Sudan University of Science and Technology

College of Graduate Studies

Department of Electronic Engineering

Implementation of an Online Text Message Reader for Blinds

A Thesis Submitted for Partial Fulfillment of the requirements for the degree of M.Sc. in Electronics Engineering (Telecommunications Engineering)

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الإستهلال

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وَبِالْحَقِّ أَنزَلْنَاهُ وَبِالْحَقِّ نَزَلَ ۗ وَمَا أَرْسَلْنَاكَ إِلَّا مُبَشِّرًا وَنَذِيرًا)

[الإسراء: 105]

DEDICATION

To my Family, with all due love……

To Soul of my Educator and my Second Mother Saadia El Hassan Mahmood.

And to everybody who supported me.

ACKNOWLEDMENT

Firstly thanks to Allah for given success to finished this research, and I would like to express my appreciation and thank my supervisor, Dr. Sami Hassan Omer, for his support and guidance throughout the research study. Last but not least I thank my parents and my family for their endless support and encouragement.

ABSTRACT

The evolutions of communications technologies have improved the daily lifestyle and enhanced welfare. Use of messages through communication media has been utilized since the twentieth century when it has evolved from SMS, EMS, MMS, to messages over the Internet.

The usage of most knowledge sources today like E-books, journals, magazines, E-mails, and short message services are a great challenge faced many review people like blinds, weak sights and busy people in most services such as aviation and medical fields and where the use of the hands and eyes are not applicable available to read text message on their mobiles or e-mails in their PDAs or when one of the hands or eyes busy in the fields of command and control. So they need a new approach to improve their usage of ICTs.

In this research implemented a system that converted text-to-speech by using some applications of the phone such as the application of online VOIP like Skype to get a good reader as much as possible for text messages of various types with little cost; make everyone get this service and take utility of them. This implementation was done by using VB.NET programming language with Skype application.

Also in this research, evaluated the TTS system by using different methods, like Diagnostic rhyme tests (DRT), Semantically Unpredictable Sentences (SUS) Test And The Mean Opinion Score (MOS) Test.

المستخلص

ساهم تطور تكنلوجيا الاتصالات في تحسين نمط الحياة اليومية والحصول على بعض الرفاهية .تبادل الرسائل عبر وسائل الاتصالات بدأ منذ القرن العشرين وتطور من تبادل رسائل قصيرة , الرسائل المحسنة , رسائل الوسائط الى الرسائل عبر الإنترنت.

استخدام معظم مصادر المعرفة اليوم مثل الكتب الإلكترونية والمجلات ورسائل البريد الإلكتروني، وخدمات الرسائل القصيرة تمثل تحديا كبيرا يواجه العديد من حالات الأشخاص مثل المكفوفين، وضعاف البصر والأشخاص المشغولين في أغلب المجالات مثل مجالات الطيران والمجالات الطبية ؛ التي يصعب فيها الاستخدام لليدين والعينين ؛ بحيث تكون غير متوفرة لقراءة الرسائل النصية القصيرة على هواتفهم النقالة أورسائل البريد الإلكتروني على أجهزة المساعد الرقمي الشخصي أو عندما تكون واحدة من اليدين مشغولة في مجالات القيادة والتحكم. لذلك يحتاج هؤلاء الأشخاص الى نهج جديد لتحسين إستخداماتهم لقطاع الاتصالات والمعلومات.

في هذا البحث طبق النظام الذي يقوم بتحويل الكتابة الى صوت عن طريق بعض تطبيقات الهاتف مثل تطبيقات الصوتية على شبكة الإنترنت مثل تطبيق الإسكايب للحصول بقدر الإمكان على قارئ جيد للرسائل النصية بتكلفة أقل تجعل إمكانية إستخدام هذه الخدمة متاحة للجميع .

هذا التطبيق نفذ بإستخدام لغة الفيجوال بيسك للبرمجة بالإضافة الى تطبيق الإسكايب .كذلك في هذا البحث قيم نظام تحويل النص الى صوت باستخدام طرق مختلفة مثل : إختبار القافية التشخيصي ؛إختبار العبارات الغير متنبأ بها وإختبارنقاط متوسط الرأي.

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List of Abbreviations

ASR	Automatic Speech Recognition
CDMA	Code Division Multiple Access
DSP	Digital Signal Processing
ECESS	European Centre of Excellence for Speech Synthesis
GPRS	General Packet Radio Service
GSM	Global Systems for Mobile Communications
GUI	Graphical User Interfaces
HMM	Hidden Markov Model
IDE	Integrated Development Environment
IVR	interactive Voice Response
MMS	Multimedia Messaging Service
MPAB	Mobile Phone Assistant for Blind
NLP	Natural Language Processing
RAD	Rapid Application Development
RES	Remote Evaluation System
SMS	Short Message Service
TDMA	Time Division Multiple Access
TTS	Text-To-Speech
UMTS	Universal Mobile Telecommunications System
VB	Visual Basic
VOIP	Voice Over IP
VoMS	Voice Message Service
WAP	Wireless Application Protocol

Chapter One

Introduction

1. Introduction

1.1. Preface

The advancement of communication technology has been gained popularity, when produced mobile phones or websites and added many useful or interesting functions in their operating systems to assist users to make things more convenient and to provide more knowledge for them.

Since telecommunication technology (mobile phone) and other technologies become more and more popular, it becomes a part of our daily life. So busy people, blind and weak sight person need a new approach to improve their daily life.

Use of most knowledge sources today like E-books, journals, magazines, E-mails, and SMS(Short Message Service) mobile phones is a great challenge faced by many situations like blind, weak sight and busy people such as medical applications, and in all situations where hands and eyes are unavailable or in hands-busy or eyes-busy command and control applications. It is difficult for them to use these new entertainments. To us, the blind, busy, and weak sight people have the right to use those modern and enjoying functions. [1]

1.2. Problem Statement

The text-to-speech synthesizer must be different from any other talking machine.

There is two phases should be executed in Speech synthesis. The first one is text analysis, and the second one is the product of speech produced waveforms, where the voice output is generated from this phonetic and prosodic information. Some busy people, blind or weak sight users feel so frustrated when using information and communications technology because they can’t read their books, journals, magazines, E-mails and SMS message in mobile phone.

1.3. Proposed Solution

To develop a system that can convert text to speech; it is to be located in the server that receives the text and convert it to voice and send it back to whoever uses this service.

1.4. Methodology

This approach concentrates only on text read function for blind, weak sight and busy people to help them to use E-books, journals, magazines, E-mail and SMS message in mobile phone or other technologies. Additional functions can be added in future work to make them enjoy their life with technology. This research focuses on the real needs of busy, blind and weak sight users. The main component of the system is Text to Speech. To convert text to speech we will develop software. This feature already exists; but it is very expensive, so we should create software for that on the server. Only the converted voice signals are sent to the customer's chooses this service with low cost and high reliability.

1.5. Aim and Objectives

This research aims to help people with disabilities in utilizing the new technologies, in particular blind people who can't read text message as in SMS or emails. Moreover, TTS can help busy people who can't use their hands to catch their mobile device or PDAs to read messages.

In order to achieve this, the followings objective should be taken into consideration;

- To study the operational aspects of TTS Systems.
- To implement a TTS system.
- To evaluate TTS system.

1.6. Research Question

Why we need to convert Text to the voice? What are the methods used to do that? Who are the user's beneficiaries?? What are the advantages of this application than the others applications?

1.7. Thesis Outlines

Chapter two illustrates the TTS and highlights its literature survey. Chapter three and four, discuss the research methodology and system implementation.

While the latter, shows the implementation of reader messages and has a practical application and discussion of the output of this application. Final Chapter five drowns conclusions and gives recommendations for future work.

Chapter Two

Text-to-Speech Systems Background

2. Text-to-speech systems Background

2.1. Background

The Speech is the fundamental element of communication between persons. The aim of text-to-speech (TTS) is to automatically create speech (acoustic waveforms) from the text. The text-to-speech synthesizer must be different from any other talking machine (such as interactive voice response (IVR)). There is two phases should be executed in Speech synthesis. The first one is text analysis, and the second one is the product of speech produced waveforms, where the voice output is generated from the phonetic and prosodic information. These two phases are commonly called high- and low-level synthesis. The speech synthesis has three main categories: articulatory synthesis, formant synthesis, and concatenative synthesis. Articulatory synthesis brings speech by direct modeling of human articulator behavior. Formant synthesis forms the frequencies of speech signal. The formants are the resonance frequencies of the acoustic plot. Make sounds distinct by formants shape the main frequencies, these estimated frequencies is used to synthesize speech [2].

2.1.1.Speech Technology

Speech technology as modern technology is strange for most developers. They want to understand and utilize subtle and powerful capabilities provided by computerized speech. Although very essential investments in the research of speech technology over the last decades have been done, the technologies of speech synthesis and speech recognition still have significant fetters. Users do not always meet the high expectations of speech technology similar to natural human-to-human speech communication.

Understanding the advanced features of the Visual Basic Speech API and effective use of speech input and output in a user interface depend on understanding limitations of speech technology. Understanding of the capabilities of speech technology is also important for developers, who are making decisions what are specific applications will interest from the use of speech input and output.

2.1.2.Text-to-speech (TTS) synthesis

The recent technology has made machines able to transform most texts into audible speech, with the aim of giving ability to provide textual information to human via voice messages. The goal of TTS applications in communications is: getting best voice performance of text-based messages such as fax or email as part of a unified messaging solution, and best voice performance of visual/text information such as web pages. Usually TTS systems extended voice output for all types of information stored in databases such as numbers of phone, addresses, information of navigation, and guides of the movie.

2.1.3.Synthesis Methods

Synthesize speech have different methods, each method situated in one of the next types: articulatory synthesis, formant synthesis, and concatenative synthesis.

2.1.3.1. Articulatory synthesis

To produce speech in this type of method uses computational biomechanical models such as moving vocal tract and the glottis. An articulatory synthesizer in the ideal case controlled by simulated muscle actions of the articulators, such as the glottis, the lips and the tongue. Unfortunately articulatory synthesis today does

not result in natural-sounding fluent speech; in addition it needs notoriously high computational requirements.

2.1.3.2. Formant synthesis

This type uses a highly simplified source-filter model controlled by a set of rules, assuming that the model (glottal) source is completely independent of the filter. This filter is determined by the control parameters (bandwidths and formant frequencies).The source generates either pulses for periodic sounds or other stylized glottal and noise. Formant synthesis is not completely natural sounding speech, but generates highly intelligible. However, it has the advantage of only moderate computational requirements and a low memory footprint.

2.1.3.3. Concatenative synthesis

It uses actual recorded speech snippets that were stored in "voice database" after cuts from recordings, either as uncoded "waveforms", or encoded speech. Speech segments contain Elementary "units" for example, phone-to-phone transitions ("diphones") or phones (a vowel or a consonant), this diphones involve the second half of one phone and the first half of the next phone. Concatenative synthesis concatenates strings together, selected units from the voice database, and outputs the resulting speech signal after optional decoding. They have the highest potential for sounding "natural", because concatenative systems use snippets of recorded speech. Concatenative synthesis produces speech by connecting prerecorded speech units. The unit length affects the quality of the synthesized speech. Diphones are most commonly used units in concatenative synthesis. It's a unit that begins at the center of one phone and extends to the center of the following one. Diphones have a full list, this list is called diphone inventory. [2]

2.2. Literature Survey

2.2.1.Evolution of mobile systems

Vasco Pereira and Tiago Sousa mention in their work Evolution of Mobile Communications: The first operational cellular communication system provided voice transmissions only by using frequencies around 900 MHz and analogue modulation. The second generation (2G) of the wireless mobile network was based on low-band digital data signaling. CDMA uses spread spectrum technology to break up speech into small, digitized segments and encodes them to identify each call. CDMA distinguishes between multiple transmissions carried simultaneously on a single wireless signal. It carries the transmissions on that signal, freeing network room for the wireless carrier and providing interference-free calls for the user. CDMA promises to open up network capacity for wireless carriers and improve the quality of wireless messages and users' access to the wireless airwaves. The Second Generation (2G) wireless networks mentioned above are also mostly based on circuit switched technology, are digital and expand the range of applications to more advanced voice services. 2G wireless technologies can handle some data capabilities such as fax and short message service at the data rate of up to 9.6 kbps, but it is not suitable for web browsing and multimedia applications. So-called ‘2.5G’ systems introduced enhance the data capacity of GSM and mitigate some of its limitations. These systems add packet data capability to GSM networks, and the most important technologies are GPRS (General Packet Radio Service) and WAP (Wireless Application Protocol). WAP defines how Web pages and similar data can be passed over limited bandwidth wireless channels to small screens being built into new mobile telephones. At the next lower layer, GPRS defines how to add IP support to the existing GSM infrastructure. GPRS provides both a means to aggregate radio channels for higher

data bandwidth and the additional servers required to off-load packet traffic from existing GSM circuits. It supplements today's Circuit Switched Data and Short Message Service.

All 2G wireless systems are voice-centric. GSM includes short message service (SMS), enabling text messages of up to 160 characters to be sent, received and viewed on the handset. So in the world of 2G, voice remains king while data is already dominant in wire line communications. And, fixed or wireless, all are affected by the rapid growth of the Internet. Initial plans focused on multimedia applications such as video conferencing for mobile phones. Third-generation wireless also requires new infrastructure. There are two mobility infrastructures in wide use. GSM has the mobile access protocol, GSM-MAP. The North American infrastructure uses the IS-41 mobility protocol. These protocol sets define the messages passed between home location registers and visitor location registers when locating a subscriber and the messages needed to deal with hand-offs as a subscriber moves from cell to cell. 3G proponents have agreed on an evolution path so that existing operators, running on either a GSM-MAP or an IS-41 infrastructure, can interoperate. But the rest of the landline infrastructure to support IMT-2000 will be in flux in the near future. UMTS use the radio technology called W-CDMA (Wideband Code Division Multiple Access). W-CDMA is characterized by the use of a wider band than CDMA. W-CDMA has additional advantages of high transfer rate, and increased system capacity and communication quality by statistical multiplexing. W-CDMA utilizes efficiently the radio spectrum to provide a maximum data rate of 2 Mbps. With the advent of mobile Internet access, suddenly the circuit-based backhaul network from the base station and back has to significantly change. 3G systems are IP-centric and will justify an all-IP infrastructure. There will be no flip to 3G, but rather an evolution and, because of

the practical need to re-use the existing infrastructure and to take advantage of new frequency bands as they become available, that evolution will look a bit different depending on where you are, [3].

2.2.2. Evolution of Data Over Mobile Network

Henry Tung& Starry Chan mention in their work Phone Assistants for Blind in Department of Computer Science: the mobile phone technology is enhancement and add more application of people with sight disability, one of these mobile phone is MPAB08 (mobile phone assistant for Blind) is an all-in-one useful and powerful system for mobile phone. It was project of Henry Tung, Starry Chan two students from university of Honking, which provides full access to the application of mobile phone through the speech instructions and responses. Users do not need to learn most of things when using the mobile phone. MPAB08 also inherited and enhanced the function and the interface of the MPAB. Moreover, it added some more new functions to the system such as reading SMS, calculator, timer, eBook reader and music player. They succeed in this project by using Java language ME platform. They didn't mention any difficulties they faced in their paper and they recommend the developer to enhance the database system to work more with phonebook and SMS management. Screen switching could be automatically done by detecting the device. These work concentrate on text to speech system which was used in SMS part in MPA08m, [4].

2.2.3. Text To Speech Technologies

Marian Macchi Bellcore talked about Issues in Text-to-Speech Synthesis: The ultimate goal of text-to-speech synthesis is to convert ordinary orthographic text into an acoustic signal that is indistinguishable from human speech. Originally,

synthesis systems were architected around a system of rules and models that were based on research on human language and speech production and perception processes. The quality of speech produced by such systems is inherently limited by the quality of the rules and the models. Given that our knowledge of human speech processes is still incomplete, the quality of text-to-speech is far from natural-sounding. Hence, today's interest in high quality speech for applications, in combination with advances in computer resource, has caused the focus to shift from rules and model-based methods to corpus-based methods that presumably bypass rules and models. For example, many systems now rely on large word pronunciation dictionaries instead of letter-to-phoneme rules and large prerecorded sound inventories instead of rules predicting the acoustic correlates of phonemes. Because of the need to analyze large amounts of data, this approach relies on automated techniques such as those used in automatic speech recognition, [5].

Miroslav HOLADA talk about Internet Speech Recognition Server: The reason for building Internet speech recognition server is the fact, that communication speed of Intranet and Internet rapidly grows, and we can divide speech recognition process to client and server parts. Such solution would allow a wider use of speech recognition technologies because all users, including those that have relatively obsolete hardware incapable of speech recognition, would be served with speech recognition from the side of our server. The article discuses net data flow reduction, client-server structure and present two demo applications, [6].

M. Z. Rashad, Hazem M. El-Bakry and Nikos Mastorakis mention in their work An Overview of Text-To-Speech Synthesis: The front-end or the NLP component comprised of text analysis, phonetic analysis, and prosodic analysis is introduced then two rule-based synthesis techniques (formant synthesis and articulatory synthesis) are explained. After that concatenative synthesis is explored.

Compared to rule based synthesis, concatenative synthesis is simpler since there is no need to determine speech production rules. However, concatenative synthesis introduces the challenges of prosodic modification to speech units and resolving discontinuities at unit boundaries. Prosodic modification results in artifacts in the speech that make the speech sound unnatural. Unit selection synthesis, which is a kind of concatenative synthesis, solves this problem by storing numerous instances of each unit with varying prosodies. The unit that best matches the target prosody is selected and concatenated. Finally, hidden Markov model (HMM) synthesis is introduced Techniques, [7].

Matej Rojc, Harald Höge and Zdravko Kačič talk about ECESS platform for web based TTS modules and systems: Presents platform for web based TTS modules and systems evaluation named RES (Remote Evaluation System). It developed within the European Centre of Excellence for Speech Synthesis (ECESS, www.ecess.eu). The presented platform will be used for web based online evaluation of various text-to-speech (TTS) modules, and even complete TTS systems, presently running at different Institutes and Universities worldwide. Each ECESS partner has to install the RES module server locally and connect it with its TTS modules. Using the RES client, partners will be able to perform different evaluation tasks for their modules using any necessary additional modules and/or language resources of their other partners, installed locally at the other partners' sites. Additionally, they will be able to integrate their own modules into the complete web-based TTS system in conjunction with the necessary modules of other partners. By using the RES client they could also build-up a complete TTS system via web, without using any of their own modules. Several partners can contribute their modules, even with the same functionality, and it is easy to add a new module to the whole web-based distributed system. The user will decide

which partner's module to use in own configuration or for a particular evaluation task. Evaluation can be done by any institution, able to access modules for evaluation without the need to install these modules locally. The platform will be used within the evaluation campaigns of different TTS modules and complete TTS systems carried-out by the ECESS consortium. The first remote-based evaluation campaign of text processing modules using the developed platform is foreseen for January 2008, [8].

Ying Zheng mention in his work Text to Speech software Comparison to improve the Text–to–Speech solution for e -learning programs in the company: e-learning program and Text–to–Speech software use, prepares a requirements gathering survey, a requirement specification, products research, testing and conducts a Text–to–Speech evaluation survey resulting in suitable tool(s). Testing of Text–to–Speech software tools was concentrated on the voice quality which meant naturalness of sounding and intelligibility of speech, and functional features, [9].

The authors Thomas Pellegrini1; Vahid Hedayati and Angela Costa reviews in their work: El-WOZ a client-server wizard-of-oz interface In the thesis: when a collect spontaneous speech in a situation of interaction with a machine, the interface was designed as a Wizard-of-Oz (WOZ) plate form. In this setup, users interact with a fake automated dialog system controlled by a human wizard. It was implemented as a client-server application and the subjects interact with a talking head. The human wizard chooses pre-defined questions or sentences in a graphical user interface, which are then synthesized and spoken aloud by the avatar on the client side. A small spontaneous speech corpus was collected in a daily center. Eight speakers between 75 and 90 years old were recorded, [10].

Fahad Algarni, Yen Cheung and Vincent Lee mention in their work An Intelligent Voice-Based eMarketplace for Visually Impaired People: eMarketplaces play a significant role in contemporary life by providing a lot of income and business opportunities to people and organizations throughout the world. Despite innovations in the field of IT, many of eMarketplaces lack the ability to provide appropriate services for people with special needs, especially the blind. Therefore, this paper is focused on incorporating an interface for blind people to participate in the business of eMarketplaces. A proposed model of a voice-based eMarketplace has been introduced using voice recognition technology. Specific blind users of the system are uniquely identified using voice recognition technology to enable them to access the eMarketplace in a secure manner. Further work of this project involves building such as module on an existing eMarketplace, [11].

Hassam Elbehiery and M. S. Abdel-Wahab mention in their work Smart Touch Phones Blind Assistant System: Smart Touch Phones Blind Assistant System including the hardware and software actually allows phones to recognize and audibly identify places, orientation and give the ability to route in the close places almost instantly. Smart phones will become an incredible and depending on the cost of the software potentially affordable aid for blind or impaired individuals. In the past decade there has been a huge leap in technology and technological advancements but unfortunately most of these technological advancements failed to consider an important part of the community which is people with visual disabilities that are also known as visually impaired individuals. Still there are many aspects of the digital world that shall be customized by them. In this work we introduce a mobile application that will allow a visually impaired individual to use a touch screen Smartphone without any human assistance, In addition to converting this Smartphone into a tool used by the visually impaired individual

allowing him to walk freely in the outdoor environment, go from one place to another and overcome several obstacles that he might face while being outside [12].

Chapter Three
TTS System Modeling

3. TTS System Modeling

3.1. Preface

Prototyping approach became more common as a software development model, it defines as building software application prototypes which display the implementation of the product under evolution not the original software, and it has allowed understanding user requirements at an early step of development. It helps get useful feedback from the user and helps software developers known about what is predictable from of the product under development [16].

A prototype is also known as a concrete description of an interactive System. It's a real artifact, not a theoretical representation that requires interpretation. In addition to designers, developers, managers, customers and end-users, it uses these artifacts to imagine and reason the final system.

Hardware prototyping and Software prototyping have different aims. When constructing hardware systems, a prototype is used to system design validate. An electronic system prototype created by using off-the-shelf elements before made it expensive by investment. A software prototype is not planned for design validation, but to help improve and check the reality of the requirements for the system. The prototype design is normally different from that of the final system.

There are many advantages of developing a prototype in the software life cycle process, for example: specification misunderstandings between users and software designers as the system functions are demonstrated, detection of lost user services, identification and refining difficult-to-use or confusing user services.

Prototypes have various life spans. Quick prototypes are built for a certain purpose and then thrown away. Iterative prototypes are developed, either to explore various

options or to work out some details (increasing their accuracy). Quick prototypes are most important in the first stages of design.

They must be economical and simple to design, Note that quick prototypes may be on-line or off-line. Produce exact software prototypes, even if they must be re-implemented in the final design of the system, is necessary for detecting and determination interaction problems [17].

3.2. Implementation of TTS model

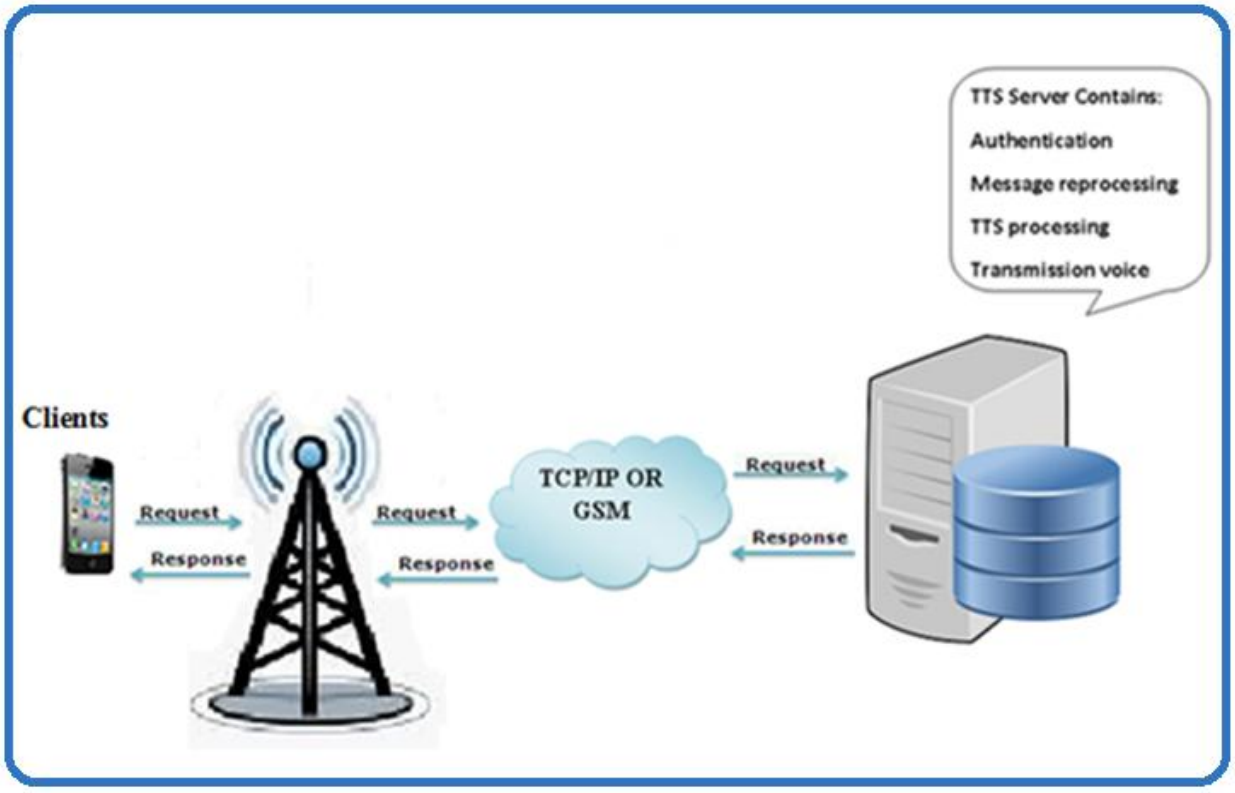

Figure (3-1): TTS System Elements

3.3. Flow chart:

The flow chart used to show how the implementation model can do. This flow chart used a network socket; it is an endpoint of a connection in a computer network. In Internet Protocol (IP) networks, these are often called Internet sockets. It is a program can pass to the networking application programming interface (API) to use the connection for receiving and sending data.

A socket API is an application programming interface, usually provided by the operating system that allows application programs to control and use network sockets. Internet socket APIs are usually based on the Berkeley sockets standard. Both have functions to read, write, open, and close. In inter-process communication, each end generally has its own socket, but these may use different APIs: they are abstracted by the network protocol. The effective use of network sockets allows server applications to communicate with client applications, such as a web browser accessing a web page. Every internet socket can be defined by a few characteristics, a local socket address and a protocol.

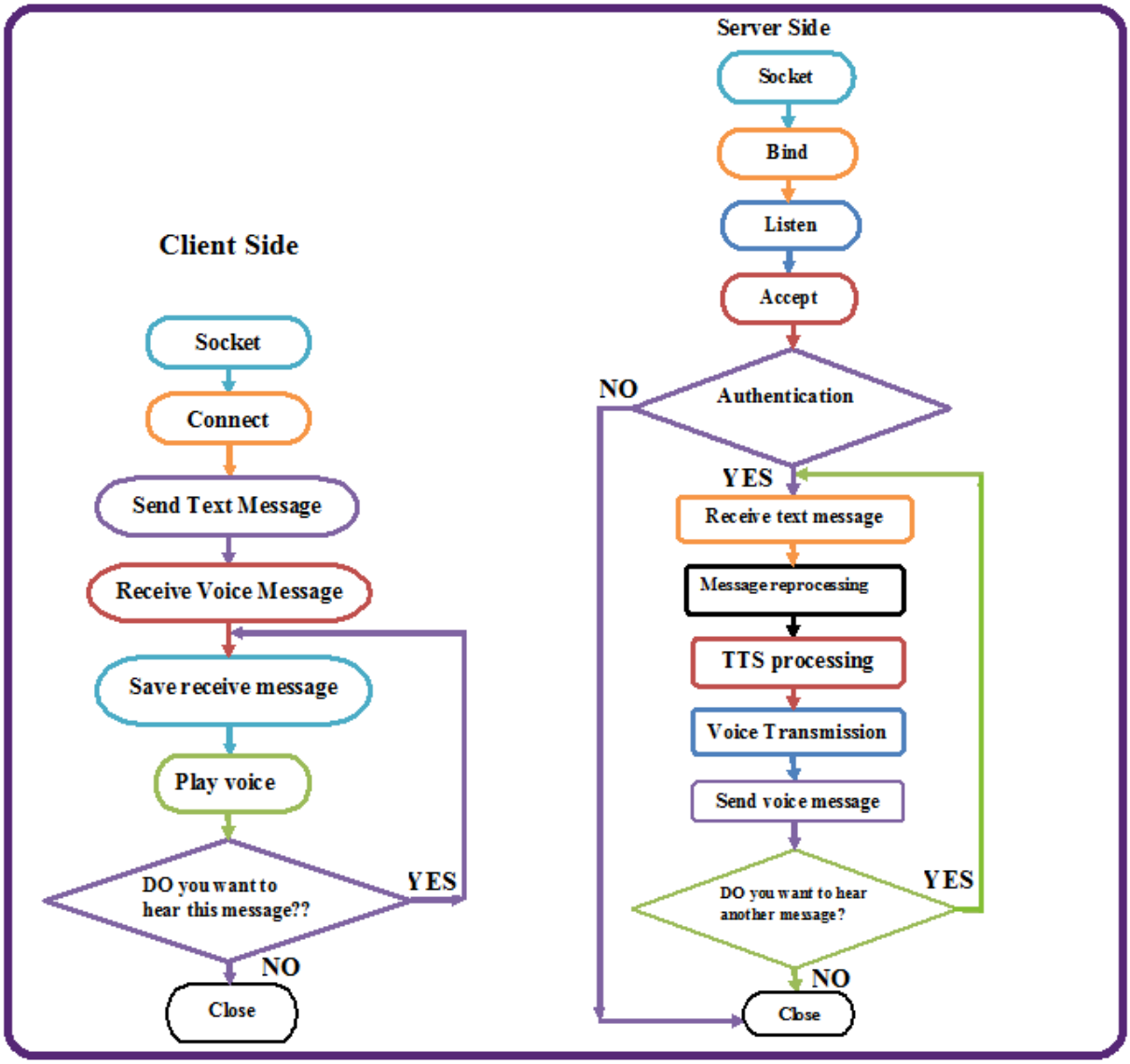

Figure (3-2): Socket API Flow Chart

3.3.1 The table(3-1) below show the Summarizes key functions in the above flow chart :

Name	Used by	Meaning
Connect	Client	Connect to a remote application
Bind	server	Specified IP address and protocol port

Listen	server	Prepare socket for use by a server
Authentication	server	To define receive number and check it from list of client before sending a voice message.
Send Text Message	client	Send the certain text message from the user to convert to speech.
Send voice message	server	Send a voice message after conversion
Message reprocessing	server	Message Processor is process responsible for specified certain message (details of message like letters, punctuations, and emoticon), sender number and receive number, and Copy this message to the window which runs voice in it after convert text to speech (TTS).
TTS processing	server	TTS responsible for convert text data of a message to sound data as human voice or answering machine by using VB-dot-net programming. As well as responsible save message as text or as voice file.
Voice Transmission	server	Voice Transmission is responsible of establish call and run audio when receiver answering, after sure authentication of receiver.
Receive text message	server	Receive text message from client.
Receive Voice Message	client	Receive voice message from server after conversion.
Save receive message	client	Save the receive voice message in the voice file.
Play voice	client	Play and replay the receive voice as user needed.
Close	either	Terminate a connection.
Socket	either	Create a socket for use by above.

3.3.2. The description work of TTS system Elements

TTS client sends the text message to the TTS server in two Typical Methods, the first method sends this message via the Internet using Skype application and the other method is to send short message through the mobile phone (SMS), the next stage is authentication of the receiver client and making sure its presence in the list of customers. The server receives the text messages sent to it from the client must be converted to the voice and start reprocessing of it (select text, the number of words, punctuations, emoticon and other details of the contents of the message language).

before the process of converting the text to the voice, copy the certain message in a specific window for reading and then read using the Function converts the text to speech in the program of Visual Basic-DOT-NET by calling the voice installed In the device (server) to convert the text to the voice through it. Defines a port that modem works via it by the same program (VB.net) to be able to represent the received message, the time that it was sending this message and other details. Also refreshes new messages. The last stage is initiated call with the specific customer and run audio when he answered; a call is established and take a channel (phone line).

Chapter Four

Implementation of Text Message Reader

4. Implementation of Text Message Reader

4.1. Preface

VB-DOT-NET language has been recognized as the widely programming language used to build Windows and web applications. The most important component is the DOT-NET Framework, it's actually more important to build applications than other of part VB language.

The Framework has an enormous collection of functions for most tasks of programming The Framework includes functionalities of the operating system, and makes it ready for requesting application through some methods. Visual Studio supply tools for manipulating databases and permit to transition between tasks, all in the same, streamline environment. Similar tools can be used in the same environment to develop a data-driven web page without a single line of code.

A Windows application contain of a visual interface and code beyond the elements of the interface. To build the visual interface can be use the tools of Visual Studio, and then program the elements of the application with Visual Basic. The visual interface of the application isn't attached to a specific language, and the same tools can be used to develop more application's interface will also be used by all programmers. To facilitate the process of application development, Visual Studio supplies an environment that's common to all languages, known as an integrated development environment (IDE). The aim of the IDE is to enable the programmer to do as much as possible with visual tools before writing code. It will help you in many ways; For example, it suggests the keywords that may appear at the current place in your code in a list, it underlines errors, and it even provides tools for locating and fixing errors (debugging). The IDE supply tools for designing, executing, and debugging your applications. It will be a while before explore and

learn all the elements of the IDE. The interface design is performed with visual tools and include of building a form with the relevant elements. These elements are the creating blocks of Windows applications and are called controls. The available controls appear in the Toolbox and are the same elements used by all Windows applications.

The Framework is a library of code into regular classes and namespaces that address typical programming tasks. The Framework is large, and transform from a self-contained programming language like VB6; the Framework demand a shift in thinking about programming. The component is a set of functions that address many of the most popular operations need to implement in applications. Every time need to execute a task, such as playing back a sound or writing or reading from a file.

4.2. Working Environment

4.2.1. Programming Language (VB-DOT-NET)

The integrated development environment (IDE) is needed to create, run and debug VB-DOT-Net programs or applications. The VB.Net IDE contains a collection of Graphical User Interfaces (GUIs) and components. It specifies all of value types, recognized as System types, such as Integer, Byte, Long, and String. It gives complex structure classes such as HashTable and Collection. The runtime is the foundation; it included the basic services on which all DOT-NET applications rely on: thread management, code execution, code security, and memory management.

The DOT-NET Framework is a developed version of the Visual Basic 6. The counterparts of the DOT-NET Framework class library in Visual Basic 6 includes the Collection object, the Visual Basic forms package, and global objects such as Printer, App, Screen, and the Clipboard. The main variance between the two

environments is that the Visual Basic 6 environment is closed. that means none of the intrinsic Visual Basic kinds, such as an App, Collection, Screen, and so on, can be shared with environments of other languages, such as C++. Microsoft Visual C++ is largely a self-contained language environment that provides its own class, libraries, and runtime.

4.2.2.Operating System (Windows 7)

Windows 7 is the operating system of a personal computer; it developed by Microsoft.

4.2.3.GSM modem

GSM Modem (Huawei modem) is modem locked to a particular network; only it can be used with more network providers SIM by unlocking code. Zain network also launched a modem Huawei E188 3G USB and like other network modems used to connect to the internet, But in this project in addition to this usage, it also used to open the port of the PC-computer by the VB.NET program and read the message may be coming to the SIM card exist in the modem.

4.3. Test and Results

The output of the implementation system is shown in figure (4-1). That window is called main window; it consist the selected messages to be read, customer who must receives the voice message and three icons for reads message, dialing and end the voice call that responsible of the arrived the intended message. All customers subscribe in the service record in the list of customers. The first steps is a refresh a list of customers, and chooses one customer of this list and make calls to this customer, read a message in the main window after his reply to the call, that call is done by using Skype application.

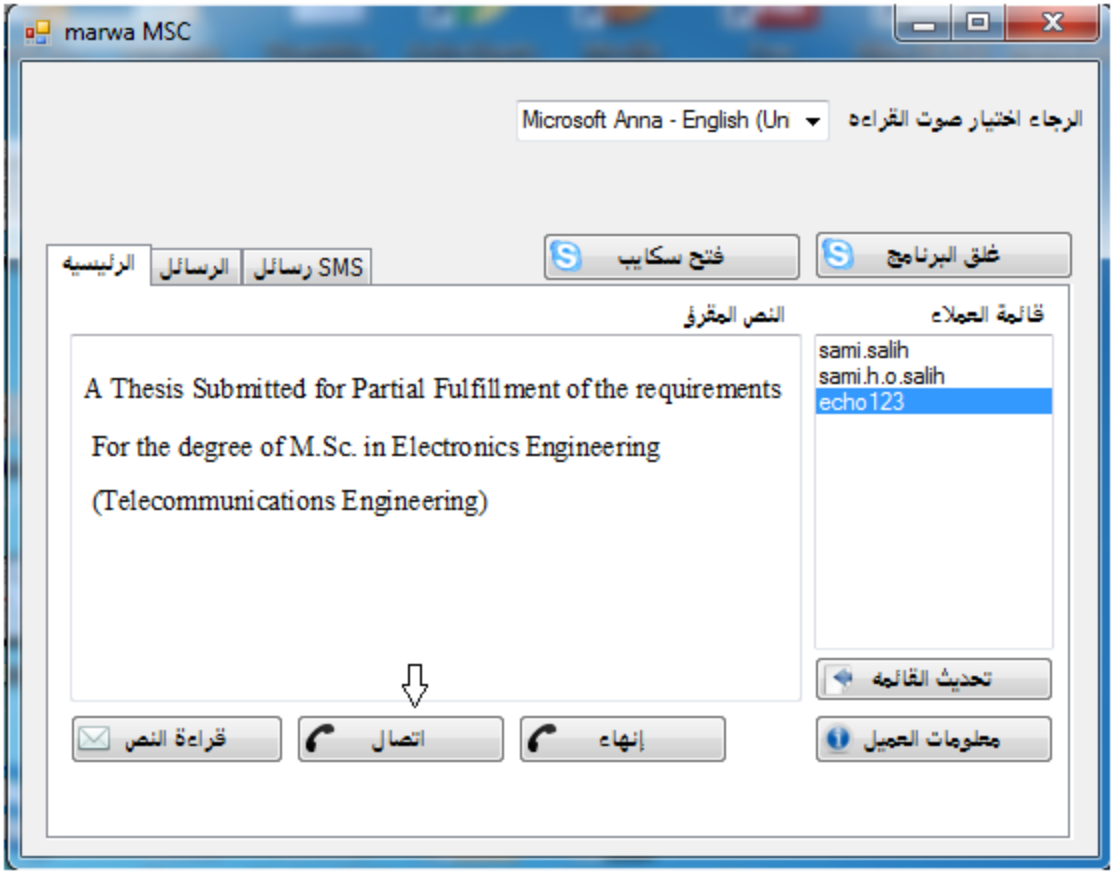

Figure 4-1: TTS GUI

4.4. Evaluating TTS system

TTS System testing is significant phase in software development. Testing & Evaluation of TTS system will be useful until the quality of synthetic speech becomes comparable to human voice; today most of the speech synthesis systems available have deformations. In order to appreciate the system output, appropriate quality estimate techniques should be adopted for defining the system performance in comparison with the quality of other versions.

4.4.1. DRT: diagnostic rhyme tests

The Diagnostic Rhyme Test is one of Speech Intelligibility Testing Methods. It uses a set of isolated words to test for consonant intelligibility in initial position. The test consist more word pairs (about hundred words) which differ by a single acoustic feature in the initial consonant. The listener hears one word at the time and marks to the answering sheet which one of the two words he thinks is correct. Finally, the results are summarized by averaging the error rates from answer sheets. Usually, only a total error rate percentage is given, but also single consonants and how they are confused with each other can be investigated with confusion matrices.

Outcome from the DRT can be estimated in a set of ways, from merely looking at the number of proper responses, to analyzing distraction between personal phonetic features. This is useful as it gives not only an overall effect of intelligibility, but can also identify areas where distractions occur.

4.4.2. Semantically Unpredictable Sentences (SUS) Test

A free answer test evaluating intelligibility at word level is called Semantically Unpredictable Sentences (SUS) test. In this test uses sentence which are syntactically normal, but semantically abnormal. That is, the sentences use the right class of the word but which may not have meaning in context. For example, "he ate the car". Presented Listeners with the sentence and asked them to write down what they heard. It allows generating large numbers of words with a variety of sentence structures; a computer is used to randomly generate sentences. The test Results consist of a percentage of correctly identified sentences, both as a percentage of the full set and as a percentage for each sentence structure.

The figure below shows the relation between the number of words in the one call and the number of words heard in each cell (CL= Call Listener), Y-axis represents the number of words used on each call and X-axis represent the listeners to the calls, example: the number of words in the first call is four words; listener number 1 heard all the words in this call; listener number 2 heard 3 words in this call; listener number 3 heard all the words in this call

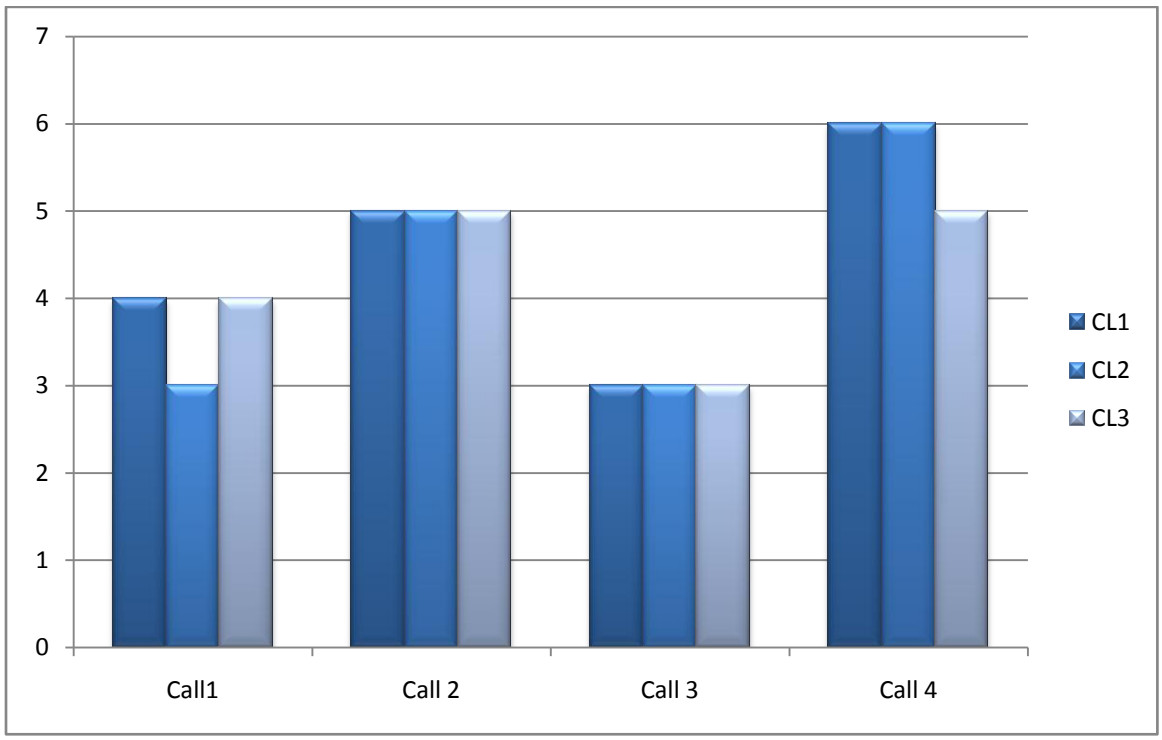

Figure (4-2): show Semantically Unpredictable Sentences

4.4.3. The Mean Opinion Score (MOS) Test

The Mean Opinion Score (MOS) is probably the most widely used and simplest method to evaluate speech quality in general. It is also suitable for overall evaluation of intelligibility of a speech synthesis to the TTS system. MOS gives a numerical indication of the quality of the synthesized speech. MOS is the arithmetic mean of the scores given by all the evaluators. MOS is a five level scale

from bad (1) to excellent (5) and it is also known as ACR (Absolute Category Rating).

Chapter Five

Conclusion and Recommendations for Future work

5. Conclusion and Recommendations for Future work

5.1. Conclusion

Recently the unlimited text for text-to-speech is still away from the normal human voice. There are some obstacles such as pronunciation where text-to-speech, text-to-speech systems still estimated adequately human speech and language efficiency.

In this Research implement a system that convert text-to-speech by using some applications of the phone such as the application of online VOIP like Skype to get a good reader as much as possible for their messages of various types with little cost that everyone can get this service and take utility of them. This implementation is done by using VB.NET programming language with Skype application.

Also in this research, evaluate the TTS system by using different methods, these methods are examples. There are others different methods to evaluate the TTS system to the development of a synthetic voice product. Each method is useful in its own way, and it is important to consider the purpose of the evaluation when choosing which evaluation method to use.

Future developments will depend on improvements from normal language understanding and more normal-sounding speech quality.

The main disadvantage of synthesis technique is required of the huge database. Some techniques are used to gain the best sound at the output for many languages, but the principles are different when the languages are different. The database will be created contents and the texts. The text will be compared with the database entered and entered the particular file will be played according to the database.

5.2. Recommendations for Future work

There are some recommendations to researcher who may wish to continue with this idea that is to add anthers features such as Add more languages to the TTS software, especially Arabic language, Add more voice options (ex: one for men and another for women) and Improve the voice quality.

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Appendixes

Appendix A

Complete System Screen Shot:

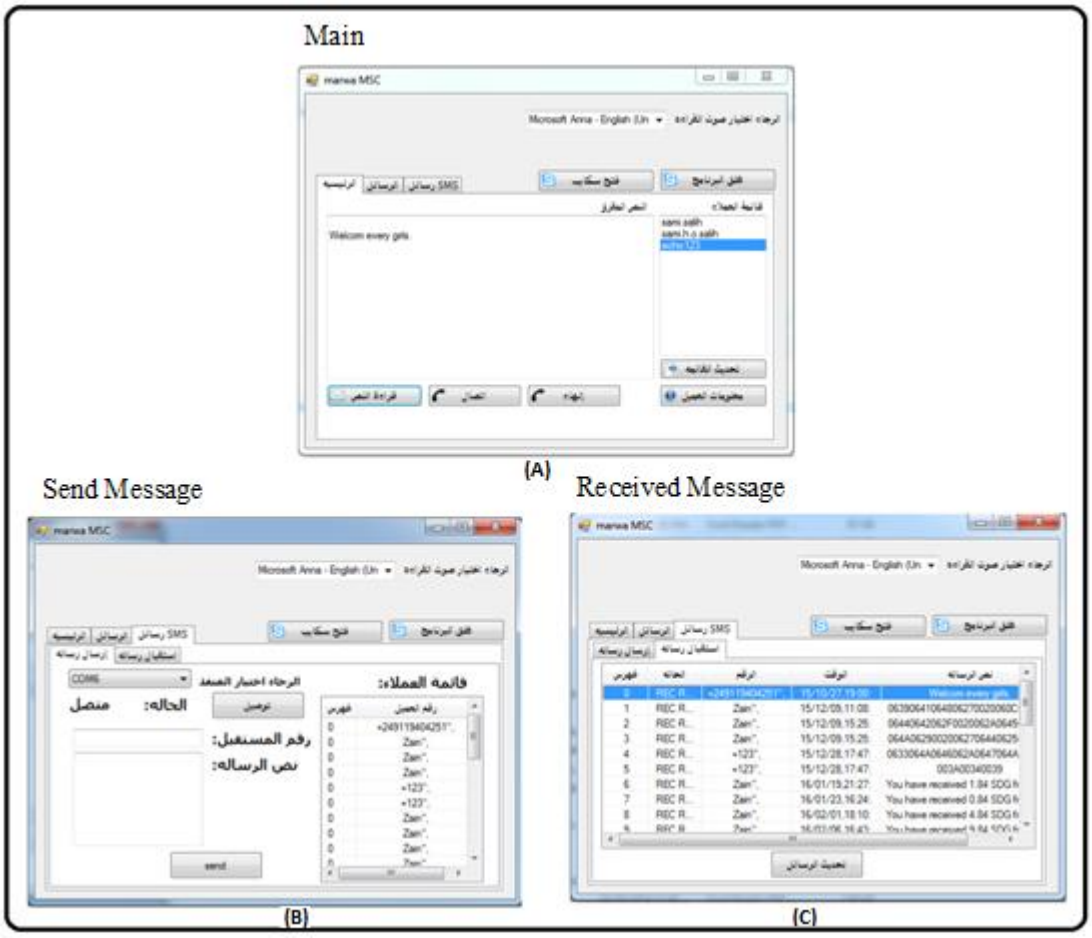

Figure 6-1: Screens Shot of System Steps

There are three screens after implementation the system as in figure 6-1:

Send message (A) is the first screen appearing contains available ports on the modem to choose the specific port and make connection.

when the device connected to the specific port, then clicked on the reception message (C) and Chooses read messages after make refreshes for inbox message saved in a SIM card, after that specify a message to read it, when we choose a certain message then copy this message to the main window by default, in the main window refreshes the list of the customers

or receivers and choose specific number for demanded receiver and make call by using Skype application, after the receiver reply reads the intended message.

Appendix B

TTS VB.NET Code

```
Imports SKYPE4COMLib
Imports System.IO
Imports System.Management
Imports System.Threading
Imports System
Imports System.IO.Ports
Imports System.Text.RegularExpressions
Public Class Form1
    Dim rcvdata As String = ""
    Public WithEvents refSkype As New SKYPE4COMLib.Skype
    Dim PressedEnd As Boolean = False
    Public Sub oSkype_CallStatus(ByVal pCall As SKYPE4COMLib.Call,
ByVal Status As SKYPE4COMLib.TCallStatus) Handles refSkype.CallStatus
        If Status = SKYPE4COMLib.TCallStatus.clsEarlyMedia AndAlso
PressedEnd = True Then
            PressedEnd = False
            pCall.Finish()
        End If
    End Sub
    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
        Try
            Dim ports As String() = SerialPort.GetPortNames
            Dim port As String
            For Each port In ports
                ComboBox1.Items.Add(port)
            Next port
        Catch ex As Exception
            MsgBox(ex.Message)
        End Try
```

```
        ComboBox1.SelectedItem = 2
        'TODO: This line of code loads data into the 'Database1DataSet.Table1' table. You can move, or remove it, as needed
        If File.Exists("C:\Program Files (x86)\Skype\Phone\Skype.exe") = True Then
            Process.Start("C:\Program Files (x86)\Skype\Phone\Skype.exe")
        ElseIf File.Exists("C:\Program Files\Skype\Phone\Skype.exe") = True Then
            Process.Start("C:\Program Files\Skype\Phone\Skype.exe")
        Else : MessageBox.Show("خطأ" , "الرجاء التأكد من تثبت البرنامج", MessageBoxButtons.OK, MessageBoxIcon.Error)
            End
        End If
        Dim x As New SpeechLib.SpVoice
        Dim arrVoices As SpeechLib.ISpeechObjectTokens = x.GetVoices
        Dim arrLst As New ArrayList
        For i As Integer = 0 To arrVoices.Count - 1
            arrLst.Add(arrVoices.Item(i).GetDescription)
        Next
        cmbVoices.DataSource = arrLst
    End Sub
    Private Sub TabControl_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles TabControl1.SelectedIndexChanged
        If TabControl1.SelectedTab Is TabPage1 Then
            TextBox2.Text = TextBox1.Text
        ElseIf TabControl1.SelectedTab Is TabPage2 Then
            TextBox1.Text = TextBox2.Text
        End If
    End Sub
    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
    End Sub
    Private Sub Button2_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
```

```
    End Sub
    ' Private Sub SerialPort1_DataReceived(ByVal sender As Object, ByVal e As
System.IO.Ports.SerialDataReceivedEventArgs)                    Handles
SerialPort1.DataReceived
    ' Dim datain As String = ""
    ' Dim numbytes As Integer = SerialPort1.ReadExisting
    ' For i As Integer = 1 To numbytes
    '     datain &= Chr(SerialPort1.ReadChar)
    '  Next
    '  test(datain)
    '  End Sub
    ' Private Sub test(ByVal indata As String)
    '    rcvdata &= indata
    ' End Sub
    Private Sub Button1_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    End Sub
    Private Sub Button3_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button3.Click
        For i As Integer = 0 To refSkype.HardwiredGroups.Count - 1
            If refSkype.HardwiredGroups(i + 1).Type = TGroupType.grpAllFriends
Then
                For j As Integer = refSkype.HardwiredGroups(i + 1).Users.Count To 1
Step -1
ListBox1.Items.Add(refSkype.HardwiredGroups(i        +        1).Users(j).Handle)
ListBox2.Items.Add(refSkype.HardwiredGroups(i + 1).Users(j).Handle)
                Next
                Exit For
            End If
        Next
    End Sub
    Private Sub Button4_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button4.Click
        Dim oVoice As New SpeechLib.SpVoice
        Dim cpFileStream As New SpeechLib.SpFileStream
```

```
        oVoice.Voice = oVoice.GetVoices.Item(cmbVoices.SelectedIndex)
        oVoice.Speak(TextBox2.Text,
SpeechLib.SpeechVoiceSpeakFlags.SVSFDefault)
        oVoice = Nothing
    End Sub
    Private Sub Button5_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    End Sub
    Private Sub Button2_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        TextBox1.Text = "Enter message here..."
    End Sub

    Private Sub Button5_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button5.Click
        Dim nLi As Integer = ListBox1.SelectedItems.Count
        If refSkype.ActiveCalls.Count > 0 Then
            MsgBox("You are currently in a call!", MessageBoxButtons.OK,
MessageBoxIcon.Error)
        ElseIf nLi = 1 Then
            refSkype.PlaceCall(ListBox1.SelectedItem)
        Else
            MessageBox.Show("الرجاء اختيار عميل من القائمه!", "خطأ اختيار العميل",
MessageBoxButtons.OK, MessageBoxIcon.Error)
        End If
    End Sub
    Private Sub Button6_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        TextBox1.Text = Clipboard.GetText()
    End Sub
    Private Sub Button7_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button7.Click
        Dim nLi As Integer = ListBox1.SelectedItems.Count
        If nLi = 1 Then
            MessageBox.Show("اسم المستخدم: " +
```

```
refSkype.User(ListBox1.SelectedItem).FullName & vbNewLine & "الدوله: " +
refSkype.User(ListBox1.SelectedItem).Country & vbNewLine & "اخر ظهور: " +
refSkype.User(ListBox1.SelectedItem).LastOnline & vbNewLine & "الرساله: " +
refSkype.User(ListBox1.SelectedItem).MoodText)
    Else
      MessageBox.Show("الرجاء اختيار عميل من القائمه!", "خطأ اختيار العميل",
MessageBoxButtons.OK, MessageBoxIcon.Error)
    End If
  End Sub
  Private Sub TabControl1_SelectedIndexChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
TabControl1.SelectedIndexChanged
  End Sub
  Private Sub Button1_Click_2(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    Dim skype As Object
    On Error Resume Next
    skype = CreateObject("skype4COM.skype", "")
    skype.Client.Start()
    skype.Attach()
    For Each User In skype.Friends
      skype.SendMessage(User.Handle, TextBox1.Text)
    Next
  End Sub
  Private Sub Button9_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button9.Click
    Dim pProcess() As Process =
System.Diagnostics.Process.GetProcessesByName("skype")
    For Each p As Process In pProcess
      p.Kill()
    Next
  End Sub
  Private Sub Button10_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
  End Sub
```

```
    Private Sub Button8_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        MessageBox.Show("This feature is not available yet!", "Sorry.",
MessageBoxButtons.OK, MessageBoxIcon.Information)
    End Sub
    Private Sub Button10_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button10.Click
        If File.Exists("C:\Program Files (x86)\Skype\Phone\Skype.exe") = True
Then
            Process.Start("C:\Program Files (x86)\Skype\Phone\Skype.exe")
        ElseIf File.Exists("C:\Program Files\Skype\Phone\Skype.exe") = True
Then
            Process.Start("C:\Program Files\Skype\Phone\Skype.exe")
        Else : MessageBox.Show("برنامج سكايب غير موجود الرجاء تشغيل البرنامج  يدوياً !", "Error", MessageBoxButtons.OK, MessageBoxIcon.Error)
            End
        End If
    End Sub
    Private Sub Label6_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    End Sub
    Private Sub LinkLabel1_LinkClicked(ByVal sender As System.Object,
ByVal e As System.Windows.Forms.LinkLabelLinkClickedEventArgs)
    End Sub
    Private Sub Button11_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button11.Click
        PressedEnd = True
    End Sub
    Private Sub Button12_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        TextBox1.Text = TextBox2.Text
    End Sub
    Private Sub Button6_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button6.Click
        Me.Cursor = Cursors.WaitCursor
```

```
        If SaveFileDialog1.ShowDialog = Windows.Forms.DialogResult.OK Then
            Dim oVoice As New SpeechLib.SpVoice
            Dim cpFileStream As New SpeechLib.SpFileStream
           cpFileStream.Open(SaveFileDialog1.FileName,
SpeechLib.SpeechStreamFileMode.SSFMCreateForWrite, False)
           oVoice.AudioOutputStream = cpFileStream
            oVoice.Speak(TextBox1.Text,
SpeechLib.SpeechVoiceSpeakFlags.SVSFDefault)
            oVoice = Nothing
            cpFileStream.Close()
            cpFileStream = Nothing
        End If
        Me.Cursor = Cursors.Arrow
    End Sub
    Private Sub Button8_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button8.Click
        Dim nLi As Integer = ListBox2.SelectedItems.Count
        If refSkype.ActiveCalls.Count > 0 Then
            MsgBox("الرجاء الانتظار البرنامج يقوم بارسال رسائل الان!",
MessageBoxButtons.OK, MessageBoxIcon.Error)
        ElseIf nLi = 1 Then
          refSkype.SendMessage(ListBox2.SelectedItem, TextBox1.Text)
        Else
            MessageBox.Show("الرجاء اختيار عميل من القائمه!", "خطأ اختيار العميل",
MessageBoxButtons.OK, MessageBoxIcon.Error)
        End If
    End Sub
    Private Sub Button2_Click_2(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button2.Click
        Dim nLi As Integer = ListBox1.SelectedItems.Count
        If nLi = 1 Then
            MessageBox.Show("اسم المستخدم: " +
refSkype.User(ListBox1.SelectedItem).FullName & vbNewLine & "الدوله: " +
refSkype.User(ListBox1.SelectedItem).Country & vbNewLine & "اخر ظهور: " +
refSkype.User(ListBox1.SelectedItem).LastOnline & vbNewLine & "الرساله: " +
```

```
refSkype.User(ListBox1.SelectedItem).MoodText)
      Else
        MessageBox.Show("الرجاء اختيار عميل من القائمه!", "خطأ اختيار العميل",
MessageBoxButtons.OK, MessageBoxIcon.Error)
      End If
   End Sub
   Private Sub Button1_Click_3(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button1.Click
   End Sub
   Private Sub Table1BindingSource_CurrentChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs)
   End Sub
   Private Sub Button15_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
   End Sub
   Public Function ModemsConnected() As String
      Dim modems As String = ""
      Try
        Dim searcher As New ManagementObjectSearcher( _
          "root\CIMV2", _
          "SELECT * FROM Win32_POTSModem")
        For Each queryObj As ManagementObject In searcher.Get()
          If queryObj("Status") = "OK" Then
            modems = modems & (queryObj("AttachedTo") & " - " &
queryObj("Description") & "***")
          End If
        Next
      Catch err As ManagementException
        MessageBox.Show("An error occurred while querying for WMI data: "
& err.Message)
        Return ""
      End Try
      Return modems
   End Function
   Private Sub Button13_Click(ByVal sender As System.Object, ByVal e As
```

```
System.EventArgs)
        Try
            With SerialPort1
                .PortName = Label8.Text
                .BaudRate = 9600
                .Parity = IO.Ports.Parity.None
                .DataBits = 8
                .StopBits = IO.Ports.StopBits.One
                .Handshake = IO.Ports.Handshake.None
                .RtsEnable = True
                .ReceivedBytesThreshold = 1
                .NewLine = vbCr
                .ReadTimeout = 1000
                .Open()
            End With
            If SerialPort1.IsOpen Then
                Label8.Text = "متصل"
            End If
        Catch ex As Exception
            MsgBox(ex.Message)
        End Try
    End Sub
    Private Sub Button14_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
        For Each sp As String In My.Computer.Ports.SerialPortNames
            ComboBox1.Items.Add(sp)
        Next
    End Sub
    Private Sub ComboBox1_SelectedIndexChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs)
    End Sub
    Private Sub ComboBox1_SelectedValueChanged(ByVal sender As Object,
ByVal e As System.EventArgs)
        SerialPort1.Close()
        Label8.Visible = True
```

```
        Label8.Text = Trim(Mid(ComboBox1.Text, 1, 5))
    End Sub
    Private Sub Button15_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    End Sub
    Private Sub Button14_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button14.Click
        If SerialPort1.IsOpen Then
            SerialPort1.Close()
        End If
        Try
            With SerialPort1
                .PortName = ComboBox1.Text
                .BaudRate = 9600
                .Parity = Parity.None
                .DataBits = 8
                .StopBits = IO.Ports.StopBits.One
                .Handshake = IO.Ports.Handshake.RequestToSend
                .DtrEnable = True
                .RtsEnable = True
                .NewLine = vbCrLf
                .Open()
            End With
            If SerialPort1.IsOpen Then
                Label8.Text = "متصل"
                Label8.TextAlign = ContentAlignment.BottomRight
            End If
        Catch ex As Exception
            MsgBox(ex.Message)
        End Try
    End Sub
    Private Sub Button13_Click_1(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button13.Click
        If TextBox4.Text = "" Then
            MsgBox("الرجاء ادخال رقم المرسل")
```

```
        ElseIf TextBox3.Text = "" Then
            MsgBox("الرجاء ادخال نص الرساله")
        Else
            Try
                If SerialPort1.IsOpen Then
                    With SerialPort1
                        ' .Encoding.GetEncoding(
                        .Write("AT" & vbCrLf)
                        .Write("AT+CMGF=1" & vbCrLf)
                        .Write("AT+CSCS=UCS2" & vbCrLf)
                        .Write("AT+CMGS=" & Chr(34) & TextBox4.Text & Chr(34) &
vbCrLf)
                        .Write(TextBox3.Text & Chr(26))
                        MsgBox("تم ارسال الرساله")
                    End With
                Else
                    MsgBox("الرجاء التأكد من توصيل المودم")
                End If
            Catch ex As Exception
                MsgBox(ex.Message)
            End Try
        End If
    End Sub
    Private Sub Button15_Click_2(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button15.Click
        ListView1.Items.Clear()
        Try
            SerialPort1.WriteLine("AT" & vbCrLf) 'is modem okay?
            SerialPort1.WriteLine("AT+CMGF=1" & vbCrLf) 'To format SMS as a
TEXT message
            SerialPort1.WriteLine("AT+CPMS=""SM""" & vbCrLf) ' Select SIM
storage
            SerialPort1.WriteLine("AT+CMGL=""REC UNREAD""" & vbCrLf)
'read unread messages
            SerialPort1.WriteLine("AT+CMGL=""ALL""" & vbCrLf) 'print all
```

```
message
            readmsg()
            Button15.Text = "تحديث الرسائل"
            'MsgBox(rcvdata.ToString)
        Catch ex As Exception
            MsgBox(ex.Message)
        End Try
    End Sub
    Private Sub readmsg()
        Try
            Dim Lineoftext As String
            Dim i As Integer
            Dim arytextfile() As String
            Lineoftext = SerialPort1.ReadExisting
            arytextfile = Split(Lineoftext, "+CMGL", , CompareMethod.Text)
            For i = 1 To UBound(arytextfile)
                Dim input As String = arytextfile(i)
                Dim result() As String
                Dim pattern As String = "(:)|(,"")|("","")("")"
                result = Regex.Split(input, pattern)
                Dim concat() As String
                With ListView1.Items.Add(0)
                    'for index
                    .SubItems.AddRange(New String() {result(2)})
                    'for Status
                    .SubItems.AddRange(New String() {result(4)})
                    'for Number
                    .SubItems.AddRange(New String() {result(6)})
                    'for date and Time
                    concat = New String() {result(8) & result(9) & result(10) &
result(11)}
                    .SubItems.AddRange(concat)
                    'for Message
                    ' Dim lineoftexts As String
                    ' Dim arytextfiles() As String
```

```
                ' lineoftexts = arytextfile(i)
                ' arytextfiles = Split(lineoftexts, "+32", , CompareMethod.Text)
                ' .SubItems.Add(arytextfiles(i))
                .SubItems.AddRange(New String() {result(12).Remove(0, 6)})
            End With
            With ListView2.Items.Add(0)
                .SubItems.AddRange(New String() {result(6)})
                'for date and Time
            End With
        Next
    Catch ex As Exception
    End Try
  End Sub
  Private Sub ListView1_MouseClick(ByVal sender As Object, ByVal e As
System.Windows.Forms.MouseEventArgs) Handles ListView1.MouseClick
    TextBox1.Text = ListView1.SelectedItems.Item(0).SubItems(5).Text
  End Sub
  Private Sub ListView1_SelectedIndexChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
ListView1.SelectedIndexChanged
  End Sub
  Private Sub TabPage4_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles TabPage4.Click
  End Sub
  Private Sub ListView2_MouseClick(ByVal sender As Object, ByVal e As
System.Windows.Forms.MouseEventArgs) Handles ListView2.MouseClick
    TextBox4.Text = ListView2.SelectedItems.Item(0).SubItems(1).Text
    TextBox4.Text = TextBox4.Text.Substring(0, TextBox4.Text.Length - 2)
  End Sub
End Class
```