

Interactive Voice Response System for College Automation

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Abstract- The interactive voice response (IVR) system serves as a connection between people & computer by connecting the telephone network with instructions. The telephone user can access the information from everywhere at any time simply by dialing a specified number and following an automated instruction when a connection has been established. The IVR system uses pre-recorded or computer generated voice responses to provide information in response to an input from a telephone/mobile caller. The input may be given by means of touch-tone or Dual Tone Multi-Frequency (DTMF) signal, which is generated when a guest presses a key of his/her telephone set, and the sequence of messages to be played is determined dynamically according to an inside menu structure (maintained within the IVR application program) and the user input. Our project allows the user to know the student's attendance, marks and fees structure quickly through the telephone line without the intervention of the college authority.

Keywords— DTMF, Text-To-Speech, GSM, Microcontroller, Database.

I. INTRODUCTION

Nowadays every institution needs automation. As a part of college automation, it is decided to do a project. Interactive Voice Response systems (IVRS) allow callers to interact with the communications system more than the telephone. IVR is used to permit the caller to retrieve information from a database, enter information into a database, or both. IVR systems allow the user to professionally exchange information, reducing clerical processing. IVRS provides a voice response to parents and guide them to the information they require. The parents can call up on the toll-free number and get any information regarding student by simply pressing certain button on his mobile as per the guidance of voice fed

into computer. An IVRS system talks to callers following a recorded draft. It prompts a response to the caller and asks him to take action by pressing a touchtone key, and supplies the caller with information based on responses made.

II. RELATED WORK

Santosh A. Kulkarni, and Dr. A. R. Karwankar et al. [2] has proposed a model which makes use Goertzel algorithm and DTMF. The Goertzel algorithm is a digital signal processing (DSP) technique for identifying frequency components of a signal. The Goertzel algorithm implementation examine the energy of one of the two tones from an arriving signal at eight different DTMF frequencies to determine which DTMF frequency is present. To do this valuation, the input signal is transformed to the DTMF frequencies, which are computed by the personalized Goertzel algorithm. The corresponding filter concept is used for each DTMF frequency to resolve the frequency at which the incoming signal has maximum energy. Since highest energy corresponds to DTMF frequency, this procedure enables us to distinguish the DTMF frequency. It is important to decide the right algorithm for detection to save memory and computation time. The Goertzel algorithm is the optimal choice for this application because it does not make use of many constants, which saves a great deal of memory space. Also, only eight DTMF frequencies need to be calculated for this application, and the Goertzel algorithm can calculate preferred frequencies, this save calculation time. Dual-tone multi-frequency signaling (DTMF) is used for telecommunication signaling over analog telephone lines in the voice-frequency band connecting telephone handsets and other communications devices and the switching center. The version of DTMF that is used in

push-button telephones for tone dialing is recognized as Touch-Tone.

Ms Seema P. Mishra, Ms Apeksha S. Chavan, and Swapnil S. Gourkar et al. [3] has proposed a model which provide Microcontroller in telephony, interactive voice reaction, or IVR, is a phone technology that allow a computer to be familiar with voice and touch tones using a normal phone call. The IVR system can act in response with pre-recorded or dynamically generated audio to further direct callers on how to proceed. A 20 pin microcontroller 89C2051 is used because of its compatibility with our hardware. This microcontroller controls the entire hardware. Visual Basic has been used for software encoding arrangement in the class and outcome of the university are completing reachable to students and parents on phone by our project. Interactive Voice Response (IVR) is a software application that accepts an arrangement of voice telephone input and touch-tone keypad selection and provides suitable responses in the form of voice. IVR is usually part of a larger application that includes database access. Interactive Voice Response (IVR) systems allow callers to get access to information without human intervention. Thus, callers listen to a pleasant and cheerful voice 24-hours a day, 7 days a year without any attendant human fatigue. The advantage to the company is that it would otherwise be impossible to handle elevated loads of callers, both in terms of time, and the cost of the large number of persons that it would require.

Prof. R. R. Bhambare, Pardhi Yogesh P, Cola Premsai V and Shinde Saurabh B et al. [1] give regarding the Ring Detector. Ring Detector detect occurrence of incoming calls. It does the function of detecting the ring activating signals and then counts the number of rings. Using Ring detector unit caller obtain connected to the computer with the help of microcontroller. Also Serial interface make available the serial interface from microcontroller to computer. The communication of the USB device is dependent scheduled pipes. A pipe is a connection from the host controller to a logical point, creates on a device, and named an endpoint.

Prachee N. Kamble, Farheen khan, Nupur Pande and Tanvi Yamsanwar et al. [4] have used Speech synthesis which is the artificial make up of human speech. A computer system used for this reason is called a speech synthesizer, and can be implemented in software or hardware. A text-to-speech (TTS) system converts standard language text into speech; other systems source to be symbolic linguistic representations like phonetic transcriptions interested in speech. Synthesized speech can be created by concatenating pieces of recorded speech that are stored in a database. For specific procedure domains, the storage of entire words or sentences allows for high-quality output. Alternatively, a synthesizer can incorporate a model of the vocal band and other human voice characteristics to generate a completely "Synthetic" voice output. The quality of a speech synthesizer is judge by its resemblance to the human voice and by its skill to be implicit. A text-to-speech arrangement (or "engine") is composed of two parts: a front-end and a back-end. The front-end has two major tasks. First, it converts raw text containing symbols like numbers and abbreviations into the equivalent of written-

out words. This process is frequently called text normalization, pre-processing, or tokenization. The front-end then assign phonetic transcriptions to each word, and divides and typescript the text into prosodic units, like phrases, clauses and sentences. The procedure of assigning phonetic transcriptions to words is called text-to-phoneme or grapheme-to-phoneme conversion. Phonetic transcriptions and prosody information collectively make up the symbolic linguistic representation that is output by the front-end. The back-end—often referred to as the synthesizer—then converts symbolic linguistic representation added to sound. In certain systems, this part includes the computation of the target prosody (pitch contour, phoneme durations), which is then compulsory on the output speech.

Kalpit S. Patel, Neha R. Lad, Kamlesh H. Gavit et al. [6] has proposed a model which makes the use of GSM. Here GSM module is used to receive the arriving call in auto answering manner at the system. One of the GSM output is prearranged to the DTMF decoder for additional processing. MAX232IC is used for serial communication between dealing out device and GSM module. It uses RS232 protocol for broadcast and function of data serially. One can control module all the way through controller via this serial interface. Audio out is specified to the input of DTMF decoder. DTMF decoder decodes the analog audio and gives output in the form digital 4 bit code. Processing Device is the heart of the system. It controls all the nonessential devices. It gives various commands to GSM module, display device and voice module. It takes the data from DTMF decoder and input device and processing accordingly.

III. ARCHITECTURE & IMPLEMENTATION

The architecture of the proposed system is shown in figure .To resolve the problems of existing work which did some study and found some advanced technologies which can be used instead of the one used in the existing system.

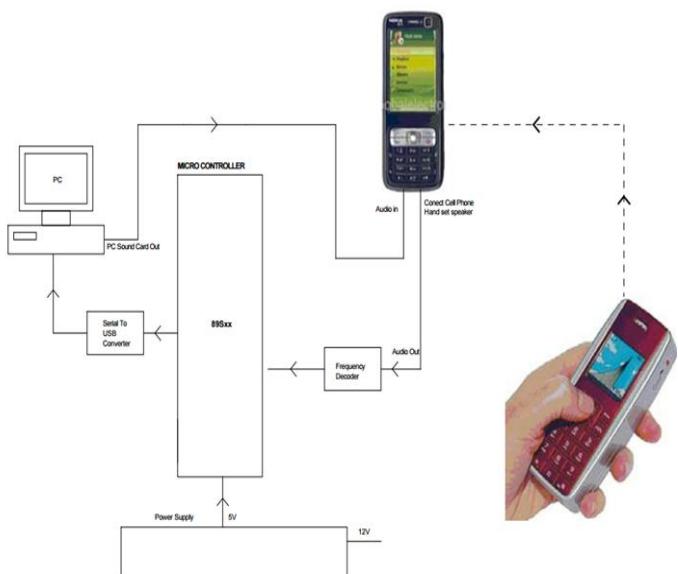


Fig. 1 System Block Diagram

Wired communication (Telephone) is fading off now-a-days, so as an alternative we are using GSM modem. Serial ports are rare now a day; in its place most of the systems have USB interface. USB send data in serial mode i.e. the corresponding data is serialized before sends and de-serialized after receiving. The benefits of USB are low cost, expandability, auto-configuration and outstanding performance. We are using text to speech converter in our project because the message stored in the system is in the form of text, that message is converted into speech so that user will get the required information. Initially the user makes a call on the provided college helpline number, for getting the student information regarding attendance or result. This call will be automatically received by the GSM modem after specific number of rings. The user is greeted with welcome message such as "Welcome to engineering college".

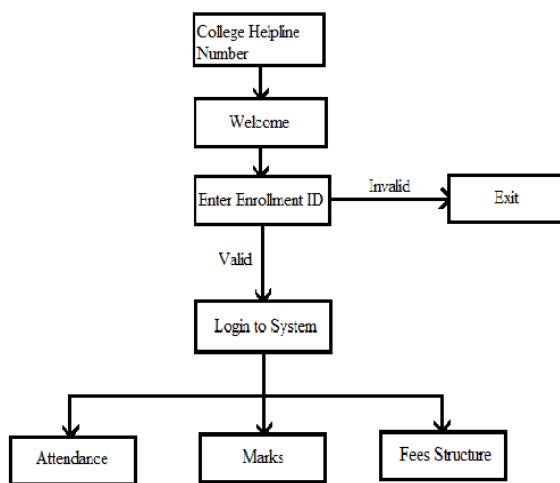


Fig. 2 Workflow of the System

Then the user will be provided with some options to choose regarding what they want to make out. The user then enters the input which is received by the frequency decoder. The frequency decoder then decodes the input and transfers all the way through the micro controller to the computer. The computer is a device where all college students' data is stored. The computer then matches the input and converts that student data into voice using Text-To-Speech. In conclusion the necessary data is transferred to the GSM Modem through audio in port which further delivers to the user.

IV. COMPONENTS USED IN THE PROPOSED SYSTEM

Microcontroller: This microcontroller consists of an on chip programmable serial dropping hardware requirement. in this project, the microcontroller serves the purpose of interfacing and controlling all the devices in the circuit. The AT89C52 is low power, high performance CMOS 8 bit microcontroller with 8 KB of flash programmable erasable ROM. Each user of IVRS system is provided with certain identification number. These identification numbers are stored in internal memory of microcontroller along with some extra information which is required for further communication. The microcontroller IC is interfaced to DTMF decoder, ring

detector and auto-hook up circuit and also to PC through RS232.

PC (Personal Computer): The programming in PC is finished in VISUAL BASIC (VB). And it is done in such a way that according to signal received from microcontroller it plays suitable wave file. This wave file produces an audio output which is openly interfaced to GSM.

Dual Tone Multi-Frequency (DTMF):

Dual-tone multi-frequency signaling (DTMF) is used for telecommunication signaling above analog telephone lines in the voice-frequency band between telephone handsets and other communications campaign and the switching center. The adaptation of DTMF that is used in pushbutton telephones for tone dialing is known as Touch-Tone.



Fig. 3 DTMF keypad

The alongside figure shows DTMF keypad which is laid out in a 4x4 matrix, with every row representing a low frequency, and each column representing a high frequency. Pressing a single key (such as '1') will send a sinusoidal tone for each of the two frequencies (697 and 1209 hertz (Hz)).

Table 1 DTMF Keypad Frequencies

| | 1209 Hz | 1336 Hz | 1477 Hz | 1633 Hz |
|--------|---------|---------|---------|---------|
| 697 Hz | 1 | 2 | 3 | A |
| 770 Hz | 4 | 5 | 6 | B |
| 852 Hz | 7 | 8 | 9 | C |
| 941 Hz | * | 0 | # | D |

Speech Synthesizer: Speech synthesis is the artificial manufacture of human speech. A computer system used for this reason is called a speech synthesizer, and can be implemented in software or hardware. A text-to-speech (TTS) system converts normal language text into speech. Synthesized speech can be created by concatenating pieces of recorded speech that are stored in a database. An understandable text-to-speech program allows people with visual impairments or reading disabilities to listen to written works. A text-to-speech system is composed of two parts: a front-end and a back-end. The front-end has two main tasks. First, it converts raw text containing symbols like numbers and abbreviations into the equivalent of written-out words. The frontend then assigns phonetic transcriptions to each word, and divides and phonetic transcriptions to each word, and divides and marks the text into prosodic units, like phrases, clauses, and sentences. Phonetic transcriptions and

prosody information jointly create the symbolic linguistic representation that is output by the front-end. The back-end—often referred to as the synthesizer then converts the symbolic linguistic representation into sound.

GSM Module: GSM module is used to obtain the incoming call in auto answering manner at the system. One of the GSM output is given to the DTMF decoder for additional processing. MAX232IC is used for serial communication between processing device and GSM module. It uses RS232 protocol for transmission and reception of data serially. We can control module through controller via this serial interface. Audio out is set to the input of DTMF decoder. DTMF decoder decodes the analog audio and gives output in the form digital 4 bit code. Processing Device is the heart of the system. It controls all the peripheral devices. It gives various commands to GSM module, display device and voice module. It takes the data from DTMF decoder and input device and processing accordingly.

V. CONCLUSION AND FUTURE RESEARCH WORK

Interactive Voice Response systems (IVRS) allow callers to interact with the communications system over the telephone. IVR is used to enable the caller to retrieve information from a database, enter information into a database, or both. IVR systems allow the user to efficiently exchange information, reducing clerical processing. IVRS provides a voice response to parents and guide them to the information they require. The parents can call up on the toll-free number and obtain any information regarding student by simply pressing certain button on his mobile as per the guidance of voice fed into computer. An IVRS system talks to callers following a recorded script. It prompts a response to the caller and asks him to respond by pressing a touchtone key, and supplies the caller with information based on responses made.

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