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A GSM, Speech Health Monitoring System

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Abstract—*In this rapid pace of life, it is difficult for people to be regularly available for their near ones who might need them while they are suffering from any disease or physical disorder. Also in ICU it is required to monitor constantly the patient's health.The main aim of this project is to design and implement a speech enabled device switching system for physically disabled and mentally handicapped people.The patient can also control the electrical device like a fan, tube light, etc…with the help of speech recognition system. In case of emergency and critical condition patient needs a doctor immediately so for this patient can use speech enabled device with GSM based network and send help message to doctors. This system offers a complete, economical, powerful and user friendly technique of real-time monitoring.*

Keywords*: GSM, Speech Recognition, SMS, ICU, Microcontroller*

1. INTRODUCTION

The proposed system is designed to introduce a healthcare infrastructure that supports human health, safety depending on new emerging technologies. In order to provide better health care in these two new emerging technologies is used. One is a Speech Recognition Technology, and another one is GSM technology. Speech Recognition technology changes the way to interact with our digital world. The main aim of this technology is to provide a way for the humans to interact with computers and other electronic devices by simply speaking. This technology reduces the time of typing or controlling the mouse and keyboard in this simply gives command by speaking. It is very useful for people who have difficulty using their hands, and other stress injuries to involved disabilities that prevent to access conventional computer input devices. This type of method of communication is best suited for those who are totally physical paralyzed from the neck down this make a person totally dependent upon others, but they often feel lonely because they have lost the ability to move most of us take for granted to ability to walk from one room to another, accessing electronic devices (fan, TV, remote facilitates, etc.) [3].

The main objective of the proposed system is to provide intensive care to patients. In case of emergency, in which patient needs help of a doctor this GSM technology is used. The projected system provides mobility to the doctor to a certain level. When the person needs help from a doctor they just speak help and through the GSM technology message is delivered to all doctors. The purpose is to find solutions for the use of remote patient monitoring system [1].

The next section shows a brief overview of the automation system while in the third section the operation of the whole system is discussed in detail. The last section is the conclusion.

2. SYSTEM DESCRIPTION

The main aim of this project is to design and construct a voice, enabled device switching system for physically challenged ICU patients and also alert about the serious condition using GSM modem [8]. In the projected system microcontroller is used so the cost of the projected system will very less. Various communication methods are used in this project.

Communication Methods

Speech: Speech recognition (in many contexts also known as automatic speech recognition, computer speech recognition or erroneously as voice recognition) is the process of converting a speech signal to a sequence of words in the form of digital data, by means of an algorithm implemented as a computer program. All working is performed by the speech recognition engine. The speech recognition engine takes all type data and then translates them into a text or we can say we speak through a microphone and the computer performs action according to that this can be done by the speech recognition engine. The component of speech recognition is grammar, decoder, and acoustic model.

- Grammar is the smallest set of file containing a combination of words.
- The audio from a user is taken by microphone. This audio is translated into waveforms.
- The engine sees the future and different characteristics of sound that is coming from waveforms and matches it with its acoustic model. Acoustic consists representation of different sounds which then makes each word. Decoder works to decode and determine which words in the grammar the audio relate and then return the result.

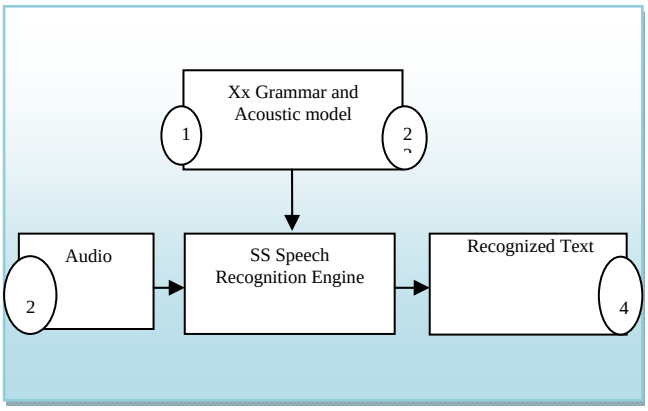

Fig. 1: Process of speech recognition

GSM: In this paper GSM technology is used. GSM is cellular networks that mean mobile phone can be associated to it by searching for cells in the immediate locality. For Serial communication GSM technique has an RS-232 interface with an external peripheral [2].In this HyperTerminal is used through this AT commands are sent to the GSM module. For communication through GSM module AT command is used that are described in table 1.

Table 1: GSM module AT command

Commands	Description
AT+CMGS	Used to send message to phone number
AT+CMGW	Used to store messages
AT+CMGF	Used to set the SMS mode
AT+CMGD	Delete message
AT+CPAS	Phone activity status
AT+CSTA	Select type of address
AT+CSQ	Signal quality
ATD	Dial or call a number
ATB	Communication standard option
ATA	Answer command
ATH	Hang up call

Fig. 2: GSM modem

Microcontroller: Microcontroller performs transmission of commands/feedbacks. It has the ability to provide serial transmission and it has a memory and ports so that numbers of operations are easily performed. In the project design ATMEL microcontroller AT89C51 is used because it is a low power high performance microcontroller. It consists CMOS 8-bit microcontroller with 4kbytes in system programmable flash memory. ATMEL AT89C51 is good controlling microcontroller that provides standards like 4kbytes of flash, 32 I/O lines, and five vectors two-level interrupt architecture, on chip oscillator and etc. In this power down mode save the RAM inside detail, but freezes the oscillator, disabling all the other chip functions until next external interrupt or hardware resets [4].

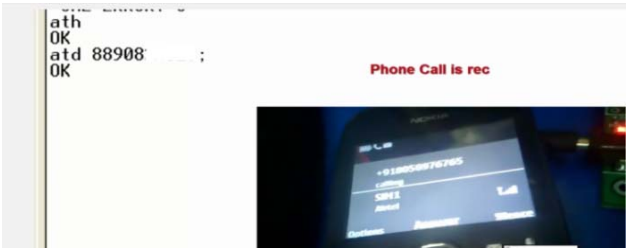

Fig. 3: Calling with GSM AT command

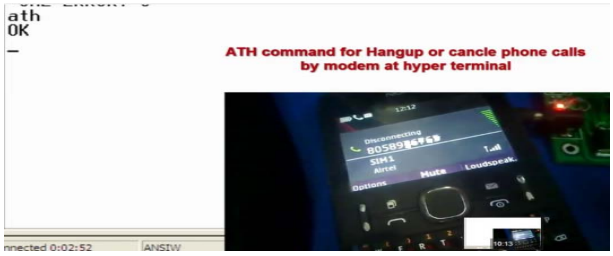

Fig. 4: Hang up, call through the GSM at command

RS-232 Unit*:* To communicate with the microcontroller, RS-232 is the most appropriate method. They provide an efficient way of communication when, communication is performed in short distances. RS-232 describes a serial communication for one device to one computer communication port, with speed up to 19,200 baud. In this 7 or 8 bits (On/Off) signal is transmitted to represent a character or digit. The 9- pin connector is used.

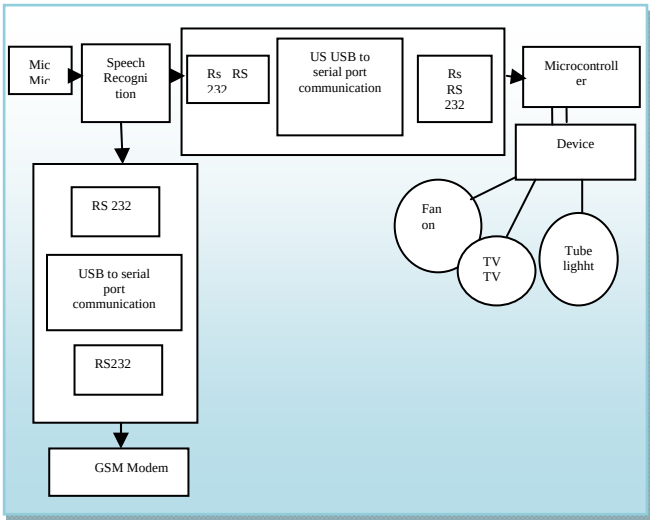

Fig. 5: Systematic diagram of overall system

Fig. 5 shows the systematic procedure of the system. The way of this concept function is when a patient speaks out some command, and then the voice is captured through microphone as the input devices. Once the voice is captured, the usage of a decoding system that will convert the analog (voice) to digital (binary signal). After that, two functions operate:

a) Once the voice captured command is transferred to RS-232. RS-232 communication method is a very suitable way to communicate with the microcontroller. So communication is performed by USB serial port communication and this works as an interface.This microcontroller is capable of communicating with all input and output modules. The speech recognition system which is the input module to the microcontroller takes the voice instruction given by the patient as input and the controller recognize whether the instruction is to be ON \OFF the device, and according to the patient voice the switching method controls the devices.
b) And if the patient needs the help of doctor in that case the patient speaks help and help SMS is delivered to doctors through GSM modem [6].

3. IMPLEMENTATION

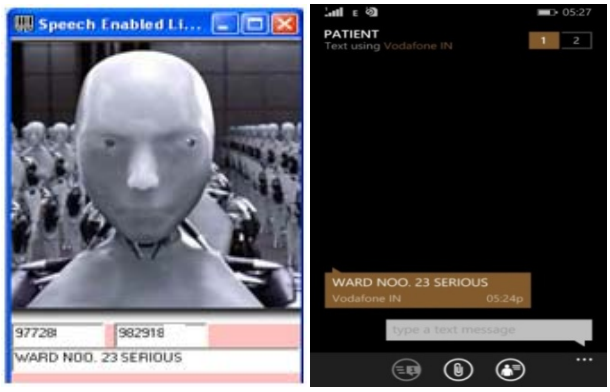

Fig. 6: Speech Recognition System and SMS by patient

Fig. 6 shows Speech recognition system that recognizes speech through mic. When the patient speaks help this system is able to send help SMS to doctors. As well as through this system patient is able to operate switching device like Fan on, TV on, tube light on. This can be done by speech recognition they recognize the patient desire, according to that SMS is transmitted to RS-232 to microcontroller and they are responsible for processing. This task is performed by patient by simply speaking [7].

The SMS send by patient through this system is Ward no. #### Patient is serious. According to this SMS serious patient provide treatment by the doctors.

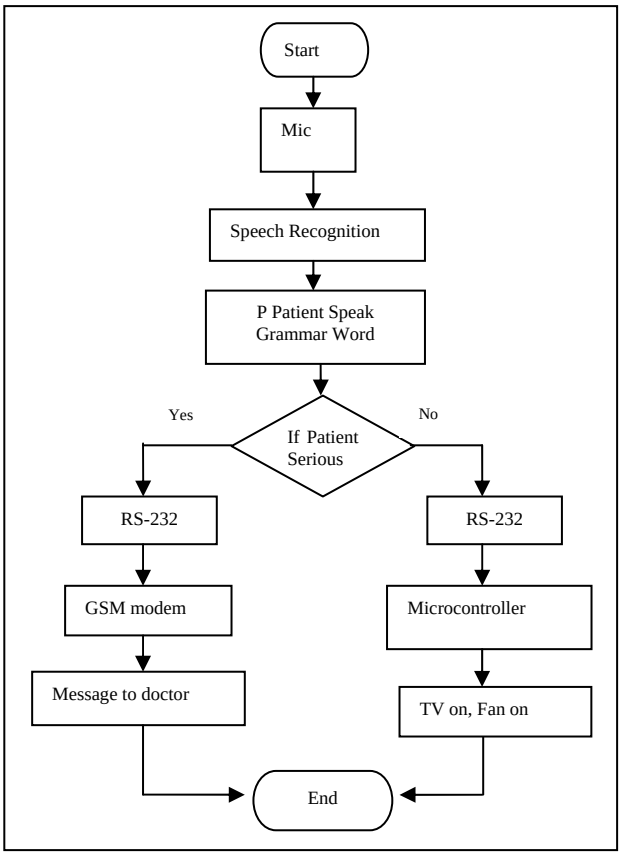

Fig. 7: Flow chart of project design

Fig. 7 shows the flow of our project the way of this concept function is when a patient speaks out some command, and then the Speech Recognition proceeds: When the Speech is captured through mic then patient speaks some grammar word. After processing of speech comparison in terms of word check through in building a dictionary of speech engine, grammar check and accent check, corresponding answer will be given according to instructions provided through mic by the patient. In this use AI Basics that are Computer will communicate with patients and accordingly react.

If patient serious and speak some grammar, word then two functions proceed:

a) If patient serious and cannot operate switching device and need help on that condition they operate switching device by simply speaking. When they speak, then the command is delivered to the microcontroller through serial port communication. This microcontroller is capable of communicating with all input and output modules. The speech recognition system which is the input module to the microcontroller takes the voice instruction given by the patient as input and the controller recognize whether the instruction is to be ON \OFF the device, and according to the patient voice the switching method

controls the devices [5].Then, according to the patient desire switch on the TV, Tube light, fan on. Either no action is performed or hypothesis are performed means again speak a grammar word is proceeding.

b) Else help message is delivered to doctor and doctor immediately handles the patient condition.

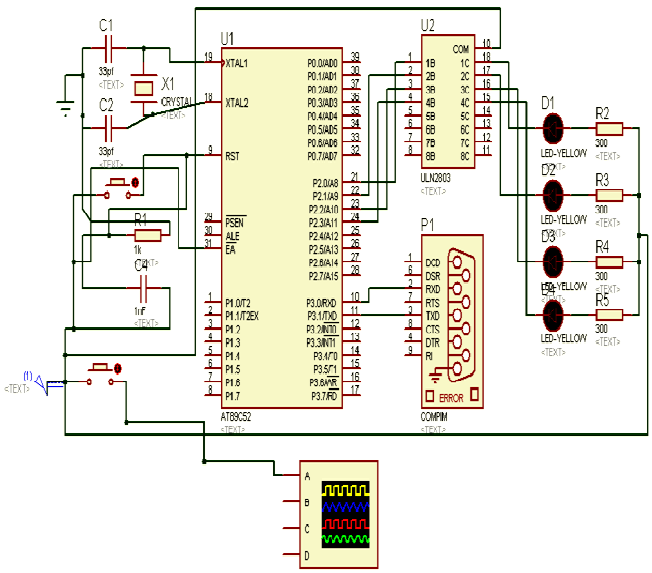

Fig. 8: Circuit diagram of system

Fig. 8 shows the circuit diagram of the system. This circuit is designed in ISIS Proteus. In this AT89C51 microcontroller is used. Design of circuit is operated through the system when the user speaks command it receive by microcontroller according to that it switch to LED or we can Fan on, tv on.

The experimental results show results that our scheme is fast and reliable. This system is good for patient because it provides real time monitoring as well as the patient can be easily operated switching devices.

Throughout the implementation of the system snapshots of the display were taken. The system's sample is successfully implemented and can be verified.

4. CONCLUSION AND FUTURE WORK

The main aim of the project is to design a reliable and efficient real time remote patient monitoring system that can play a vital role in providing better patient care. The GSM System is used for handling the emergencies in cases of abnormality in the Patient's health or for the immediate care / treatment required. Through speech recognition technology disabled persons as well as serious patient can easily monitor by doctors. Health Level 7 (HL 7) is a global standard for communication of patient data among health institutions. This can be a very helpful for patients. In future we will be working on making this type of system HL7 compliant.

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