

Modified Text to Public Announcement System

Rahul Raveendran, Nikhil C M, Sameer K K, Prabheesh A , Shijulal M B, Lekshmi A Kurup

Abstract—in this paper we are giving brief outline of improving the transmission of information from user to destination. This system is an interesting solution to avoid the difficulty to convey the messages by user to the various destinations. It is an approach which helps the user to convey messages or important information to a particular person without any time delay. The text messages from the principal are transmitted through a transmitter and is received by the receiver. A micro controller at the receiver end converts the incoming text messages to audio signal. The message from the user is provided as voice message through the loud speaker installed in proper destinations. The corresponding response for the message can send back from destination to user end using a matrix keypad. It can be implemented at institutional level.

Index Terms— ATMEGA328/P, RF Data Modem, RS-232, Serial Data Communication, Text to Speech Synthesis, UART Protocol, Visual Basic

1 INTRODUCTION

Modified text to public announcement system is concerned with transmitting and receiving messages from user end to destination end. It involves both software requirements and hardware requirements. It is very difficult to convey the messages and information directly from the user to different destination separately. It is not easy to circulate notices to entire destination by one man. The one who assigned the job can make mistakes due to misunderstanding or sometimes he will not be free at the needed time. This will leads to the wastage of time. Thus, focusing on the solutions to this problem and improving the performance of the existing system is one of the ambitious aims of Modified Text to Public Announcement System (MTPAS).

This system deals with the recent wireless communication trends. A universal asynchronous receiver/transmitter (UART) is a computer hardware device that translates data between parallel and serial forms. A UART is usually an individual part of an integrated circuit used for serial communications over a computer or peripheral device serial port. Here an embedded system is created to do the task.

In MTPAS the text messages from the user is transferred into voice signals and is provided to particular destination. Here the user provides the message to be conveyed as text through his PC. This message is transmitted and received in receiver end (destination). The loud speaker present at the receiver end will output the text as audio signal. By this system the user can convey information as fast as possible and it helps to reduce the wastage of time. The destination end can also send acknowledgement and pre-stored data to user side wirelessly.

2 COMMUNICATION PROTOCOLS

2.1 UART Protocol

In telecommunications, a communication protocol is a system of rules that allow two or more entities of a communication system to transmit information via any kind of variation of a physical quantity. These are the rules or standard that defines the syntax, semantics and synchronization of communication and possible error recovery methods. Protocols may be implemented by hardware, software or a combination of both.

Data communication is one of the most challenging fields today as far as technology development is concerned. Data, essentially meaning information coded in digital form, that is, 0s and 1s is needed to be sent from one point to the other either directly or through a network. The requirement above finally paves the way for some Data Communication Standards [1]. There are two major classification of communication strategies, namely serial and parallel.

The UART performs serial-to-parallel conversions on data received from a peripheral device and parallel-to-serial conversion on data received from the Central Processing Unit (CPU). The CPU can read the UART status at any time. The UART includes control capability and a processor interrupt system that can be tailored to minimize software management of the communications link. The UART includes a programmable baud generator capable of dividing the UART input clock by divisors from 1 to 65535 and producing a 16× reference clock or a 13× reference clock for the internal transmitter and receiver logic. It converts parallel (8bit) data to serial and vice versa.

There are two ways of design and development of communication protocols

- Informal methods
- Formal methods

Informal way of specification of the protocols include textual description. It is not suitable for large complex protocols and it often leads unclear and ambiguous specifications.

- Rahul Raveendran, Nikhil C M, Sameer K K, Prabheesh A, Shijulal M B is currently pursuing bachelor's degree program in electronics and communication engineering at Royal College of Engineering & Technology under Calicut University, India, PH-09567141561. E-mail: rahulraveendran15@gmail.com
- Lekshmi A Kurup is currently working as assistant professor in electronics and communication engineering department in Royal College of Engineering & Technology under Calicut University, India, PH-09447783167. E-mail: lekshmiwineeth21@gmail.com

Formal methods use formal specification languages and these protocols must be of high quality with higher performance with low cost.

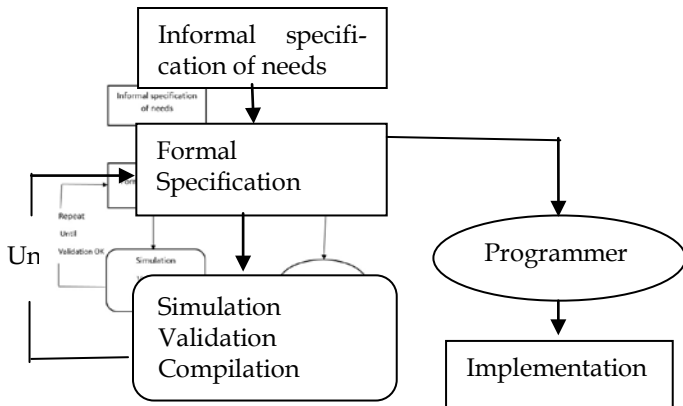


Fig.1 Formal Specifications

2.2 Need for Protocol Engineering

- If the protocols are not properly designed and implemented as per the requirements, leads to improper behavior of network and system may jam the networks.
- Hence it is required to engineer the protocols for their correctness reliability, optimized performance, reusability and code optimization.
- Deals with application of formal techniques and software engineering methodologies to protocol design and implementation.

2.3 Functions of protocol

- Service specification: The service required for performing certain tasks in any given environment.
- Synthesis: It is an automated tool to generate the formal specification of a protocol.
- Protocol specification: It looks into syntax and semantics of the protocols specifications.
- Protocol verification/validation: User makes about the structure of possible dialogues between processes of protocol.
- Performance analysis: It analyses the protocol performance in terms of message complexity, time complexity, space complexity and scalability.
- Conference testing: It tests whether the protocol confirms to the specifications laid down in protocol specification phase by generating exhaustive set of test sequences.
- Protocol implementation: It deals with the real coding of the protocol using software engineering aspects.
- Monitoring/diagnosis: It monitors the working of the implemented protocols and checks for the errors

2.4 Serial Data communication

Serial data communication strategies and standards are used in situations having a limitation of the number of lines that can be spared for communication. This is the primary mode of

transfer in long distance communication. But it is also the situation in embedded systems where various subsystems share the communication channel and the speed is not a critical issue.

Serial data communication is the most common low level protocol for communicating between two or more devices. Normally one device is a computer, while the other device can be a modem, a printer, another computer or a scientific instrument such as an oscilloscope or a function generator.

As the name suggests the serial port sends and receives bytes of information, rather characters (used in other modes of communication), in a serial fashion one bit at a time. These bytes are transmitted using either a binary format or text format. The most common serial communication system protocols are asynchronous, synchronous and bit-synchronous communication standards.

The asynchronous communication and its standards includes the bits of information to be transmitted between two devices at an arbitrary point of time and it defines the data or character is sent as frames. The start of a frame is identified according to a start bit and a stop bit identifies the end of data frame. Both the transmitter and receiver need to communicate at an agreed upon data rate (baud rate) such as 19200 KB/s or 115200 KB/s.

2.5 Interface Specifications for Serial Data Communication

The serial port interface for connecting two devices is specified by the Telecommunications Industry Association (TIA) /EIA-232C (Electronic Industries Alliance) standard published by the TIA, both the physical and electrical characteristics of the interfaces.

RS-232, RS-422, RS-423 and RS-485 are each recommended standard (RS-XXX) of the EIA for asynchronous serial communication. Some of the more advanced standards for serial communication like the USB and the FIREWIRE are being popularized these days to fill the gap for high speed, relatively short run, and heavy data handling applications but still the above four satisfy the needs of all those high speed and longer run applications [12] found most often in industrial settings for plant-wide security and equipment networking.

RS-232, 423,422 and 485 specify the communication system characteristics of the hardware such as voltage levels, terminating resistances, cable lengths etc. The standards however say nothing about the software protocol and how data is framed, addressed, checked for errors or interpreted.

3 TEXT TO SPEECH

3.1 Text to Speech Synthesizer

A text to speech synthesizer (TTS) is a computer based system that can read text aloud automatically, regardless of whether the text is introduced by a computer input stream or a scanned input. A speech synthesizer can be implemented both hardware and software. Speech is often based on concatenation of natural speech that are taken [7] from natural speech put together to form a word or sentence. Rhythm is an important factor that makes the synthesized speech of a TTS system more natural and understandable. Many TTS systems are

developed on the principle corpus-based speech synthesis. It is very popular for its high quality and natural speech output.

The TTS system comprises of 5 fundamental components

1. Text analysis and detection
2. Text normalization and linearization
3. Phonetic analysis
4. Prosodic modeling and intonation
5. Acoustic processing

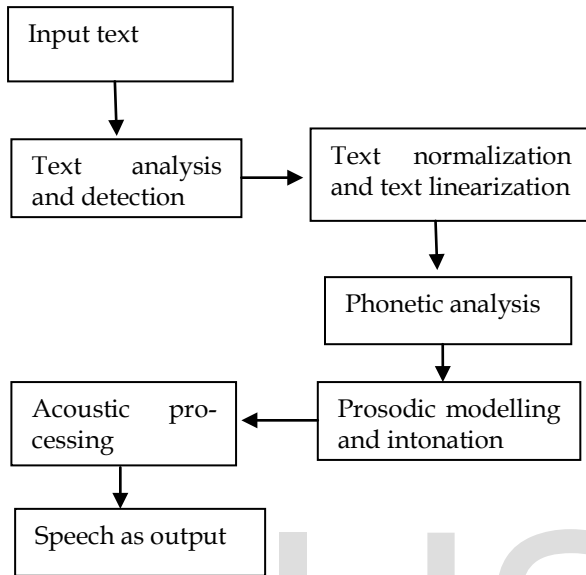


Fig.2 System overview of TTS

1. Text analysis and detection: The Text Analysis part is preprocessing part which analyse the input text and organize into manageable list of words. It consists of numbers, abbreviations, acronyms and idiomatics and transforms them into full text when needed. An important problem is encountered as soon as the character level: that of punctuation ambiguity (sentence end detection). It can be solved, to some extent, with elementary regular grammars.
2. Text normalization and linearization: Text Normalization is the transformation of text to pronounceable form. Text normalization is often performed before text is processed in some way, such as generating synthesized speech or automated language translation. The main objective of this process is to identify punctuation marks and pauses between words. Usually the text normalization process is done for converting all letters of lowercase or upper case, to remove punctuations, accent marks, stopwords or "too common words" and other diacritics from letters.
3. Phonetic analysis: Phonetic Analysis converts the orthographical symbols into phonological ones using a phonetic alphabet. Basically known as "grapheme-to-phoneme" conversion. Phone is a sound that has definite shape as a sound wave. Phone is the smallest sound unit. A collection of phones that constitute minimal distinctive phonetic units are called Phoneme. Number of phonemes is relatively smaller than the graphemes, only 44.

4. Prosodic modelling and intonation: The concept of prosody is the combination of stress pattern, rhythm and intonation in a speech. The prosodic modeling describes the speaker's emotion. Recent investigations suggest the identification of the vocal features which signal emotional content may help to create a very natural [9] synthesized speech.

5. Acoustic processing: The speech will be spoken according to the voice characteristics of a person, There are three type of Acoustic synthesizing available [5] (i) Concatenative Synthesis (ii) Formant Synthesis (iii) Articulatory Synthesis

(i) Concatenative synthesis: The concatenation of prerecorded human voice is called Concatenative synthesis, in this process a database is needed having all the prerecorded words. The natural sounding speech is the main advantage and the main drawback is the using and developing of large database.

(ii) Formant synthesis: Formant-synthesized speech can be constantly intelligible. It does not have any database of speech samples. So the speech is artificial and robotic.

(iii) Speech organs are called Articulators. In this articulatory synthesis techniques for synthesizing speech based on models of the human vocal tract are to be developed. It produces a complete synthetic output, typically based on mathematical models.

4 PROPOSED SYSTEM

4.1 MTPAS Architecture

In this paper we are proposing an announcement system in which both hardware and software is essential. This system is basically an embedded system in which the embedded part is placed in the destination area and the software section and PC is in user area. The user and destination is connected using a wireless modem.

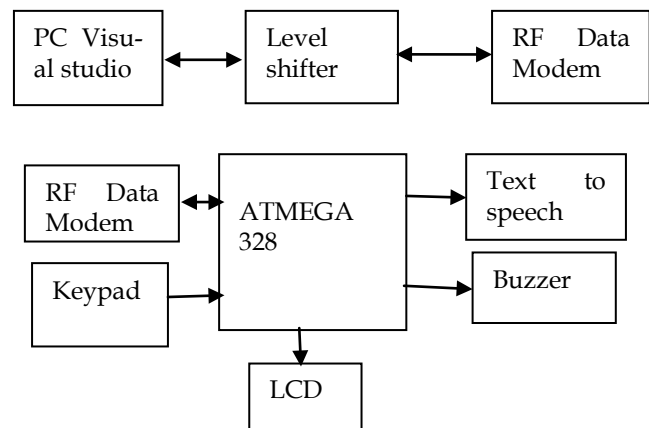


Fig.3 Block Diagram of MTPAS

The ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR Enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. The LCD communicates with the microcontroller using parallel communication of the data 5x8 dots with cursor and 1/16 duty cycle. RF modem can be used for applications that need two way wireless data transmission. It features high data rate and longer transmission distance. The communication protocol is self controlled and completely transparent to user interface. The buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Level shifters convert signals from RS-232 serial port to signals suitable for using TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. It is used in applications where particularly 12V is not available. Matrix keypad uses a combination of four rows and four columns to provide button states to the host device, typically a microcontroller. Underneath each key is a push button with one end connected to one row and the other end connected to one column. In order for the microcontroller to determine which button is pressed, it first needs to pull each of the four columns either low or high one at a time and then poll the states of the four rows. Depending on the states of the columns, the microcontroller can tell which button is pressed.

4.2 Embedded System

This flexible device sitting at the heart of the circuits is none other than a Customized Microprocessor better known as an Embedded Processor and the mobile phone housing a number of functionalities is known as an Embedded System. Thus "A Real Time Embedded System" (RTES) is precisely the union of subsystems to discharge a specific task coherently. Hence forth we call them as RTES. RTES as a generic term may mean a wide variety of systems in the real world. However we will be concerned about them which use programmable devices such as microprocessors or microcontrollers and have specific functions.

In RTES the on-chip or on-board non-volatile memory does keep these programs. These programs are the part of the Real Time Operating System (RTOS) and continually run as long as the gadget is receiving power. A part of the RTOS also executes itself in the stand-by mode while taking a very little power from the battery. This is also called the sleep mode of the system. Both the hardware and software coexist in a coherent manner. Tasks which can be both carried out by software and hardware affect the design process of the system.

Embedded System is pre-programmed to do a specific function while a general purpose system could be used to run any program of your choice. Further, the Embedded Processor is only one component of the electronic system of which it is the part. It is cooperating with the rest of the components to achieve the overall function.

5 SOFTWARE OVERVIEW

5.1 Arduino Overview

Arduino is an open-source single-board microcontroller, descendant of the open-source wiring platform, designed to make the process of using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open hardware design for the Arduino board with an Atmel AVR processor and an on-board I/O support. The software consists of a standard programming language compiler and the boot loader that runs on the board. Arduino hardware is programmed using a wiring-based language (syntax + libraries), similar to C++ with some simplifications and modifications, and a Processing-based IDE. Currently shipping versions can be purchased pre-assembled; hardware design information is available for those who would like to assemble an Arduino by hand.

Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the Lily Pad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external chip programmer. At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a simple inverter circuit to convert between RS-232-level and TTL-level signals. The programming of ATMEGA328 microcontroller is done by using the Arduino IDE environment. The program codes sketched in this software using the C language is burned to the microcontroller. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. The Arduino Uno can be programmed with the Arduino software.

5.2 Visual Basic

VISUAL BASIC is a high level programming language which evolved from the earlier DOS version called BASIC. BASIC means **B**eginners' **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. It is a very easy programming language to learn. The code look a lot like English Language. Different software companies produced different versions of BASIC, such as Microsoft QBASIC, QUICKBASIC, GWBASIC, and IBM BASICA and so on. However, people prefer to use Microsoft Visual Basic today, as it is a well-developed programming language and supporting resources are available everywhere. Now, there are many versions of VB exist in the market, the most popular one and still widely used by many VB programmers is none other than Visual Basic 6. We also have VB.net, VB2005, VB2008 and the latest VB2010. Both Vb2008 and VB2010 are fully object oriented programming (OOP) language.

VISUAL BASIC is a VISUAL and events driven Programming Language. These are the main divergence from the old BASIC. In BASIC, programming is done in a text-only environment and the program is executed sequentially. In VB, programming is done in a graphical environment. In the old

BASIC, you have to write program code for each graphical object you wish to display it on screen, including its position and its color. However, In VB, you just need to drag and drop any graphical object anywhere on the form, and you can change its color any time using the properties windows.

On the other hand, because the user may click on a certain object randomly, so each object has to be programmed independently to be able to response to those actions (events). Therefore, a VB Program is made up of many subprograms, each has its own program code, and each can be executed independently and at the same time each can be linked together in one way or another. Visual Basic is a highly interactive programming language. It has a several features that allow the programmer to develop applications for MS-Windows in an easy and efficient manner. Visual Basic follows the standard syntax of basic, except that some new language features have been added to it to give more flexibility to the programmer. Visual Basic makes use of GUI for creating robust and powerful applications.

6 RESULTS AND DISCUSSION

In this paper we discussed about the communication protocols and recent trends in communication area. Transmitting of information from user end to destination is becoming a main problem in now a days. By increasing the range of the RF modem or using high power modems we can increase the coverage area of the system and can implement it widely. UART consist of TX buffer and RX buffer. The TX buffer helps in transmission of data with the help of transmission enable signal. The transmission enable signal is enabled only when the enable bit toggle.

RS-232 is mainly intended for short cable runs, or local data transfers in a range up to 50 feet maximum, but it must be mentioned here that it also depends on the baud rate. RS-232 capabilities range from the original slow data rate of up to 20 kbps to over 1Mbps for some of the modern applications. Being a single ended system it is more susceptible to induced noise, ground loops and ground shifts, a ground at one end not the same potential as at the other end of the cable.

RS-422 and RS-423 are designed specifically to overcome the distance and speed limitations of RS-232. Although they are similar to the more advanced RS-232C, but can accommodate higher baud rates and longer cable lengths and accommodate multiple receivers.

7 CONCLUSION

In this paper we discussed the communication protocols and text to speech synthesis. As started TTS is divided into two sub problems character recognition and speech. To get best speech synthesis rate the data base of the system should be large. For effective communication the range capabilities of the RF modem have to be large. By implementing this system we can reduce the wastage of time and can provide faster delivery of messages.

8 FUTURE SCOPE

In our work, we deploy RF modems in user end and destination end having range of 30 to 100 m. When more modems are placed in between user end and destination end or by using high range modems we can improve the performance of the system. In case of broadcasting emergency messages this system can be adopted. For efficient delivery with minimum power consumption and less cost this system can be used.

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