

A Comprehensive Study of Design, Development and Implementation of an Automated IVR Systems

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Abstract –The Interactive Voice Response (IVR) system serves as a bridge between people & computer by connecting the telephone network with instructions. The telephone user can access the information 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 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 IVR System which will be designed to provide an ideal platform for the operation of start-ups and existing small concern. It will be a highly economical & efficient way to replace the Dialogic card which is very costly and requires a high maintenance and regular up gradation.

Keywords: IVR, A text-to speech (TTS), voice over internet protocol (VOIP), Dual Tone Multi-Frequency (DTMF).

I. INTRODUCTION

Interactive Voice Response systems represent a powerful means for automating business and customer-facing processes. IVR systems process phone calls, play pre-recorded messages, provide callers with real-time data from any number of databases and potentially route calls to service agents. IVR technology requires virtually no human interaction over the telephone, as the user's interaction with the database is predetermined by what the IVR system will allow the user access to. IVR is an automated computer telephony integration (CTI) system which allows providers to create complex menus which the caller can navigate by using touch-tone key presses. IVR systems can be used as a Voice portal to access remote information such as bus scheduling where the caller can select the route for which they require information, or for billing or customer service systems which allow the caller to enter information such as their account number or credit card details without the need for operator assistance For example, banks and credit card companies use IVR systems so that their customers can receive up-to-date account information instantly and easily

without having to wait to speak with someone directly. IVR technology is also used to gather information, as in the case of telephone surveys or tele-votes in which the user is prompted to answer questions by pushing the numbers on a touch-tone telephone. IVR systems can combine touch-tone input, speech recognition and text-to-speech capabilities, resulting in high customer satisfaction and operational effectiveness. The aim of research on IVR to development of Automated IVR college management system like attendance information, result information with clustering environment along with virtualization.

Interactive Voice Response Features:

- Simple to use Graphical System Design Interface.
- Multiple telephone line support both on Analog and Digital.
- Advanced call screening and call switching options.
- Can be integrated with any type of database. Playback data retrieved from database.
- Text to Speech
- Call Transfer to other extensions, optionally announcing the Caller ID, allowing the recipient to accept or decline the call.
- Full logging of callers' details and all the selections made during the call.
- Multi-Language support (English /Hindi).
- DNIS: (Dialed number identification service).
- ANI: (Automatic Number Identification).

Common IVR applications include:

- Schools, Colleges and Educational Institutions.
- Bank and stock account balances and transfers.
- Surveys and polls.
- Call center forwarding.
- Simple order entry transactions.
- Selective information lookup (movie schedules, etc.).
- Ticketing and Reservation.
- IT Enabled Services.

- Hotels, Airline & Train Ticket Enquiry & Booking Centers.
- Entertainment Industry.
- Complaint Booking and Customer Support Centers.
- Banks, Finance and Credit Corporations.

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 database of system, the Software solution for the complete computerization of Educational Institutions. 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:

Common Features:

- Fees Installment Paid/Due Status of the Student.
- Attendance status for any day, week, month or entire year.
- Marks scored in any test or exam.
- Percentage scored in exam.
- Homework for any day.
- Exam Timetable.
- Test schedule and test syllabus. .
- Vacancies for faculty, if any.
- Any important announcements for parents like dates for parents-teachers meetings or any other messages.

II. BACKGROUND

A. Personalized IVR system in Contact Center.

In “Personalized IVR” [3] the customer is greeted by its name. When the customers make a call to the contact center, it uses the caller phone number to interact with the database and greet the customer by its name. Fig 1 represents the flow chart of the Personalized IVR system.

As in the case of most of now a day’s web application like Google or yahoo, users have the privilege to manage its web application for example some may like to keep chat, Lab, buzz, travel, work, receipt and many more where as some may prefer to keep email and nothing else. Similarly in the “Personalized IVR” each customer has privilege to personalize his/her menu according to their need and taste. For example one customer has their customized menu containing travel, value added services, new offers and news where as other customer has its own customized menu. So when the customer makes a call to Personalized IVR for self

service he/she is provided with their own customized menu. This approach gives the customer more control and friendly environment over the IVR system resulting in more satisfied self service.

This “Personalized IVR” solution is different from other customer self service, it provides personalized customer service. It automatically generates personalized voice menus for users based on the choice and habit. Additionally, users can maintain these menus on the portal Web site.

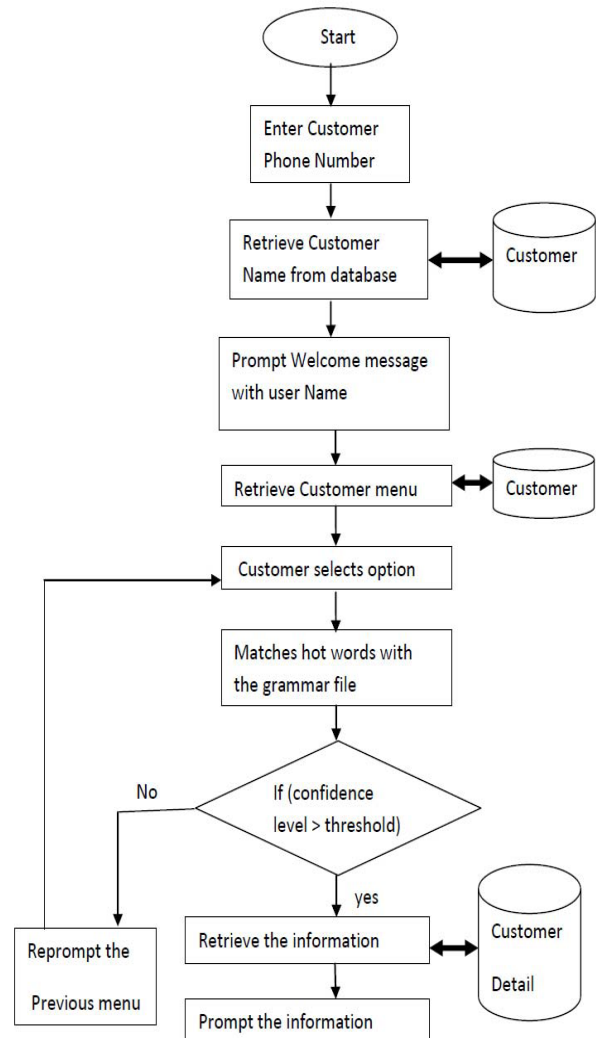


Fig 1.Flow Chart of the Personalized IVR system

B. Automated IVR System with feature based TTS using Open Source Tools.

Text to speech System is most widely used system in speech technology. We have various text to speech synthesizer systems available like Festival, Multilingual and Flite etc. A Text-To- Speech (TTS) systems a computer-based system that should be able to read any text aloud, whether it was directly introduced in the computer by an

operator or scanned and submitted to an Optical Character Recognition (OCR) system. Speech synthesis is a process where verbal communication is replicated through an artificial device. A computer that converts text to speech is one kind of speech synthesizer. In the business world, such situations are very common, especially for telephone transactions. Without text-to-speech (TTS) alternatives, business owners would have to spend money hiring even more customer service personnel. Synthesized solutions avoid this problem, since everything is done by computer, not a human being. Depending on the level of sophistication of the individual device, the sounds produced may be somewhat stilted and artificial sounding, or sound very much like the voice of a real

Following Tools/Applications required to setting up an IVR system[5]

S.No.	Basic Requirement	Optional Requirements
1	Centos Linux operating system	Apache web server
2	Asterisk	GUI Scripts
3	Festival / eSpeak Text to Speech	IPtables / PHP
4	MySQL database	Send Mail

C. IVRS for college automation.

In this IVRS for college automation system using voice over internet protocol (VOIP). Which the major part of the system software design. The system software development includes the technologies Goertzel algorithm, dual-tone multi-frequency signaling (DTMF), speech synthesizer etc. When caller dial the number then the technique used for identifying frequency components of a signal is Goertzel algorithm. That is for Dual Tone Multi-Frequency (DTMF) detection or decoding. A text-to speech (TTS) system converts normal language text into speech. For that Speech synthesis is used.

The call flows in the following manner and accordingly caller will get the information. When caller dial number, caller listen the welcome message that is in three languages (Marathi, Hindi, English). After that caller can choose any of these language for the information. After this caller can choose the field and then branch (Civil, Electronics, Electrical, Mechanical, Computer, IT). Then choose year (i, ii, iii, iv). After this the caller can choose either attendance or result. Then caller have to enter Roll no. And PIN no. Then system plays for attendance or result of the student.

After getting information call is disconnected[1]. Fig 2. represents the flow chart of the call.

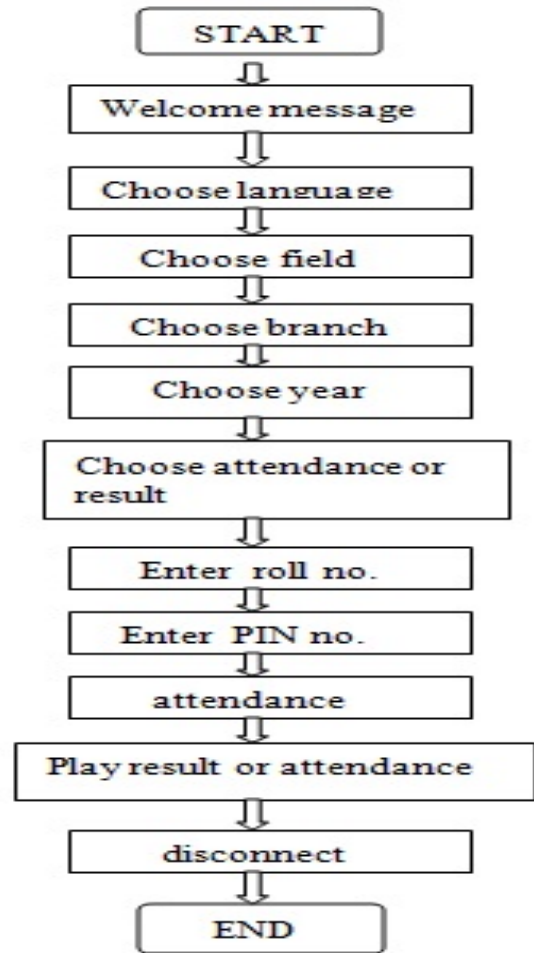


Fig.2 Flow Chart of Call

This type of system performs operations similar to that of a human telephone operator. The USP of the project is its relevance to the field of telephony and its cost that will be bearable even by a small concern due to its simpler and easily available components.

D. Telepurchasing using IVR system.

Tele-purchasing (sometimes known as inside sales or tele-sales in the UK and Ireland) is a method of direct marketing in which a salesperson solicits prospective customers to buy products or services, either over the phone or through a subsequent face to face or Web conferencing appointment scheduled during the call. Telepurchasing can also include recorded sales pitches programmed to be played over the phone via automatic dialing Telepurchasing has come under fire in recent years, being viewed as an annoyance by many[6]. As part of Tele-purchasing, IVR system can bring Customer data voices and the relevant information by pressing the key on normal telephones and input the required request information.

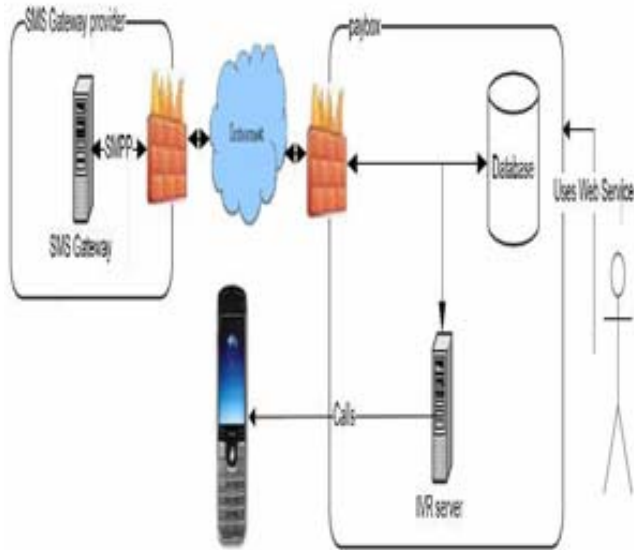


Fig. 3 System Overview Diagram

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III. CONCLUSION AND FUTURE WORK

The system designed will be intelligent for interaction and will suitably provide good response to the caller who can access it. It will be truly a responsible system for human mankind. According to the application available we can use the best appropriate method.

In future we can make it better than present scenario for college automation system. It would have installation, configuration and development of IVR setup in cloud & clustering environment along with virtualization. It also have database replication to provide redundancy and clustering support for strong data base and can be operated easily and of low cost. Benchmark Testing is also important.