	montepulciano : epu_o
monthlynin : hly_o	moresby : esb_o
morganeI : eix_s	moshoeusi : usi_s
moskvI : vix_s	mouquet : uqu_o
mpinin : mpi_b	mrmiCte : mr_b
msUden : msux_b	mspden : msp_b
mtadaki : mta_b	mteblerden : mte_b
muGlaklIk : mu_b	mudoci : oci_s
muhelefet : uhe_o	muhiddin : uhi_o
munekuni : eku_o uni_s	murakabe : abe_s

murphy : urp_o hy_s	musIcle : usix_o
muwallid : uwa_o	myanmarIn : mya_b
myocardial : myo_b	mystique : mys_b
nInkini : nix_b	nObetCilerini : nox_b
nOtron : oxt_o	nUanslarI : nux_b
nUrnberger : uxrn_o	naCizane : na_b
nahuake : ahu_o ake_s	naranjo : jo_s
narcejac : eja_o	naruai : ua_s
nasuhi : uhi_s	nbalilerden : nba_b
nbonabucya : nbo_b	ncUlUGe : ncux_b
ndanISmanlIk : nda_b	neCirvan : ne_b
necula : ecu_o	nedeljni : elj_o
nemtsova : emt_o	nethercutt : utt_s
newark : ewa_o	newsidasp : asp_s
newsweek : ews_o	nguesso : ngu_b
nhille : nhi_b	niCini : ni_b
nilUferi : ilux_o	nitroselUloz : elux_o
njieryanIn : nji_b	nobelde : no_b
nobuhiko : iko_s	nordrhein : rhe_o
nostromo : omo_s	novorossiisk : isk_s
novruzoGlu : uzo_o	npqnun : npq_b
nsubuganIn : nsu_b	nternetteki : nte_b
nubira : nu_b	nufUsuna : ufux_o
numune : une_s	nyeter : nye_b
nylilerin : ny_b	nymexe : exe_s
oCIklarInda : ocxix_b	oGlandIr : ogx_b
oGuSturarak : ogxu_b	oGuzUlgen : uzux_o
oObpIm : oox_b	oSvangIn : osx_b
oakeshottun : oa_b	obajdin : oba_b
obeliC : obe_b	obiorah : obi_b
objektifi : ob_b	oburgate : obu_b
ocaGInI : oca_b	october : oc_b
odaGInI : oda_b	odasIiso : iso_s
odeggard : ode_b	odinsovada : odi_b
odtUmimarlIk : od_b	odunCelik : odu_b
odyovizUel : izux_o	ofansta : ofa_b
offdan : off_b	office : of_b
offshoreun : sho_o	ofisboyu : ofi_b
ogUnsUz : ogux_b	ogbufi : og_b ufi_s
ogilvy : ogi_b ilv_o	ogunkoyuanIn : ogu_b
ohalcilerin : oha_b	ohensiz : ohe_b
ohionun : ohi_b	ohranaya : oh_b
oidipusun : oi_b ipu_o	ojenizin : oje_b
okCudan : ok_b	okanarIn : oka_b
okechukwu : oke_b wu_s	okitundu : oki_b
okochasIz : oko_b	okuduGumuzdan : oku_b
okulOncesi : ulox_o	olUylU : olux_b

olaGanUstU : ola_b	olafsson : afs_o
olajuwon : aju_o uwo_o	olcayIn : ol_b
olduGIunu : ugxix_o ixu_o	olesky : ole_b
oligarSi : oli_b sxi_s	olikhver : ikh_o
olmaaylzz : ixzz_s	olmuSmu : mu_s
oluSabileceGi : olu_b	olympIakos : oly_b mpix_o
olympiakosu : mpi_o	omaghda : oma_b
ombudsmana : om_b uds_o	omerta : ome_b
omomatik : omo_b	omurgalllarIn : omu_b
onadIGInda : ona_b	onbaSIlar : on_b
oneill : one_b	onikincisi : oni_b
onowaniquenin : ono_b	onukun : onu_b
onyszkiewicz : ony_b sz_o	oostlanderin : oo_b
opabaumdur : opa_b	opecin : ope_b
opiumdan : opi_b	oportUnizmden : opo_b
oppdir : opp_b	opsiyonlarI : op_b
orCunusunkine : or_b	oracIGa : ora_b
orchestrayl : orc_b	oregonlu : ore_b
orgneral : org_b	orientsiz : ori_b
orkstrasInIn : ork_b	orlyye : orl_b
ormond : ond_s	orospu : oro_b pu_s
ortakdtp : akd_o tp_s	ortmek : ort_b
oruClarInI : oru_b	osakada : osa_b
osborne : os_b	osdden : osd_b
osijek : osi_b	ostrovskynin : ost_b
osyOdle : oxd_o	otabUs : ota_b
otekiler : ote_b	othman : oth_b
otistiklere : oti_b	otlacanIn : ot_b
otobUsUmU : oto_b obux_o	otoyola : oyo_o
ottmarIn : ott_b	otumasyonu : otu_b
ouakili : ou_b	ovacIka : ova_b
ovcarevo : ov_b evo_s	overmans : ove_b
ovidius : ovi_b	ovosodo : ovo_b odo_s
ovuSturup : ovu_b	owenIn : owe_b
ownership : ow_b	oyacak : oya_b
oyduGunu : oy_b	oyuldukCa : oyu_b
ozaman : oza_b	pIhtIlarI : pix_b
pOhrenkleri : pox_b	pUaStan : pux_b
paCana : pa_b	pabuCa : ucxa_s
padoga : oga_s	pahnke : ahn_o
palmtop : alm_o	parSOmen : sxox_o
pardOsUsU : oxsux_o	pardesU : esux_s
parlamentoyo : oyo_s	parodi : odi_s
parrish : ish_s	partikUllerin : ikux_o
partisininrp : inr_o	pastryi : ryi_s
patijn : ijn_s	patronlmrIn : onl_o mrix_o
paulskirche : uls_o	pclerden : pc_b

pdklIyl : pdk_b	pdsdeki : pds_b
peCesiz : pe_b	peSreviylhe : iyl_o
perspectiva : iva_s	petrolsporun : ols_o
petrzalka : etr_o	pevezenk : enk_s
pfdkye : pfd_b kye_s	pfeilden : pfe_b
pfizeri : pfi_b	phaetonun : pha_b
phelpsin : phe_b elp_o	philharmonia : phi_b
philipps : ipp_o	phillips : ips_s
phoenix : pho_b	phtopharmIn : ph_b
piSdiyi : pi_b	piggye : igg_o
pkkdan : pkk_b	plUtonyumun : plux_b uxto_o
plaGIn : pla_b	placebo : ebo_s
plebilisitli : ple_b	ploieSti : plo_b
plumerin : plu_b	pnvnin : pnv_b
poSetle : po_b	pokholchik : olc_o
policyde : icy_o	politkisI : isix_s
pollygram : yg_o	polygramdan : oly_o
popUlaritemiz : opux_o	portfOyUnde : fox_o
portmouth : uth_s	poyrazImu : ixmu_s
ppkyla : ppk_b	prUdential : prux_b
pradeSin : pra_b	praskeviciusz : usz_s
precado : pre_b	priStinanIn : pri_b
prjesi : pr_b	proGramI : pro_b
prodigy : igy_s	profan : ofa_o
prokofieff : eff_s	prosound : und_s
protestocu : ocu_s	prudential : pru_b
psahna : psa_b	pseudomonas : pse_b
psiSik : psi_b	pskiyatrist : ps_b
psychiatry : psy_b atr_o	puStlarIn : pu_b usxt_o
pulatsU : sux_s	puzzle : uzz_o
qantasIn : qa_b	quality : qu_b
quintenz : enz_s	rIdvan : rix_b
rOdovaz : rox_b oxdo_o	rOmorkOr : oxmo_o
rOntgende : oxnt_o	rOporta : oxpo_o
rOtuSlar : oxtu_o	rUChan : rux_b
rUttgers : uxtt_o	raGbetinin : ra_b
radyoterapi : api_s	ragIpa : agix_o ixpa_s
rashava : ava_s	rcdnin : rcd_b
rdeydi : rde_b	reCelli : re_b
rebabi : abi_s	refUjU : efux_o uxjux_s
refonmlara : onm_o	reischtagI : agix_s
rejisOrUn : isox_o	rekatebt : ebt_s
remaxIn : axix_o	repuhu : uhu_s
rethymno : eth_o ym_o	revervlerinin : erv_o
reykjavikte : eyk_o	rezerv : erv_s
rheine : rhe_b	rhorhomanie : rho_b
riayet : ri_b	ritmleri : itm_o

roadCularIn : ro_b	roemelt : elt_s
ropOrtajIn : opox_o	rothchildIn : oth_o
rothschild : sc_o ild_s	rpilerin : rpi_b
rplilerce : rp_b	rsyoya : rs_b
ruandada : ru_b	rwandada : rwa_b
ryfell : ry_b	sCgden : scxg_b
sICandiSi : six_b	sIGabilecek : ixgxa_o
sIkIyOnetimi : ixyox_o	sIrbiCa : icxa_s
sOGUSlenen : sox_b	sOnmezISIk : ezix_o
sOrfCUlere : oxrf_o	sOyldiler : oxyl_o
sOylememk : emk_s	sUbUtaS : sux_b
sUbuta : uxbu_o	sUpertech : ech_s
sUrCmesiyle : uxrcx_o	sUrUld : uxld_s
sUrprizden : uxrp_o	sUssmuthun : uxss_o
sUzgeCe : ecxe_s	saCIldIGI : sa_b
saGolda : agxo_o	sabote : ote_s
sacchinin : acc_o	sadako : ako_s
saffron : aff_o	salGlamGyor : algx_o amgx_o
salihe : ihe_s	salinh : inh_s
sallantIml : ixml_s	salzburga : alz_o
samsioe : oe_s	samsunsporl : uns_o orl_s
sanIIIrk : ixrk_s	sanskrit : kri_o
santrfordu : rfo_o	sarIgUzel : ixgux_o
sarIoG : ogx_s	sarIyerli : ixye_o
saschdan : asc_o hda_o	saxaphone : axa_o
sayIsInd : ixnd_s	sbaSkanI : sba_b
sbertsan : sbe_b	scacker : sca_b
scenicin : sce_b	schOllerin : sc_b
schOnn : oxnn_s	scheufelle : ufe_o
schIkwykIn : sch_b lkw_o ykix_o	schmidth : idt_o
schwabl : abl_s	schwytz : wyt_o
sciences : sci_b	scnhrOder : scn_b hrox_o
scognamilloya : sco_b	scudlarla : scu_b
seCCik : se_b	seahawklarIn : awk_o
sebestyu : yu_s	sefunCa : efu_o
segualanIn : egu_o	semptomlarI : emp_o
serfaty : aty_s	serpmeyi : erp_o
sevkler : evk_o	sevodn : odn_s
sevrdir : evr_o	sexual : exu_o
sgarbinin : sga_b	shIpInk : shix_b ixnk_s
shabati : sha_b	shadows : ows_s
shearere : she_b	shejnberg : ejn_o
shifferI : shi_b	shmuel : sh_b
shohei : sho_b	showunuzdan : owu_o
shpnin : shp_b	shulmilova : shu_b
shuruq : uq_s	siadlarla : si_b
siegldan : egl_o	simpson : imp_o

sisstemleri : iss_o	sitUasyonist : uxa_o
sitayiSkr : isxk_o	skalayl : ska_b
skeClerle : ske_b	skidoo : ski_b oo_s
skorboard : sko_b	skulptur : sku_b
skylife : sky_b	sladjic : sla_b
slavneft : eft_s	sleepers : sle_b
slibin : sli_b	slobodon : slo_b
smaCOre : sma_b acxox_o	smeonovicten : sme_b
smileyi : smi_b	smithle : ith_o
smokinin : smo_b	smyrnayl : smy_b rna_o
snehise : sne_b	snitzer : sni_b
snogrossun : sno_b	soCideki : so_b
softly : ly_s	sofular : ofu_o
sohoda : oho_o	sojournerden : ojo_o
solarzI : zix_s	sonClarIyla : oncx_o
sorGulam : gxu_o	soruml : uml_s
sorunmlarI : unm_o	spadayl : spa_b
spdden : spd_b	speaker : spe_b
spielberge : spi_b	splitz : sp_b
sponsora : spo_b	spydaki : spy_b
squaredeki : squ_b	srbinoski : sr_b
ssaraydan : ssa_b	sschrOterin : ssc_b
ssiyasetin : ssi_b	sskyla : ssk_b
stOden : stox_b	stUdyolarIn : stux_b
stabat : sta_b	stardust : ust_s
statreji : eji_s	steInzeIt : ste_b
stiers : sti_b	stikIrlarI : ikix_o
stoGun : sto_b	storysi : ory_o
straight : st_b	strang : ang_s
strazburgspor : spo_o	struppler : upp_o
studien : stu_b	suCbuzluGuna : su_b
sufilik : ufi_o	suhrstedt : edt_s
sumoya : umo_o	sundsvall : sva_o
sutiyoso : oso_s	suzaku : aku_s
svastika : sva_b	svenssona : sve_b
swIssaIrin : swix_b	swapiyle : swa_b
sweetest : swe_b	swifty : swi_b
swobodaya : swo_b	sybase : sy_b ase_s
symbian : sym_b	syncro : syn_b cro_s
synthesizerda : the_o	szajnaya : sza_b
szenesinkiydi : sze_b	szymborskaya : szy_b mbo_o
tIGIImarmara : tix_b	tOdefli : tox_b
tOrOristin : oxrox_o oxri_o	tOrnqvist : oxrn_o qvi_o
tUSundUGun : tux_b uxsxu_o uxgxu_o	tUkiye : uxki_o
tUmOrU : uxmox_o	tUmoba : uxmo_o
tUrklyerin : lye_o	tUyapa : apa_s
taClanan : ta_b	taCsporu : acxs_o

taaahUdUmUz : ahux_o	taahhUt : uxt_s
taarruzi : uzi_s	tabldotu : abl_o
tabscott : ott_s	tadakazu : azu_s
tafurundan : afu_o	tahmasb : asb_s
tahtlarI : aht_o	taiwanI : iwa_o
talebi : ebi_s	tanImIbilmesi : ixbi_o
tanjug : ug_s	tarzdIr : arz_o
taylorI : orix_s	tbmmden : tbm_b
tbmmne : mne_s	tbtknIn : tbt_b
tcddya : tcd_b dya_s	tcheky : tc_b eky_s
tdanIn : tda_b	tdvnin : tdv_b
teChizatII : te_b	teSUkkUr : esxux_o
teSkkUr : esxk_o	tecUmanIIk : ecux_o
technologynin : ogy_o	tekevvUn : vux_o
tekirburnu : nu_s	telOrgUlerin : elox_o
telefi : efi_s	temsilcilewr : ewr_s
temslciler : ems_o lci_o	tesadUfdUr : adux_o
teypleri : eyp_o	tffnin : tff_b
tgcden : tgc_b	tgrtnin : tgr_b tni_o
thUringen : thux_b	thalmann : tha_b
theatrein : the_b	thierr : thi_b err_s
thkdan : thk_b	thomassIn : tho_b
thorvalt : alt_s	threat : th_b
thuramla : thu_b	thyder : thy_b
thyndan : nda_o	tiSOrtUnUn : ti_b isxox_o
timesInda : esix_o	tirbUSon : uxsxo_o
tjaernasa : tja_b	tkbnIn : tkb_b
tkpnin : tkp_b	tldeki : tl_b
tmodaki : tmo_b	tntnin : tnt_b
toGrol : to_b	tobbden : obb_o
toffolInin : olix_o	toksikt : ikt_s
toledeo : eo_s	tontrbas : rba_o
toplmu : opl_o	toshiba : iba_s
tpaoda : tpa_b	tpfazilet : tp_b
trOndheimda : trox_b oxnd_o	trOstlerin : oxst_o
trUbUnler : trux_b	trabelsi : tra_b
trakys : aky_o	trechsel : tre_b
triangede : tri_b	trnavanIn : tr_b
troCkiyi : tro_b	trohpyye : ohp_o
trondheimIn : imix_o	trophynin : oph_o
trtdeki : trt_b	trucks : tru_b
tsarskaya : tsa_b	tsekva : tse_b
tsibliyev : tsi_b	tskdIr : tsk_b
tsruir : ts_b	ttUrkiyenin : ttux_b
ttgvtUrkiye : ttg_b vtux_o	ttnetaSa : tt_b
tuGamirelliGe : tu_b ugxa_o	tudjmannIn : udj_o
tunesu : esu_s	turkcellin : urk_o

tutanhhamon : anh_o	tutklandI : utk_o
tutmka : utm_o	tuviden : uvi_o
tvlerin : tv_b	twainin : twa_b
twenteli : twe_b	tysnin : tys_b
tzharev : tz_b	tzununnun : tzu_b
uCaGImIzIn : ucxa_b	uCkana : ucx_b
uCuSla : ucxu_b	uGraSIlIp : ugx_b
uGultular : ugxu_b	uSacuklarda : usxa_b
ubeyde : ube_b	ubsnin : ubs_b
uceymi : uce_b	ucubeyle : ucu_b
udayIn : uda_b	udeschinin : ude_b
udidemini : udi_b	udovitch : udo_b
udugovun : udu_b	uefasI : ue_b
ufaklIGIn : ufa_b	ufkirin : uf_b
ufoyla : ufo_b	ufukla : ufu_b
uganda : uga_b	uglovskoye : ug_b oye_s
ugulanan : ugu_b	uhdenize : uh_b
ukalallklara : uka_b	ukraynadan : uk_b
ulSatI : ul_b	ulaSIlIrmIS : ula_b
ulemalar : ule_b	ulilide : uli_b
ultrasona : ult_b	uluCevikin : ulu_b
ulysses : uly_b sse_o	umarImki : uma_b
umbrayla : umb_b	umduGumu : um_b
umududur : umu_b	unIcefe : unix_b ixce_o
unaIds : una_b ixds_s	uncuoGlu : un_b
unescodaki : une_b	unhcrIn : unh_b crix_o
unicretido : uni_b	unolarIn : uno_b
unutabiliriz : unu_b	upjohn : up_b ohn_s
uralla : ura_b	uretiyor : ure_b
urfalIdIr : ur_b	urindide : uri_b
uruguayda : uru_b	usUllerini : usux_b
usalliyun : usa_b	uslandI : us_b
usulUdUr : usu_b	utahda : uta_b
utkanI : ut_b	uvertUr : uve_b
uyabilme : uya_b	uyduGunuzu : uy_b
uyglamaya : uyg_b	uyuSmadIGI : uyu_b
uzaGIndaylm : uza_b	uzatamaaazzz : azz_o
uzlaSIrIz : uz_b	uzunal : uzu_b
vIplerini : vix_b	vUcudumu : vux_b
vaCgeCerse : va_b	vakflar : akf_o
valOrlu : alox_o	vangOlU : oxlux_s
varoSa : osxa_s	vasiliku : iku_s
veChelerinde : ve_b	vedrdiler : edr_o
vejetaryan : eje_o	veldhvizen : hvi_o
venezUelanIn : ezux_o	ventspils : spi_o
vertigo : igo_s	viagara : vi_b
vietnmam : etn_o	virginijus : iju_o

vizOrUnU : izox_o	vladimir : vla_b
vlotomas : vlo_b	vodmoskovniye : vo_b
volkswagendan : swa_o	vriyor : vri_b
vuelve : vu_b	vujacic : uja_o
vurdguladI : urd_o	vyugin : vyu_b
wUrzburgda : wux_b uxrz_o	waelkens : wa_b
wahlberg : ahl_o	walgrave : alg_o
watchda : hda_s	wbcnin : wbc_b
weather : we_b	wedgwooda : edg_o
wembleyde : emb_o	whItney : whix_b
wheeler : whe_b	whitaker : whi_b
widdick : wi_b	wilfried : ilf_o
wilmots : ots_s	windsurfCUsU : urf_o
wladimir : wla_b	wohale : wo_b
wolfram : olf_o	woolworths : hs_s
worldda : orl_o dda_s	wrighta : wri_b
wronskiyi : wro_b	wtfinin : wt_b
wuldridge : wu_b uld_o	wyntonun : wyn_b
xaninin : xa_b	xenephobia : xe_b
xeroxtan : ox_o	xingin : xi_b
xsarayl : xsa_b	yIGIIlp : yix_b
yIldIzeli : ixze_o	yIldIzoGlu : ixzo_o
yIIIIIk : ixll_o	yOklerinden : yox_b
yUcealpan : yux_b	yUkksek : uxkk_o
yUrUtmUyi : uxyi_s	yUzOlCUmUyle : uxzox_o
yUzssUzlerini : uxzs_o	yUzylIn : uxzy_o
yaGISInI : ya_b	yakuvov : uvo_o
yangtzeye : tze_o	yapIlacaGi : agxi_s
yapIlm : ixlm_s	yapacaklarmI : mix_s
yaptGIna : apt_o	yaratmlak : atm_o
yardImlaSm : asxm_s	yardmlaSma : mla_o
yatIrmlarI : ixrm_o	yazIOren : ixox_o
ydkdan : ydk_b	yeGenaGayla : ye_b
yeSilbaGOzgUr : agxox_o	yelpaze : aze_s
yeltsinnden : inn_o	yenikOylU : ikox_o
yerleSmS : esxm_o	yiGide : yi_b
yiyeceGum : egxu_o	yoGrulmak : yo_b
yoGunlGu : gxu_s	ypknIn : ypk_b
ysknIn : ysk_b	yucatan : yu_b
yveline : yve_b	zIkkImlanarak : zix_b
zImbabwe : we_s	zIrhlIsInIn : ixrh_o
zUbeyr : zux_b eyr_s	zUrefa : efa_s
zaGranIn : za_b	zawita : awi_o
zdarovkov : zda_b	zdravkovic : zd_b
zebaniliGine : ze_b	zibnev : zi_b
zivalj : alj_s	zodiaclarla : zo_b
zubareyev : zu_b	

Appendices