Accessing Information about Programs and Services through a Voice Site by Underprivileged Students in Education Sector of Sri Lanka

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Abstract - *The World Wide Web (WWW) has made the Internet accessible to anyone regardless of their computer background. A large number of people in the world are using Internet facilities for various purposes. Especially in the education sector most of the universities and other institutions around the world using Internet for networking, teaching and learning purposes. Therefor students should have the facilities to access the information through the Internet easily and quickly. However there is a huge number of students, especially in the developing region like Sri Lanka who are still unreached by this sophisticated facility. Because of lack of resources. But mobile phones and wireless phones have made a considerably high percentage into the population of Sri Lanka. Low of cost, the simple user interfaces, limited menus, Infrastructural growth are the main factors to the high usage of mobile and wireless phone.*

The main objective of this research to implement a voice site which is a voice-driven site parallel to the existing web site in education institutes. This concept is known as The World Wide Telecom Web (WWTW). A voice-driven site which addresses the underprivileged students to access the information through voice based communication parallel to the web site and provide a facility to generate own voice site. Voice site enables the telephone (Mobile, Wireless and fixed phones) students to access through a simple voice based interface from telephony devices and do voice browsing further. This helps for education institutions to reduce the operational cost.

Key Words: **World Wide Telecom Web (WWTW), Voice XML (VXML), Voice Site, Voice Browser, Voice Recognition**

1. INTRODUCTION

The Internet is the one of the sophisticated technology and fashion that have made differences in world order in recent past. The World Wide Web is one of the service accessible via the Internet along with various other including email, file sharing, online gaming, streaming media, voice telephony, remote access etc. Therefor the Internet and WWW are very popular in modern society and the most of the sectors in the society like educational, industrial, business, government are exposed to the Internet and World Wide Web.

1.1 Overview of the Problem

Situation in Sri Lanka, The Internet penetration is 29.3% according to the Internet World stats [6]. When it compares to other developing countries. It is a low percentage of the Internet usage. See Table 1.

Table-1: Internet usage and Population Statistics in Sri Lanka

Year	User	Population	%penetration
2016	6,087,164	20,810,816	29.3 %
2015	5,839,905	20,715,010	28.2%

There are various reasons to the low rate of the Internet penetration in Sri Lanka. The most common access mechanism to the Internet has been through the Personal Computers (PCs) or high end web-enabled handled devices. A PC cost is still high about LKR 20,000(USD134) - 30,000(USD202). This is very costly for people in Sri Lanka who are spending money for educational purposes as well as connectivity cost is also very high in Sri Lanka. Common methods of access Internet include dial-up, broadband, Wi-Fi, Satellite. Dial-up connection is comparatively cheaper than others but it has slow moving traffic (52kbps). In additional to cost factor, there are infrastructural issues such as non-availability of electricity and non-availability of Internet connection facility. In rural areas in Sri Lanka still not having the facilities of electricity and telecommunications. A huge amount of money is needed to invest to develop infrastructural facilities but developing country like Sri Lanka, It is impossible to do quickly. In addition, using a PC requires IT skills beyond language reading and writing, leading to a low acceptance rate.

Interestingly, Mobile phones and Wireless phones usage in Sri Lanka is increasing rapidly. Many of the local and foreign Telecom companies invest on the telecommunication sector. Now a days, Most of the rural areas in the Island wide have been covered by telecommunication service providers. Hence cost of Mobile phones and wireless phones are considerably low than a PC and the connections facilities are also cheaper than the Internet connection. Therefore these phones have had a far greater penetration among the Sri Lankan population and have the potential to communicate with the underprivileged users beyond the basic voice communication. In addition, the simple user Interfaces, limited menus are few reasons to the popularity of the mobile and wireless phones.

1.2 Goal and Objectives

The goal of research work is to enable the students who wish to follow programs can access and share existing Information and service through Mobile, Wireless or fixed line phones. To ensure this, a voice site which is a set of interconnected voice pages (i.e. Vxml files) hosted and located in the telecommunication infrastructure is developed [3].

The contributions of the paper are as follows:

● Enables the underprivileged students to access and share Information and services through existing telecommunication facility.

● Enables the students to access voice pages and generate their own voice pages.

● Provide a cost effective ecosystem for students parallel to the Web site.

● Reduces operational cost of education institutions.

● Provides accessibility to physically impairment students.

2. DESIGN OF THE SYSTEM

In this system, two main components can be identified with sub components.

1. Voice Site Hosting Engine

2. Voice Site Generator

2.1 Voice Site Hosting Engine

Voice Site Hosting Engine hosts a Voice site with a telephone no which is mapped with VoiNum [3]. It is like, IP address is mapped with Domain name. Students interact with the system through a Voice browser and given telephone no. This voice site is a predefined site with a sequence of questions (Fig-2). That is used to create by Reusable Dialog Component (RDC) Repository and Registry [2]. RDCs are predefined Voice User Interface components that can be used as readymade dialog components to develop voice applications [2]. Then Automated Voice Recognition System (AVRS) converts speech to text. Those texts capture in AVRS send to the Voice Site Generator. Finally Voice Site Hosting Engine uses Student Voice XML (VXML) Repository to store customized voice sites from Voice Site Generator [1] and Interactive Voice Response System (IVRS) is used to deliver voice. All together AVRS and IVRS are called Speech Recognition System.

2.2 Voice Site Generator

This is the core part of the system. Based on student's requests, it creates voice sites by using voice site creator with an application composition system and integrate with web server and database server and it consists of predefined Voice Application templates suited to different student requests such as program details, scheduling, and fees. Those templates are known as Voice templates. Here Voice XML is used to
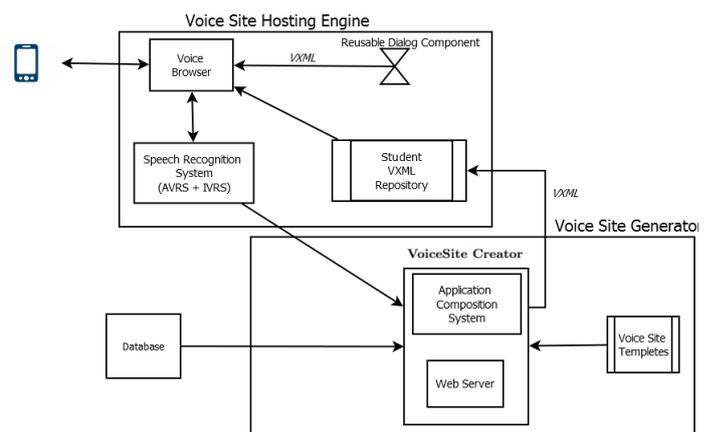
format voice sites and voice templates [5].

Fig-1. System Architecture

2.3 Motivation Scenario

Let say Amal a student, he wants to get the information about Bachelor of Information technology University of Colombo School of computing from one of the educational institution. Assuming that institution is offering number of programs for the students and maintain the system with database.

Amal does not have an Internet connection at that time or not accessible to the Internet but it is an argent. He knows the phone number. In some case though phone he cannot get reliable information once he calls to the hot line.

Here a sample interaction of system with student.

```
Voice : Welcome to Voice Prompt, Please Answer the Questions
Voice : What is your Name?
S : Amal
Voice : Do You Want to get Information about BIT UCSC degree
say 1, Londen Met BSc Degree say 2
S : One
Voice : Do you Want to get program Details say 1, Scheduling
Say 2, Program Fee say 3
S : One
Voice : Please wait your request has been recorded,
Your voice site is generating Thank You
```

Fig-2: A sample interaction of system with a sequence of questions.

A sample VXML code can be referred in Fig-3.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<vxml version = "2.1">
  <meta name="creator" content="dherath10@gmail.com"/>
  <form>
    <block>
      Welcome to Voice Prompt, Plaese Answer the Question
    </block>
    <block>
      What is your Name
    </block>
    <block>
      Do You Want to get Information about BIT UCSC degree say 1, Londen Met BSc Degree say 2
    </block>
    <block>
      Do you Want to get program Details say 1, Scheduling Say 2, Program Fee say 3
    </block>
    <block>
      Please wait your request has been recorded Your voice site is generating Thank You
    </block>
  </form>
</vxml>
```

Fig-3. A Sample VXML code for a predefined voice page

A student could access voice site through phone number [1] which is located in Voice Site Hosting Engine. The voice browser presents the voice interface to the student consists of sequence of predefined voice prompts. Then student can easily answer the voice prompts to get information. Those input voices are records and interact with Automated Voice Recognition System (AVRS) that provides speech recognition and synthesis technologies required to capture and render voice input during the conversation with student [2].

By analyzing the answers, AVRS identifies which information are needed by the student. Then those findings are forwarded into Voice Site Generator [1]. Voice site creator generates customized voice site (Voice XML format) getting information from existing database. Then the customized voice site is delivered requester using standard protocols.

3. IMPLEMENTATION

Students call up the Voice Site by dialing a specific phone number from a regular phone. Voice Sites are hosted in a centralized server (Websphere), The Voice Sites are authored in Voice XML and use a voice browser (Genesys Voice Platform) and a speech recognition server (Websphere Voice Server) to handle Input voices. Database server are used to store data and information. Standard programming language (java) is used to develop the system components. The System is built on standard protocols therefore it is not depending a specific software [4].

4. EVALUATION

A Survey is conducted with students and institutions. The Internet facilities is very high urban and suburban but students are visiting their home town and villages still they are facing a lot of hindrances. Therefore most of students are welcome to voice driven application and institute point of view they agree to implement such a system as a positive approach to give their services minimize any obstacles.

5. CONCLUSIONS

Voice driven system is an attempt to give a better service for the underprivileged students, similar in way to what World Wide Web (WWW) is to the IT literate students today. It enables to access information and services through voice driven channels. Enabling voice-driven front-ends to websites and WWW services would only enable the underprivileged to access global information.

This system builds a vision of a service for students in developing regions that harnesses WWW services as well as the ones in the converged networks under one

umbrella. Further, it provides the means to create and sustain an ecosystem of local (and global) services, information and communities relevant to these underprivileged students.

5.1 Advantages

- The easy of accessing Information and services for underprivileged students

Underprivileged students can easily access the Information and services through existing infrastructure and with less number of Hardware resources. They need not to have computers, Internet connection or electricity facilities in order to access to the super highway. When we compare with computer literacy mobile and wireless phones can be used to access the Internet easily because of the simple interfaces and limited menus.

- Easily integrate with local and remote applications

Voice sites provide a gateway to several categories of services in WWTW. Voice sites can be used in existing IP network to share Information and services in WWW.

5.2 Challenges

- Usability

When the users are accessing Information and services. There is no visual interfaces to view the entire application. It is difficult to browse through voice sites without a proper guide interaction. All the steps should been memorized in order to browse.

- Searching

The key piece of the Information to be searched would be voice. This requires advanced automatic speech recognition techniques. Pronunciation of a key voice phase could be differ from student to student. Therefore it is a key challenge to filter the voice phase. Error recognition is also a big challenge.

- Accessibility

Supporting a multiple language is a huge challenge in underlying speech recognition and synthesis technologies. In additional to that students who have problems in speaking and hearing would be able to access the access the voice sites.

- Infrastructure

WWW is very popular in the entire world. New technologies and concepts are developing rapidly and using frequently. The growing rate of the WWW is tremendously high. But Telecom world, it is much more controlled and lack of open standards [1].

5.3 Future Works

This voice driven application is develop to support for only English language as future work, it is going to develop to support multiple languages. There is no voice searching facility, more advanced speech recognition and synthesis technologies are introduced to overcome those issues.

This system is not for only education sector. This facility can be used in e-commerce, e-government, e-learning sector as well as.

Finally, our effort is to provide a better and practical solution by integrating WWTW with WWW to minimize the gap between underprivileged and privileged students to achieve their educational prospects.
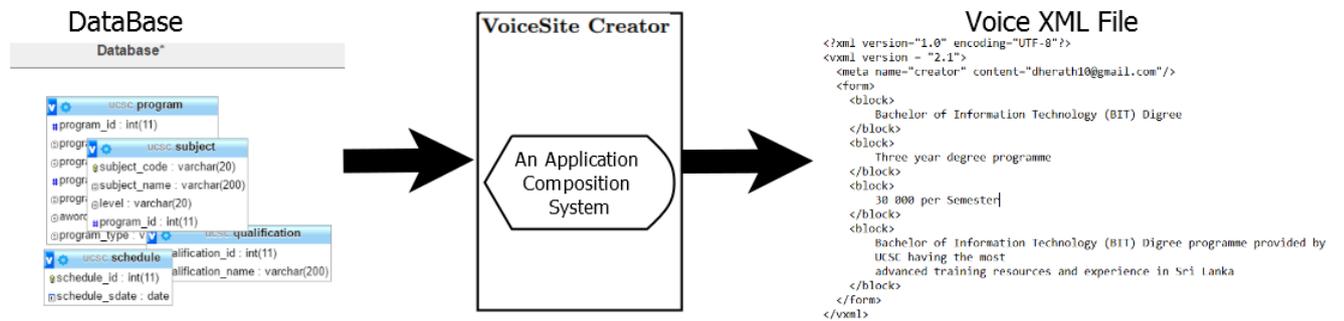
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APPENDIX

Fig-4. The Process of Creating a Customized Voice XML