E- EXAMINATION USING VOICE INTERFACE FOR VISUALLY IMPAIRED STUDENTS

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Abstract - *Voice based systems can access the internet very easily with the help of voice interface. With the development of voice based systems, the use of internet has become very easy for visually impaired students in the context of E-examination. This paper studies about how voice based systems helps to improve the problems that occur during E-examinations. This will provide a framework that will guide the development of voice based E-examination expert system for visually impaired students in Open and Distance Learning (ODL). This technique is not only beneficial for visually impaired students it can also be beneficial for other kinds of online examinations.*

Key Words: ODL, VUI, VCD, BVI, WWW, CBR.

1. INTRODUCTION

As time passes ODL has become very popular particularly in educational institutions as a result of its nature that is being characterized by time, distance and education. The normal web page cannot be used directly for students with visual impairments. The ease of access to distance learning programmes by the visually impaired is well-defined by the existence of significant learning resources and its usability. ODL based on assistive technology allows individuals with disabilities to do things that were difficult or impossible for them in the normal learning environment. ODL based on assistive technology establishes a system appropriate for persons with disabilities and more predominantly, for individuals with visual impairment, as it can add to their incorporation into the educational and societal environment.

While the blind and visually impaired (BVI) do not represent a large portion of the disabled in our society, they do represent a group that is uniquely disadvantaged by contemporary distance learning technologies, which tend to rely heavily on visual perception (e.g., video teleconferencing, World Wide Web (WWW), CD-ROM). This, coupled with a documented lack of qualified instructors for all special education. So a system should be generated such that visually impaired students can also access the web pages as normal students. ODL based systems assisted with voice interface can help to resolve such problems.

The National Centre for education statistics, U. S department of Education Washington D. C reported that the amount of visually impaired students attending high school has increased gradually. As the number of students attending high school has improved there is a need for assistive technologies that can help these students. In order to increase the quality of life of the blind and partially sighted persons, special attention needs to be paid to their education. For resolving the inconvenience with web pages, Voice User interface (VUI) systems are introduced. A voice-user interface (VUI) makes spoken human interaction with computers possible, using speech recognition to understand spoken commands and questions, and typically text to speech to play a reply. A voice command device (VCD) is a device controlled with a voice user interface.

In this E-Examination system, the system automatically reads out the questions along with the choices to the students, the student in return can reply to the system in terms of speech itself. In the background the text to speech conversion is performed. The important tool used for VUI systems is Voice Xml. This uses technologies allow users to traverse through a speech system by use of cellular phone and voice instructions.

In our current education system the calibre of a student is evaluated with the help of examination. So exams should be easily available for all categories of students irrespective of disabilities. The problem that should be considered is how we can conduct examination for visually impaired students. This problem is managed in this and improvements are also proposed.

The existing ODL technology is purely text based and is graphical. So it is not possible for visually impaired students. A study in [11] analyzed the problems a visually impaired student faces on reading information and navigating the pages. A multimodal approach has been used in [11] for combining visual and audio technologies for visually impaired students. Accessibility was achieved to some extent, some sort of intelligence could have further enhanced the convenience of navigating the menu driven dialogue sequence for these categories of students, as a result of their disability. A variety of studies based on e-examination has been proposed previously based on VUI, but it does not generate a successful form of assessment, which in turn can reduce the rigour of examination.

In ODL, internet technologies support learning and examination for the able-bodied learners. The visually impaired are therefore neglected in the scheme of technology-enhanced learning. Also, it can be challenging to achieve educational and mental assessments for students who are visually impaired using the normal examination system [12]. So there is a need for a voice based platform to assist these categories of students and hence the motivation of this research.

2. RELATED WORKS

The issue of availability utilizing web and discourse is extremely vital in the feeling of following access for the physically tested in learning and evaluation in an ODL domain [13]. Some earlier investigates in the territory of e-examination concentrated for the most part on the web stage [14], [15] utilizing web advancements, what's more, discourse advances [7]. Different investigations [16] on voice-put together learning centered with respect to giving sound-related interfaces to the outwardly hindered students. In an investigation by [16], intuitive classroom programming that offers a route for cross-stage access to web learning was presented. A voice framework was recommended that amasses a perplexing voice modules and e-learning materials. Voice XML was utilized to build up the voice discoursed and ASR and Dual Tone Multi Frequency (DTMF) signals were utilized for info methodology.

Creators in [17] structured, executed and conveyed a voice-based application called V-HELP framework. In the framework, a bit of the Computer Science and Engineering (CSE) division site was voice empowered utilizing Voice XML device to empower the outwardly hindered understudy populace to have access to the departmental data. Paper [18] furthermore, [19] investigated the blend of m-Learning applications and voice acknowledgment advancements to lessen get to boundaries for ordinary clients and outwardly/versatility impeded clients. The framework incorporates an Interactive Voice Response (IVR) framework that empowered taking in for visually impaired understudies from higher instructive organization of learning.

In [20], Voice Campus, an IVR framework for understudies of the University of Crete, Greece was created. With the framework, understudies approach data and examination results which was continuously made accessible on the web. This gives understudies simplicity to data and examination results. In [21] an online test framework utilizing a visual operator as an inspector that is discourse based was proposed. An one way question configuration test was led with three bunches so as to think about the impacts of the use of the operator in the discourse based framework. In [22] a model communication entrance framework for course enlistment and examination known as (Course Reg Exam Online) was created. The framework offers double access module utilizing VUI and Web User Interface (WUI).

WUI gives enrollment administrations and access to examination question the executives.

Much more examinations have been finished by various researchers trying to give smart administrations in the e-examination for the outwardly disabled in a typical customary examination framework utilizing voice. For example, [7] built up a wise voice-based e-Learning framework with a multimodal UI. Case-based Reasoning (CBR) was utilized as a wise segment of the framework making it workable for the framework to reason as a matter of fact. The framework was utilized for course enrollment, voice learning instructional exercise addresses and examination. The framework was intended for ordinary conventional examination settings where understudies live inside school grounds and remained in their residence. This investigation make a commitment to the ODL space by giving a structure that coordinates VoiceXML and master framework for the advancement of e-examination voice interface in separation learning condition to help the outwardly impeded understudies.

3 SYSTEM DESIGN

3.1 SYSTEM ARCHITECTURE

The proposed system design can be divide into three levels, namely introduction level, business logic level and information level.

3.1.1 Introduction Level

The introduction level gives clients interface to voice and web, and furthermore gives clients access to the framework utilizing convenient and shrewd gadgets. The segments of the VUI are land and cell phones. The WUI is comprised of PCs and PC. Clients dial into the framework utilizing their cell phones to take an interest in examination, while the executive deals with the client's profile and transfers examination inquiries through WUI.

3.1.2 Business Rationale Level

The business rationale level isolates the introduction level and the information level. It comprises of the framework administrations, application administrations and the middleware layer. The framework benefit parts are the voice passage and Hypertext Transmission Protocol (HTTP) can be corrected with help which is the thing that this exploration work recognizes. Administrations. The application administrations are made up of all the framework's modules,

For example, understudy enlistment, question transfer, examination and results handling. A client gains admittance to the application through the VUI utilizing a cell phone continuously.
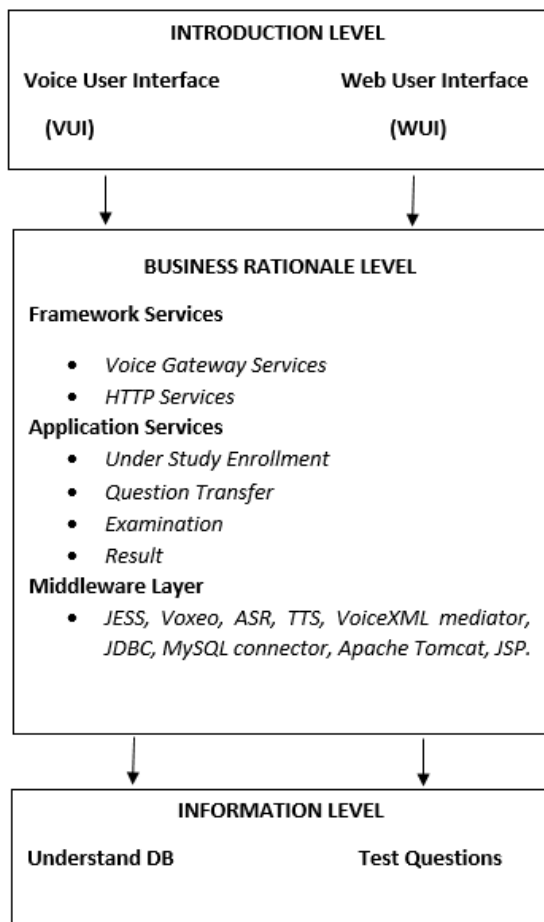
Fig 3.1. System Architecture

The Text-To-Speech (TTS) and Automatic Speech Acknowledgment (ASR) translator, which are the middleware apparatuses, are utilized for the voice interpretation. The VoiceXML translator conveys through the HTTP administrations to the Voxeo server. The web application utilizes the apache tomcat to recover data from the database and the VoiceXML mediator TTS sends the reaction to the guest utilizing voice. The middleware layer involve the devices occupied with the framework improvement, for example, master framework, voice advances, server side preparing what's more, database.

3.1.3 Information Level

The information level gives Database Management Framework (DBMS) functionalities. The information level contains data about the understudies, course, program, questions, answers and results. MySQL was utilized to actualize the database.

The exchange arrangement

At the point when a client dial into the framework, the client will have to experience certain discussion with the framework in request to achieve the ideal assignment. The discourse grouping demonstrates how the framework will be utilized by the clients. It contains a framework incite that says a welcome message to the client, which is trailed by sets of menu choices in type of contingent explanation utilizing IF proclamation.

Fig 3.2. The Exchange Arrangement

3.2 ALGORITHM

In creating the arrangements of inquiries, a variant of Fisher Yates called inside-out algorithm is used for rearranging calculation. It was utilized to actuate randomization of examination inquiries as appeared. The calculation depict a circumstance whereby an irregular thing is chosen and swapped with another thing before a variety of n areas is made. This results in age of irregular numbers, correlation of produced numbers with past number in cluster, prompting age of examination questions. In the plan of the framework, the job and collaboration of the clients were demonstrated utilizing the Brought together Modeling Language (UML) which includes use case chart, class outline, action graph and succession graph.
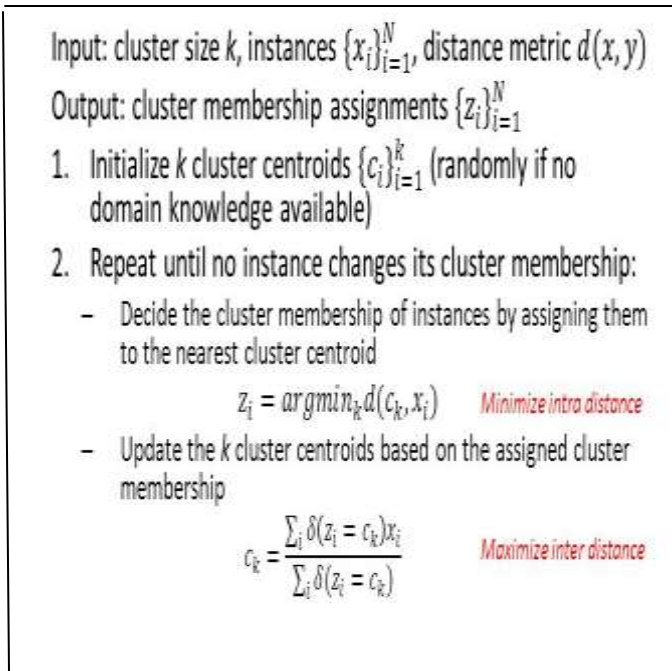
Input: cluster size k, instances $\{x_i\}_{i=1}^{N}$, distance metric $d(x, y)$

Output: cluster membership assignments $\{z_i\}_{i=1}^{N}$

1. Initialize k cluster centroids $\{c_i\}_{i=1}^{k}$ (randomly if no domain knowledge available)

2. Repeat until no instance changes its cluster membership:

   – Decide the cluster membership of instances by assigning them to the nearest cluster centroid

$$z_i = argmin_k d(c_k, x_i)$$ *Minimize intra distance*

   – Update the k cluster centroids based on the assigned cluster membership

$$c_k = \frac{\sum_i \delta(z_i = c_k) x_i}{\sum_i \delta(z_i = c_k)}$$ *Maximize inter distance*

Fig 3.3. K-Means Algorithm

To initialize an array a of n elements to a randomly shuffled copy of source, both 0-based:

```
 for i from 0 to n – 1 do
   j ← random integer such that 0 ≤ j ≤ i
   If j ≠ i
     a[i] ← a[j]
   a[j] ← source[i]
```

After examination, the result will be obtained. These results can be used to group the students in different categories. The algorithm used for clustering is K-Means. By doing so, we can divide the students to different categories and can give more concentration to weak students. In this way the idea of those students can also be improved.

4. FRAMEWORK IMPLEMENTATION AND EVALUATION

The VUI of the framework was actualized utilizing VoiceXML and the discourse motor utilized was Voxeo prediction [24]. Java Expert System Shell (JESS) was utilized for empowering the master framework functionalities.
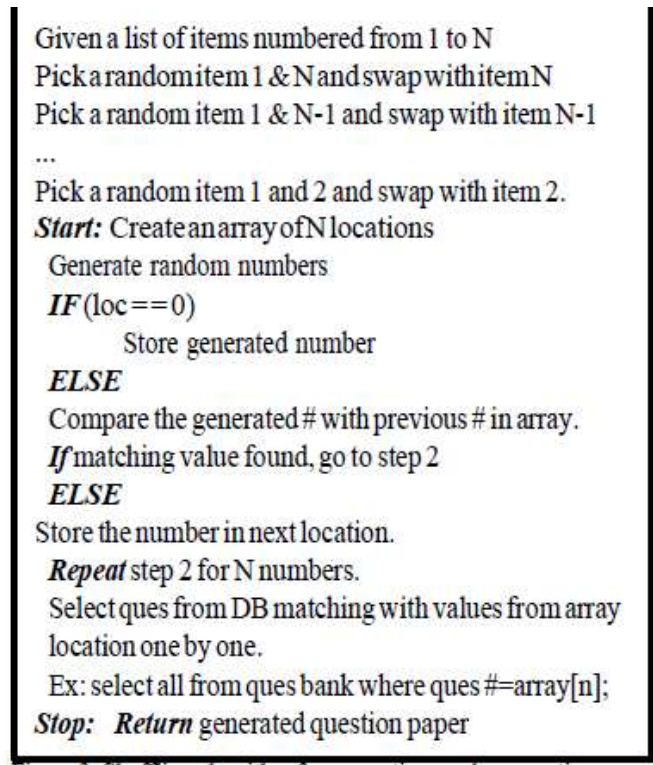
Given a list of items numbered from 1 to N
Pick a random item 1 & N and swap with item N
Pick a random item 1 & N-1 and swap with item N-1
...
Pick a random item 1 and 2 and swap with item 2.
Start: Create an array of N locations
  Generate random numbers
  IF (loc == 0)
        Store generated number
ELSE
  Compare the generated # with previous # in array.
If matching value found, go to step 2
ELSE
Store the number in next location.
  Repeat step 2 for N numbers.
  Select ques from DB matching with values from array location one by one.
  Ex: select all from ques bank where ques #=array[n];
Stop: *Return* generated question paper

Fig 3.4. Shuffling Algorithm

The framework was executed with the end goal that each approved client is given a discourse menu and examination addresses that will be perused out to the client. Clients' answers are coordinated against the privilege replies in the database and the outcome conveyed to the clients through voice. At the point when the application is keep running on a neighborhood PC, the client dial a specific taste number on [24], to associate with the e-examination framework and from that point pursue the discourse succession. At the point when the framework is conveyed on a Voxeo discourse motor, a number that is created on the Voxeo stage is dialed from a cell phone to interface with the e-examination framework. The VUI gives moment input of examination results, for what it's worth with a web based examination.

The WUI was actualized utilizing JSP/Servlets which gives simple access to the master shell. For the server side, JSP and Apache Tomcat were utilized, while MySQL and JDBC were utilized as the database. The WUI incorporates a login page, examination page, also, expansion of test addresses page. The example screen shot in Figure 4 is a showcase of various examination questions and choices in radio catch list. Clients are required to choose just a single alternative for each inquiry.
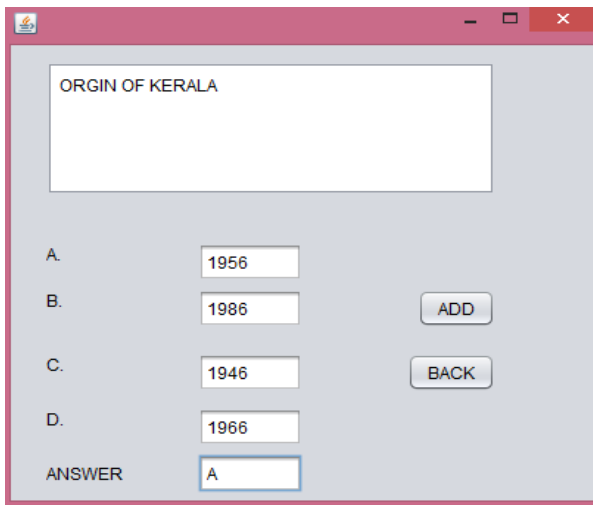
Fig 4.1. Question Uploading

The WUI was actualized utilizing JSP/Servlets which gives simple access to the master shell. For the server side, JSP and Apache Tomcat were utilized, while MySQL and JDBC were utilized as the database. An ease of use assessment of the framework was done utilizing [25] to quantify the viability, proficiency and fulfillment of the framework. In doing the field study of clients' feeling of the framework, polls were dispersed to respondents.
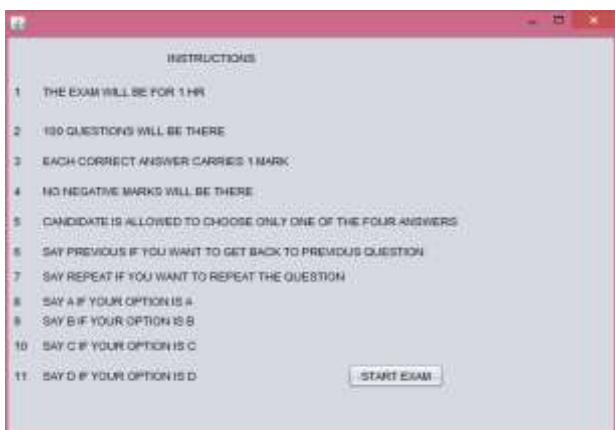

Fig. 4.2. Instructions

The structured poll had three areas: Background data of respondents (6 questions), client fulfillment (6 questions), adequacy (5 questions) what's more, effectiveness (6 questions). The inquiries were controlled by means of a five-point rating scale where 1=strongly dissent, 2=disagree, 3=undecided, 4 =agree what's more, 5=strongly concur. An aggregate of ten polls were controlled and every one of the reactions were gotten and broke down. The ease of use investigation in Figure 5 demonstrates that adequacy is 31%, productivity 37% and clients' fulfillment 32%. The aftereffects of the ease of use assessment demonstrated that the created application had a 'Normal Ease of use' rating of

3.48 out of 5 scales. A great deal of studies on ease of use assessment are of the sentiment that a framework with "Terrible Usability" ought to have 1 as mean rating, "2 as Bad Usability", 3 as Average Usability, "4 as Good Usability" and "5 as Excellent Usability". Likewise, [26] suggested that "Great Usability" and "Normal Usability" ought to have a mean rating of 4 and 3 individually on a size of 1-5. In this way, it very well may be reasoned that the model e-examination VUI application created for the outwardly disabled students in ODL has "Normal Usability" in light of the normal (AVG) complete rating of 3.48

5. CONCLUSIONS

It ought to be noticed that reviews by past researchers on assistive innovation, (for example, the one announced in this article) for the outwardly hindered students, have to a great extent concentrated on the examples of overcoming adversity in created nations in the Western Europe and North America [27], where huge advancement has been recorded [28] and [29], be that as it may, the status of assistive innovation in the creating nations in Africa, Eastern Europe and Asia, essentially features downsides in its execution [30]. Among the dominating hindrances to the effective execution of voice-based comprehensive instruction for the outwardly debilitated incorporates lacking subsidizing, lacking prepared educators and support staff, legislative help, insufficient arrangements and enactment, political insecurity, and monetary emergency [27]. These are a portion of the confinements of the examination that would should be tended to, for effective arrangement of the voice-based e-examination master framework for the outwardly disabled. As far as security of the application, verification of the guest utilizing email and stick was locked in. Further chips away at this study will incorporate a third method of validation utilizing guest's voice print.

In this paper, an e-examination voice interface for the outwardly impeded students in ODL has been given. The created framework was acknowledged utilizing a structure, framework plan with pseudo code exchange succession and calculation. An ease of use assessment of the framework was likewise led. The voice-based e-examination framework would enhance the availability of examination in separation learning for students with visual impedance, just as other capable students.

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