



INTERACTIVE VOICE RESPONSE SYSTEM FOR EDUCATIONAL INSTITUTION

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ABSTRACT

The Interactive Voice Response (IVR) System serves as a bridge between people and computer databases by connecting the telephone network with the database. The telephone user can access the information from anywhere at anytime simply by dialing a specified number and following an on-line 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 caller. The input may be given by means of touch-tone or Dual Tone Multi-Frequency (DTMF) signal, which is generated when a caller presses a key of his/her telephone set, and the sequence of messages to be played is determined dynamically according to an internal menu structure (maintained within the IVR application program) and the user input. The IVRS system which will be designed will provide an ideal platform for the operation of start-ups and existing small concerns. It will be a highly economical and efficient way to replace the Dialogic card which is very costly and requires a high maintenance and regular up gradation. The IVRS system which will be designed will consist of simple components like microcontroller and some basic application chips interfaced to a PC which will have small software running in the backend while the other jobs are performed on the front end.

INTRODUCTION

Interactive Voice Response systems can play a significant role in providing efficient customer service. Properly implemented, they can increase customer satisfaction, lower costs and offer new services. The return on investment (ROI) on these systems is also quite amazing, making them the most popular Computer Telephony systems in the world. Compare them to a call center. The price for the extra "human touch" translates into a huge running cost in the form of Agents, Supervisors, infrastructure maintenance, training, call center performance & discipline reviews, etc. World over, the first systems that any company deploys with a view towards enhancing customer satisfaction are IVR's. Call centers come much later. IVR's can provide information to callers in one of two ways:

Pre-recorded information.

Common examples are audio movie snippet previews (e.g. at PVR). Though it is possible to build these IVR's through live information from databases (using text-to-speech engines), one doesn't get the voice variations, which are so important for the moviegoer. Other examples are around procedural (or "how to") information dissemination like Income tax filing procedures, bank account opening or credit card application procedures, etc.

Live information from databases.

These IVR's get information from databases, convert to voice, and speaks it back to the caller. Practically all industry segments are potential users for this, and examples include Phone banking (where you call in, dial in your account number & TPIN and can hear your account balance on phone) Courier packet trace (where you call in, dial the AWB number, and the system tells you whether the packet has been delivered, if it is in transit, etc)

3. Microcontroller Based Ivrs For College Automation

In telephony, interactive voice response, or IVR, is a phone technology that allows a computer to detect

voice and touch tones using a normal phone call. The IVR system can respond with pre-recorded or dynamically generated audio to further direct callers on how to proceed. IVR systems can be used to control almost any function where the interface can be broken down into a series of simple menu choices. Once constructed IVR systems generally scale well to handle large call volumes.

Now-a-days every institution needs automation. As a part of college automation, we have decided to do a project. Voice Interactive System for College Automation. Our project allows the user to know the student attendance and marks quickly through the telephone line without the intention of the college authority. In the hardware side embedded system has been used. It will be very obliging to the parents to be acquainted with their son/daughter recital in the college.

In the hardware side embedded system has been used. A 20 pin microcontroller 89C2051 is used because of its compatibility with our hardware. This microcontroller controls the whole hardware. Telephone line is used for communication purpose. Visual Basic has been used for software programming. Presentation in the class and outcome of the university are made reachable to students and parents on phone by our project.

Interactive Voice Response (IVR) is a software application that accepts a combination of voice telephone input and touch-tone keypad selection and provides appropriate responses in the form of voice, fax, callback, e-mail and perhaps other media. IVR is usually part of a larger application that includes database access.

An IVR application provides pre-recorded voice responses for appropriate situations, keypad signal logic, and access to relevant data, and potentially the ability to record voice input for later handling. Using computer telephony Integration (CTI), IVR applications can hand off a call to a human being who can view data related to the caller at a display.

Interactive Voice Response (IVR) systems allow callers to get access to information without human intervention. Thus callers hear a pleasant and cheerful voice 24-hours a day, 7 days a year without any attendant human fatigue.

Since even the cost of the call is borne by the caller, apart from the one-time installation cost, there is no running expense for the company who deploys the IVR systems. Another advantage to the company is that it would otherwise be impossible to handle high loads of callers, both in terms of time, and the cost of the large number of individuals that it would require.

INTERACTIVE VOICE RESPONSE SYSTEM FEATURES

1. Simple to use Graphical System Design Interface
2. Multiple telephone line support both on Analog and Digital
3. Advanced call screening and call switching options
4. Can be integrated with any type of database. Playback data retrieved from Database
5. Text to Speech
6. Call Transfer to other extensions, optionally announcing the Caller ID, allowing the recipient to accept or decline the call
7. Full logging of callers' details and all the selections made during the call
8. Multi-Language support (English /Hindi)
9. DNIS: (Dialed number identification service)
10. ANI: (Automatic Number Identification)
11. Common IVR applications include:
12. Schools, Colleges and Educational Institutions
13. Bank and stock account balances and transfers
14. Surveys and polls
15. Call center forwarding
16. Simple order entry transactions
17. Selective information lookup (movie schedules, etc.)
18. Ticketing and Reservation
19. IT Enabled Services
20. Hotels, Airline & Train Ticket Enquiry & Booking Centers
21. Entertainment Industry
22. Complaint Booking and Customer Support Centers
23. Banks, Finance and Credit Corporations
24. Tele-Marketing Industry –Outbound Calls

IVRS for an Educational Institution

An IVRS is an exemplary innovation in the area of voice assisted browsing and data retrieval on telephone, data that contains information of interest and has straight relevance to the user. This application software allows full resource sharing and integration with the existing database of :

Our Software solution for the complete computerization of Educational Institutions, for e.g. in a) Visual Basics 6.0 & (MS –Access 2003)

The software first converts the data into a voice format and then sends it on to the telephony network. The voice response by the system is then heard by the caller, and as discussed, shall cover the following informational requirements:

1. Fees Installment Paid/Due Status of the Student.
2. Attendance status for any day, week, month or entire year.
3. Marks scored in any test or exam.
4. Rank in any test or exam.
5. Percentage scored in exam.
6. Score, rank and percentage in any particular subject.
7. Homework for any day.
8. Remarks given by teachers.
9. Timetable.
10. Test schedule and test syllabus.
11. Dates of admission, pre-requisites for admission and status of admission for any application.
12. Vacancies for faculty, if any.
13. Any important announcements for parents like dates for parents-teachers meetings or any other messages.
14. Automatic Fee Reminders on student telephone numbers.
15. Voice mail accounts for each and every student (especially in case of a boarding school), to help parents leave important messages for their wards.

Parents' Grievance Box, to make parents leave their grievances about their child's performance, for any subject. The recorded grievance is then automatically sent to the voice mailbox of the teacher who takes that particular subject in the class. The basic system can handle 4 incoming calls at one point of time, 24 hours a day, 7 days a week and 365 days a year.

The Hardware Requirement

- A Server computer
- Telephony cards that answer calls
- IVR software

Apart from this, there needs to be connection to the database from where the Information will be picked up. This is generally through an IP based network. Apart from delivering information by voice, there are other methods, as well that one should consider. They are fax, email & SMS. For instance, if the caller wanted an account statement from his bank, voice is quite useless, Fax or email are better options. The system can be integrated with applications to send Emails, fax, SMS features. Thus

1. Relay: For switching between the ring detector and the DTMF decoder.
2. Ring detector: To detect the presence of incoming calls.
3. DTMF decoder: To convert the DTMF tones to 4 bit BCD codes.
4. Micro controller: To accept the BCD calls, process them and transmit them serially to the PC.

5. Level Translator: To provide the interface between PC and micro controller.
6. Personal Computer: To store the data base and to carry out the text to speech conversion.
7. 7. Audio Amplifier: To provide audio amplification to standard output and to act as a buffer between the telephone line and sound card.

SEQUENCE FOLLOWED IN THE IVRS SERVICE

- Caller dials the IVRS service number.
- The computer waits for a specified number of ringing tones at the end of which, the connection is established.
- The connection is established by lifting the handset of telephone base from ONHOOK condition.
- Now, a pre-recorded voice greets the caller conforming that the number dialed corresponding to the particular service.
- Next, the menu is presented to the caller again in the voice form, giving him then various options to choose from.
- If the information to be relayed back is confidential, then the system may even ask the dialer, to feed in a password number.
- The database is accordingly referenced and the necessary information is obtained.
- Next, the same information is put across to the user in voice.
- The caller generally given the option to :
 - a. Repeat whatever information was voiced to him.
 - b. Repeat the choices.
 - c. Break the call by restarting ON-HOOK condition

CIRCUIT DIAGRAM of IVR System

Figure 1 Shows diagram of IVR System for college automation system. Any telephone set will always be in any of the conditions mentioned below:

ON-HOOK

It is the state whenever telephone handset is placed on the cradle. During this state, the telephone line is open circuit with the exchange and the voltage of -48 V is available on each telephone line from the exchange.

OFF-HOOK

This is the state whenever telephone handset is displaced from the cradle. During this state the voltage level is between $\pm 5\text{V}$ to $\pm 12\text{ V}$. The telephone OFF – HOOK resistance is typically $600\ \Omega$

SIGNALING TONES

• Dial tone:

This tone indicates that the exchange is ready to accept dialed digits from the subscriber. The subscriber should start dialing only after hearing the dial tone. Otherwise, initial dialed pulse may be missed by the exchange that may result in the call landing on the wrong number. The dialed tone is 33 Hz or 50 Hz or 400 Hz continuous tones.

• Ring tone:

When the called party is obtained, the exchange sense out the ringing current to the telephone set of the

called party. This ringing current has the familiar double ring pattern. Simultaneously, the exchange sends out the ringing tone to the calling subscriber, which has the pattern similar to that of ringing current, the two rings in the double ring pattern are separated by a time gap of 0.2s and two double rings patterns by a time gap of 2s. The burst has duration of 0.4s. The frequency of the ringing tone is 133 Hz or 400 Hz.

• Busy tone:

Busy tone is bursty 400 Hz signal with silence period in between. The burst and silence duration has the same value of 0.75s. A busy tone is sent out to the calling subscriber whenever the switching equipment or junction line is not available to put through the call or called subscriber line is engaged.

• Number unobtainable tone:

The number unobtainable tone is a continuous 400 Hz signal. This tone may be sent to the calling subscriber due to a variety of reasons. In some exchanges this tone is 400 Hz intermittent with 2.5s ON period and 0.5s OFF period.

• Routing tone:

The routing tone or call – in – progress tone is 400 Hz or 800 Hz intermittent patterns. In an electromechanical system it is usually 800Hz with 50% duty ratio and 0.5s ON-OFF period. In analog electronic exchange it is 400 Hz pattern with 0.5s ON period and 0.5s OFF period. In digital exchange it has 0.1s ON-OFF period at 400 Hz

• TOUCH –TONE KEY PAD

Touching a button generates a ‘tone’, which is a combination of two frequencies, one from lower band and other from upper band. For e.g. pressing push button ‘7’ transmits 852 and 1209 Hz, as shown in table 1.

Table 1: Typical 4 x 3 touch keypad

	1209Hz.	1336Hz	1477H
697Hz	1	2	3
770Hz	4	5	6
852Hz	7	8	9
941Hz	*	0	#

In the keypad ten keys of decimal digits are used to call required number. The touch-tone telephone produces decade or DTMF signals for DTMF type. The keypad produces two tone sinusoidal outputs. Rows and columns determine the frequency. This keypad is working with different frequencies but only two frequencies are transmitted at a time. So the signal coming from this type of telephone is called Dual Tone Multi Frequency (DTMF).

TELEPHONE INTERFACE SECTION

It consists of following subsections:

Ring Detector Section

Ring detector circuit does the function of detecting the ring activating signals and then counts the number of rings.

Ring activating signals

This is send by telephone exchange to the subscriber. This signal causes an audio tone in the subscriber’s telephone set. This ring tone is an alarming signal, which diverts the attention of the subscriber towards the instrument. The ring signal produced at the central office is composed of a 10v ac, 400Hz signal that is always present on the telephone line with the

handset in ON-HOOK position. The ring-activating signal is ON for 0.2 sec and the subscriber can hear the sound of ring in that duration of time. For next 0.4 sec the ring-activating signal goes OFF. Now the subscriber can't hear the sound. Again this repeats for six times with the pause of 2 sec. Thus the subscriber hears six rings

Optocoupler

In the same application it is necessary to isolate input and output. The isolation can be achieved in many ways. One of these is to use an Opto-coupler. Opto-coupler is controlled by optical energy. Optocoupler is MCT 2E. The device consists of GaAs infra red emitting diode optically coupled to a monolithic silicon phototransistor detector

APPLICATIONS

a) Voice-activated dialers

(VAD) Voice-activated IVR systems are now used to replace the switchboard or PABX (Private Automatic Branch eXchange) operators which are used in many hospitals and large businesses to reduce the caller waiting time. An additional function is the ability to allow external callers to page hospital staff and transfer the inbound call to the paged person.

b) Clinical trials

IVR systems are used by large pharmaceutical companies to conduct global clinical trials and manage the large volumes of data generated. The application used by the IVR in clinical trials is generally referred to as a Voice form application. The caller will respond to questions in their preferred

language and their responses will be logged into a database and possibly recorded at the same time to confirm authenticity. Applications include patient randomization and drug supply management.

c) Automated reward transfer line

This reduces labour costs and turnaround time. Managers allocating incentive funds are able to do so directly on the IVR phone, saving time and energy over their previous slow, clerical system

d) Banking & Finance

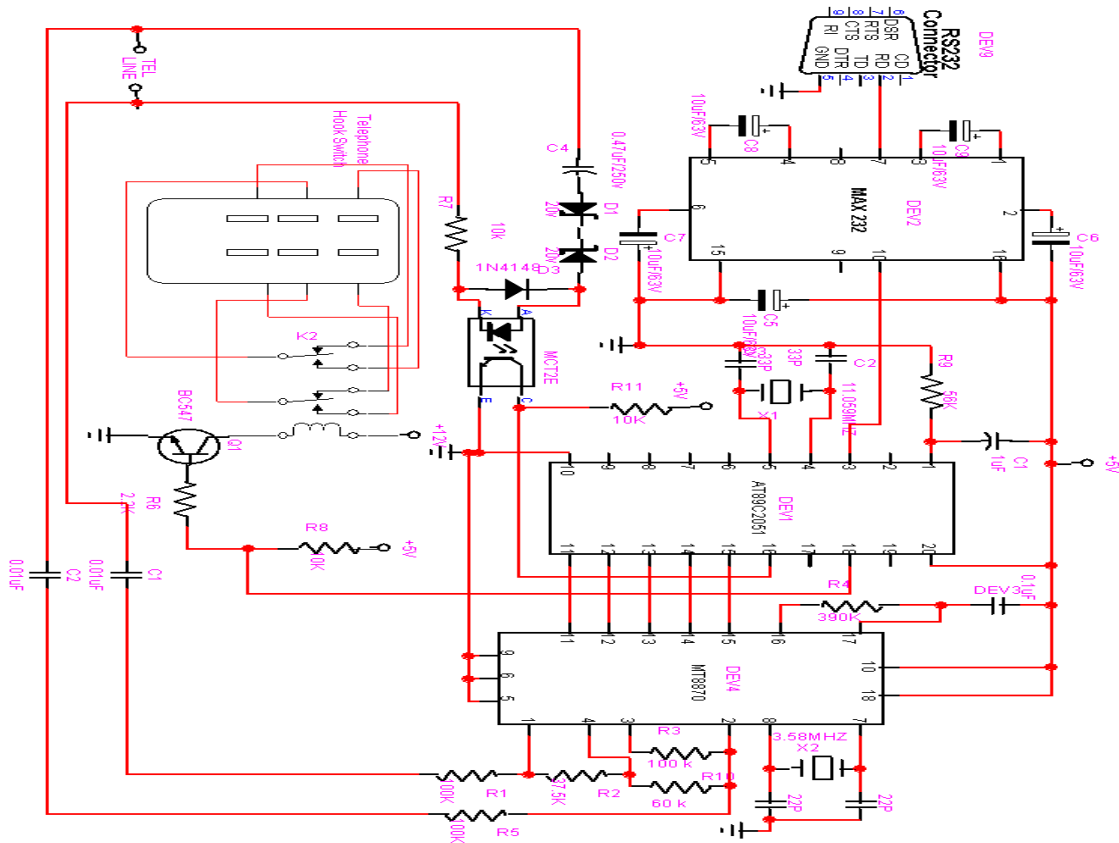
Technological innovations have brought about not just new types of electronic money, but also new bank-customer relationships

e) Government

In order to improve the efficiency of information accessibility, many government departments such as the Labour Department, the Education department the Immigration Department, the Inland Revenue and the Department of Health.

f) Telecommunications

In this highly competitive industry, we can help telecom service providers (wire line or wireless) to develop infrastructure and add value to their services. Large companies use IVR services to extend the business hours of operation. The use of the *VUI (Voice User Interface)* is designed to match the customer experience of the web interface. Companies have realised that access to voice services is impulsive and readily available. This is down to the high penetration of mobile phones.



ADVANTAGES & DISADVANTAGES OF USING IVR SYSTEMS

ADVANTAGES

In software we have to implement the basic code for working of our system. For this we will be using Visual Basic and Structured Query Language. We will be designing database using SQL. Database will consist of student's information like student's attendance and student's marks along with their roll numbers. With the help of Visual basic, we will be doing front end coding. Front end will consist of a Graphical User Interface (GUI) which will help the college or organization in adding, updating or deleting the data from the database.

- **Better Customer Contact**

The IVRS can collect necessary information relating to the call from the customer which he is waiting to be connected to a customer care executive. The IVRS will collect the details from the customers and is been displayed on the customer care executive's system. Thus helping him to handle the in a swift professional manner. Both parties can straightaway get down to resolving the object of the call.

- **Better Customer Satisfaction**

This can make sure by the following ways: The number of missed calls will be very much less as the calls are attended by the system Instead of waiting for a customer care executive the customer can get the necessary details directly from the system very easily by just pressing necessary keys. The company can provide consistent replies for all routine enquires. This enhances the quality of customer service. Customer can obtain the requested information, products and service at any time, 24X7.

- **Cost Effective**

Customer service cost can be significantly reduced through automated customer service and it reduces human resource inefficiencies. Since IVR works for 24 hours, the company can use it as a sales order line. Also the increase in customer satisfaction promotes repeat business with existing customers thus generating more revenue without much expenditure. Many clients often realize a full return on investment within a year of implementation.

- **Security**

Unlike internet-based applications, in IVR system there is no entry point for hackers. This will give more security to the data.

- **Upgradeability**

The latest cutting edge technologies can be easily adapted to the existing system.

- The biggest advantage of IVR for small and large organizations is to save time and money. Answering phone calls takes a lot of time, and not every phone call deserves the attention of a trained employee. IVR systems can take care of most of the frequently asked questions that an organization receives (office hours,

directions, phone directory, common tech support questions, et cetera) and allow customer service reps, salesmen and tech support specialists to concentrate on the harder stuff. If a large company is able to shave even a second off the average length of each phone call with a live operator, it can save them hundreds of thousands or even millions of dollars a year [source: Human Factors International]. IVR systems have the advantage of making callers and customers feel like they're being attended to, even if it's just by a machine. If you have a simple question, it's better to get a quick answer from a computerized operator than to wait ten minutes on hold before talking to a human being.

- Another advantage is that IVR systems don't sleep. They don't take lunch breaks. They don't go on vacations to the Bahamas. An IVR system can be available 24 hours a day to field questions and help customers with simple tasks. An IVR system can make a small company look bigger. Some IVR hosting plans even set you up with an 800 number to look more official. Subscription IVR hosting plans make it easier for businesses and organizations to use these automated phone services. This is a big advantage of days past, when only large companies with big telecommunications and computing budgets could afford the hardware, software and staff to run in-house IVR systems.
- The addition of speech recognition capabilities help IVRS owners derive more benefit from their investment in existing IVRS resource.
- Motivating organizations to embrace speech solutions is the potential for dramatic reductions in operational cost.
- Increased automation frees the customer service agents from any routine administrative tasks and reduces cost related to customer service staffing. That is fewer agents are able to serve more customers.
- Resources that have been developed to support an internet presence can support an IVRS as well. Thus organizations can use some of the same data modules bid for speech enabled IVRS application for their intranets. This could deliver a high degree of code reuse.

DISADVANTAGES

- The greatest disadvantage of IVR systems is that many people simply dislike talking to machines. Older adults may have a hard time following telephone menus and lengthy instructions.
- And younger callers get frustrated with the slowness of multiple phone Menus.

- Defects of the Public Switched Telephone Network (PSTN) is applicable to IVRS also.
- Visual basic, the software used is platform dependent.
- In its present condition IVRS cannot be used in internet applications.
- The security measures adopted are also not up to the mark.

CONCLUSION

Interactive Voice Response System has been the latest technology; each provides the foundation for providing convenient new IVRS services for customers as well as reduced operational costs, improved customer satisfaction and retention, increased return on investment and a stronger market presence for the IVRS services provider. A speech interface gives caller more flexible navigation outputs that are less complex and more rigidly hierarchical touch tone menu options.

IVRS can be used in organizations to know about various departments, mode of working and levels of control. Hardware circuitry of IVRS is very compact and it can be used as a card in computer. By the wide spread of internet it is possible to know information from anywhere in the world with the advanced features of Interactive Voice Response System.

The system designed will be intelligent for interaction and will suitably provide a good response to the caller who will access it. It will be truly a responsible system for human mankind. We will make it better than the present scenario system. It will be digitally accessed and will have a strong data base and can be operated easily and of low cost. And the future will show that every organization will be using our system. So we have decided it to implement this system for educational purpose i.e. marks enrolment

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