Cloud Based Ubiquitous Computing for Smart Classroom using Smart Phone

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Abstract:
The idea behind this project is reducing the cost and improving the quality of service in this technology aided learning. Here, we will replace laptop’s or any other portable device with Raspberry Pi. The web interface of raspberry pi will be used to access files stored on remote location and view them through projector. This project will replace laptops or portable devices with raspberry pi and thus help in cost reduction. It will also help in improving the quality of service as device will consume less amount of power. We can also use smart boards for good quality of services. The smart Board is an interactive white board that uses touch detection for user input in the same way as normal PC input devices. But it will be costlier as using smart board for each and every classroom will not be feasible and will be costly. Hence, we will collaborate the idea of smart board and smart projectors for our smart classrooms. The proposed system will be controlled by using a smart phone which will be more convenient. In this system, we are also going to develop a mobile application for Admin and Student. This application includes two modules namely Student and Admin. After the registration procedure, user can login in his/her account. Admin is able to upload the documents for students. Admin can able to send Notifications such as the meeting schedule, events, alerts etc.

Keywords: Raspberry Pi, Smart Board, Cloud Computing, Wireless Interface

I. INTRODUCTION

A Smart Classroom is an intelligent class that integrates emerging technologies with novel teaching and learning methods. The smart classroom system requirements should be designed to promote the development of active interactions among learners for cooperative education and provide essential elements that allow teachers to help them interact with each other. The smart class room concept appeared with the evolution of the internet based learning such as e-learning, m-learning and many other distance education systems or intelligent environment equipped with a set of devices that communicate with the gateway. The emergence of connectivity and the developments around has totally changed the vision of teaching methods. Innovation in education sector using technologies such as pervasive computing facilitates of the communication among students. This educational solution offers perfect teacher-student interactivity while contributing to learning through use of tablets, computers that can be controlled and monitored by the teachers. So just what is displayed on the digital table can be instantly shared with the students equipped with these devices. Student is able to download and upload document on cloud. Admin can also download, modify documents on cloud. User can draw diagrams or write something with the help of stylus. There is wireless interface between mobile and cloud, and mobile and projector using Raspberry-pi. In fact, students outside the school can follow the courses. The application will have a admin login and student login. Admin will have access rights to upload the data to the cloud. They can also download and modify the data. Student can only download the data from the cloud. To access the cloud, we will use http protocol. HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files on the World Wide Web. This learning method ensures greater flexibility in transmission of knowledge by teachers. Ubiquitous computing is a concept where processors and sensors are embedded in various physical objects to form a network and communicate information. Using this concept, the focus of teacher-student’s interaction with the environment is through heterogeneous devices connected to a gateway. This solution allows educational environment to be controlled as well as providing direct internet access in classroom through a gateway.

II. MATERIALS AND METHODS

Figure 1. system architecture
The main idea behind this project is wireless control of projector using Wi-Fi. For giving presentations teachers have to carry their laptops and in case laptop is not there then they have to carry CPU, keyboard, mouse etc. and do all those complicated connections. As these connections are wired and it restricts them to stand at one place and control their presentations. To reduce all these efforts Raspberry pi can be used. Raspberry pi is a credit card sized computer which uses Raspbian OS which is Linux based. To control all the operations from anywhere in the class we can use mobile devices and Wi-Fi at transmitter side. The mobile device will contain an application which will be connected to the projector using raspberry pi and the same application will be used to access the cloud storage. Cloud storage is a cloud computing model in which details stored on remote servers accessed from the Internet, or "cloud." It is maintained, operated and managed by a cloud storage service provider on storage servers that are built on virtualization techniques. The application will have a admin login and student login. Admin will have access rights to upload the data to the cloud. They can also download and modify the data. Student can only download the data from the cloud. To access the cloud, we will use http protocol. HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. This cloud will have different storage units for different departments and only the admin or student of that department can access that particular unit of the cloud. The mobile will contain an application which will act as a GUI. This application will help us to show all the data stored on the cloud or from the mobile’s internal memory or some other external storage. Also, it will help us to draw diagrams with the help of stylus. This application will be connected to the projector using raspberry pi. And hence the main aim i.e. to access the projector from anywhere can be accomplished.

A. Connection between Smart Phone and Database
HTML5 is used as a web interfaces between mobile devices a cloud server. Mobile devices are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. They are becoming more and more powerful with full-fledged facilities provided by various services from mobile applications. However, the mobile devices are facing many challenges in their resources and communications. The limited resources significantly obstruct the improvement of service qualities. These challenges are solved at some extent by using cloud computing (CC). CC offers some advantages by allowing users to use infrastructure (e.g., servers, networks, and storages), platforms (e.g., middleware services and operating systems), and software’s (e.g., application programs) provided by cloud providers (e.g., Google, Amazon) at low every platform. It ensures that application and their data also should be available when device is offline. It will shorten cost. With the explosion of mobile applications and the support of CC for a variety of services for mobile users, mobile cloud computing (MCC) is introduced as an integration of cloud computing into the mobile environment.

![Figure 2. Smart Phone and Database Connection](image)

The HTML5 was initially developed so as to simplify the web content creation and to reduce the requirements of extra plug-in for the browsers. Nowadays, the HTML5 specifications open the door to a large area of application, from multimedia distribution to business and development application. Rational and significance of the study generally native component or web interface or is used in Mobile Cloud Applications. But it would be bound to particular platform; it does not work on another platform. So, we require such interface for application which compatible on update lifecycle significantly. There is no notion of application installation. HTML5 has cross-platform capability. HTML5 support is available in any latest mobile device’s browser. So, application made in HTML5 can be run on any devices. Ability to use same application and data from different devices without tedious installations. Here applications and data are stored on cloud and not bound to particular devices. So, we can use it on anywhere, anytime and on any device. HTML5 is lightweight than other alternative like Flash, etc. It has not required extra plug-ins because it has built in support for video, audio, canvas, etc. Survey of work done in the area and techniques to be used HTML5 specifications open the door to a large area of applications from multimedia distribution to business and development applications, thus becoming the preferred language for mobile web. HTML5 extends the previous elements so as to deal with the interaction modes emerged (simple/multi touch, touch scrolling, etc). If we use Web Socket connection mechanism with deflate compression mechanism in HTML5, network consumption will become efficient.

B. Connection between Projector, Raspberry-pi and Smart Phone

Raspberry Pi Model B is to be used for this purpose. It comprises of a 512 MB RAM model with two USB ports and a 10/100 Ethernet controller. The figure below shows the model. The Raspberry Pi Model B consists of a 512 MB RAM. It exhibits the Broad com BCM2835 ARM11 700Mhz ‘System on Chip’ Processor. One can play Full 1080p High Definition Blu-
Ray Quality Videos on Raspberry Pi due to the presence of Integrated Video core 4 Graphics Processing Unit (GPU). One can program as well as learn programming conveniently due to the presence of the free, versatile, and highly developer friendly Debian GNU/Linux Operating System. It consists of 2 USB ports, 1 HDMI Video output, RCA Video output, 3.5mm Audio Jack output. Raspberry Pi Model B is powered by a 5V Micro USB Power Input Jack. It is pretty energy-efficient as it requires only about 700mA current to operate. It also consists of an SD, MMC, SDIO Flash Memory Card Slot SD, MMC, SDIO Flash Memory Card Slot as well as a 26-pin 2.54mm Header Expansion Slot [6].

![Figure 3. Raspberry pi connection](image)

The HDMI port on Raspberry Pi will allow connecting a projector to the palm top. This also helps eliminating the need an LCD screen, thus reducing the cost involved. The next component is the SD card storage, which will store all the files which are transferred to the Pi from remote locations. The network access layer includes the use of wireless dongle or Ethernet to connect to the network the remote-control application will be present on the smart phone and will primarily be used for navigating through the slides for teaching purposes. Message Queuing Telemetry Transport (MQTT) Protocol is being used for interfacing between raspberry pi and smart phone. It is a lightweight messaging protocol that provides resource-constrained network clients with a simple way to distribute telemetry information. The protocol, which uses a publish/subscribe communication pattern, is used for machine-to-machine (M2M) communication and plays an important role in the Internet of Things (IoT).

**C. HARDWARE REQUIREMENTS**

- 8GB RAM (Development machine)
- Raspberry-pi
- 5V Micro USB Power Input Jack
- 5V Micro USB Power Input Jack
- HDMI Video output
- RCA Video output
- 3.5mm Audio Jack output
- 26-pin 2.54mm Header Expansion Slot
- SD, MMC, SDIO Flash Memory Card Slot

**Raspberry pi** is a credit card sized computer which uses Raspbian OS which is Linux based. It’s basically a small PC which provides all the basic functions that are provided by a desktop PC. For example, it provides functions like word processing, gaming and playing audio/video.

**Android phone:** The mobile device will contain an application which will be connected to the projector using raspberry pi and the same application will be used to access the cloud storage.

**D. SOFTWARE REQUIREMENTS**

- Operating system: Windows 7
- Language: Android, Java
- Software with version:

**E. TECHNOLOGIES USED**

**GPS:** Google Play services are used to update Google apps and apps from Google Play. This component provides core functionality like authentication to your Google services, synchronized contacts, and access to all the latest user privacy settings, and higher quality, lower-powered location based services.

**WEBSERVICE:** A Web service is a service offered by an electronic device to another electronic device, communicating with each other via the World Wide Web. In a Web service, Web technology such as HTTP, originally designed for human-to-machine communication, is utilized for machine-to-machine communication, more specifically for transferring machine readable file formats such as XML and JSON. In practice, the Web service typically provides an object oriented Web-based interface to a database server, utilized for example by another Web server, or by a mobile application, that provides a user interface to the end user. Another common application offered to the end user may be mashup, where a Web server consumes several Web services at different machines, and compiles the content into one user interface.

**III. CONCLUSION**

This system creates an innovative platform for professors and teachers to use their android phones as white boards by use of screen projection. This product indeed has tremendous potential of replacing laptops, especially for the particular application of storage and projecting.

**IV. DISCUSSION**

To create online/offline interface between teachers and students. E.g. If a student is absent then with the help of this interface he will be able to follow all the activities happening in the classroom. This interface can be online/offline. This can be extended over a large scale too, say for all the departments of the college and then also over many institutes all over the country.

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VI. REFERENCES


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