

Web Based Pre-School Children Monitoring System

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Abstract: This paper presents a Web based Child Monitoring System for monitoring of children in the Pre-School Educational system. The prime objective of this research work is to design a system that can provide parents the opportunity to obtain real time information or the state of their children or ward via their mobile phone from a remote location. And to achieve this, web cameras are mounted in all the classrooms and strategic locations within the school premises which capture and store activities going on in the classrooms and within the school premises in form of video. These videos are served into a web portal, such that any Parent or guardian who wishes to access the information or videos will login into the web portal with a web address using their GPRS enabled mobile phones, Laptops, palmtops, Tablets, Desktop Computer etc. The researcher adopted the object modeling technique design methodology to develop the system. The programming languages used in developing the system are, Hyper text markup language (HTML) in conjunction with the Hypertext Pre Processor (PHP) scripting language, JQuery and Real Time Media Protocol (RTMP) development tools. Information used by the system was stored on the internet with the use of the MySql database, RTP server and File storage. This system has been tested and found to reduce frequent calls and visits to schools as usually embarked upon by parents to check on their wards, since parents can react to any observed issues through instant live chat to administrator in the school. The development of a web based child monitoring system can help schools to manage its security problems and also provide the school with computer systems that will store its student's information efficiently in a database.

Keywords: *Monitoring, Crime, Security, Web Based, Web Camera, Real Time, Video Streaming, Server*

I. INTRODUCTION

A. Background

In fact, World Wide Web traffic, which mostly uses the Hypertext Transfer Protocol (HTTP), greatly surpasses any other application protocol (such as Telnet and FTP) as using the most bandwidth across the Internet. Modern

computer operating systems provide Web browser applications by default. Some even provide Web servers, thus making it easier for users and businesses to explore and exploit the vast capabilities of worldwide networked computing. The World Wide Web is a global hypertext system that was initially developed in 1989 by Tim Berners Lee at the European Laboratory for Particle Physics, CERN, in Switzerland to facilitate an easy way of sharing and editing research documents among a geographically dispersed group of scientists. In 1993, the Web started to grow rapidly, which was mainly due to the National Center for Supercomputing Applications (NCSA) developing a Web browser program called Mosaic, an X Window System-based application. This application provided the first graphical user interface to the Web and made browsing more convenient. Today, there are Web browsers and servers available for nearly all platforms. The rapid growth in popularity of the Web is due to the flexible way people can navigate through worldwide resources in the Internet and retrieve them.

B. Preschool

Preschool or infant education is the provision of learning to children before the commencement of statutory and obligatory education, usually between the ages of one and five, depending on the jurisdiction of the state. Preschool education is essential as it is the foundation for the child's education. The skills and knowledge developed during the preschool years will have a dramatic impact on the child's academic success when formal schooling begins and will give the child the edge in a competitive and educational environment

The main objectives of preschool are:

- To develop a good physique, adequate muscular co-ordination and basic motor skill in the child.
- To develop good health habits and to build up basic skills necessary for personal adjustments such as dressing themselves, toilet and eating habits.
- To develop emotional maturity by guiding the child to express, understand, accept and control his feelings and emotions.

- To develop good desirable social attitudes, manners and to encourage healthy group participation.
- To encourage aesthetic appreciation (art, music, beauty, etc.)
- To stimulate the child's beginning of intellectual curiosities concerning his immediate environment.
- To encourage the child's independence and creativity by providing him with sufficient opportunities.

Indeed the school is an opportunity for progress of the student. Each one is having the freedom to develop freely (Akinola, 2004).

II. REVIEW OF RELATED LITERATURE

Different technologies have been used to implement child monitoring systems to relieve parents from continuous observation of their children. These techniques include camera systems, wireless technology using RFID sensors, and GPS systems. Cooper *et al.* (2010) collected data about the outdoor physical activity of over 1000 children to study their behavior patterns. The data was collected through accelerometers and GPS receivers. Al-Ali *et al.* (2008) described a Kids Tracking System using RFID sensors. The system was designed to track moving children in an area such as a large park or a shopping center. The children to be tracked were given an RFID tag to wear. Several wireless RFID readers were installed in the park. These readers sent the locations of the children to a central station through wireless LANs. A multiple camera system using FireWire web cameras was described by Rai *et al.* (2003). One of the potential applications for this system was to track the position of a moving person. The aforementioned systems are examples of three technologies that have been used in child monitoring systems. There has been also research work that combined some of the aforementioned techniques. Shatha K. Jawad, Al-Gawagzeh Mohammed Yousef, and Balkiest Essa Al-Shagoor (2009), presented a child tracking system that used GPS outdoors and RF signals indoors to provide the locations of children. Another child tracking system was developed by Nakagawa *et al.* (2003). This system used multi-camera system and RFID to monitor children. Based on the information provided from the RFID tags, the parents can choose the camera that will take and transmit the images. A system that combined omni-directional camera and a GPS receiver to remotely monitor a child was described by Ishikawa *et al.* (2008). This system allows the parents to open Google Maps using the position provided by the GPS system. The images transmitted from the omni-directional cameras would compensate for the measurement error of the GPS

system. Sampath and Sundaram (2008) described a mobile unit that combined an omni-directional camera, a basic health monitoring gadget module, and wireless transceivers to serve as a remote monitoring system for children. In the work of Wong *et al.* (2009), a child care system that combined GPS and Bluetooth technologies was proposed. The system detects the location of the child with the GPS system and the distance between the child and the parent through received signal strength indicator (RSSI) from Bluetooth. Rafidah *et al.* (2006), described a school children monitoring system via RFID. It is a combination of the latest technology using RFID. When the student enters the main school entrance, they must pass the tag that is given to the RFID antenna, and the RFID reader will read the student ID. Then, information about the student such as time in and time out from school will be recorded to web based system and the SMS system automatically sends to their parent's mobile to inform them that the children arrived safe at school. Khepera robot, a robotic child monitoring prototype system capable of remotely reporting the status of a child and take actions based on the interpretation of the scenarios, was proposed by Yanfei *et al.* (2011). In this prototype system, the robot is capable of finding and following a 7-10 month old baby prop (crawling age) in a confined space. This system also features an artificial intelligence component in order to determine the danger level that the child might be in and take actions accordingly. This research differs from all the above work done on monitoring of children, in the sense that it gives a real time video stream of school activities and equally enable the parents/guardians to make comments to Admin through live chat, and obtain response from Admin, in case of any observed issue or anomaly

III. METHODOLOGY

According to (Hornby 2001), methodology is defined as a set of methods and principles used to perform a particular activity, and software Methodology is the body of methods, rules, postulates, procedures, and processes that are used to manage a software engineering project (Osugwu, 2008). System analysis is defined as the detailed study of a system with a view to unfolding all its inherent problems and possibly suggesting and proffering ways to curtailing them. The objectives of research methodology is to take a realistic insight into a system and its problems areas so that an improved system can be designed. Therefore, to tackle this research, a set of well articulated guidelines and procedures was adopted in order to be able to achieve the desired result. The concept of system methodology entails the physical implementation of the logical cycle that incorporates the following activities:

- The step-by-step processes/activities for each phase involved.
- The individual functions to be performed in various activities.
- Deliverables standard for each activity involved in the process.
- Tools/techniques to be applied for each activity

There exists a number of software engineering methodologies that can be used to develop the proposed system. Some of them are waterfall/sequential model, spiral/cyclical methodology, rapid prototyping model, object modeling technique, structured methods, etc. However, we decided to adopt the Object Modeling Technique (OMT) for this work.

OMT is an object-oriented software development methodology developed by James Rumbaugh et.al. (2007). This methodology describes a method for analysis, design and implementation of a system using object-oriented technique. It is a fast, intuitive approach for identifying and modeling all the objects making a system. The OMT consists of three related but different viewpoints each capturing important aspects of the system i.e. the static, dynamic and functional behaviors of the system. These are described by object model, dynamic model and functional model of the OMT. The object model describes the static, structural and data aspects of a system. The dynamic model describes the temporal, behavioral and control aspects of a system. The functional model describes the transformational and functional aspects of a system. Hence, each model describes one aspect of the system but contains references to the other models. The entire OMT software development process has four phases: analysis, system design, object design, and implementation of the software. Most of the modeling is performed in the analysis phase. In this phase, three basic models - Object Model, Dynamic Model and Functional Model are developed. The Object Model is most important of the models, as it describes the basic element of the system. The objects and all the three models together describe the complete functional system. Object Model describes the objects in a system and their interrelationships. This model observes all the objects as static and does not pay any attention to their dynamic nature. Dynamic Model depicts the dynamic aspects of the system. It portrays the changes occurring in the states of various objects with the events that might occur in the system. Functional Model basically describes the data transformations of the system, which equally describes the flow of data and the changes that occur to the data throughout the system.

IV. SYSTEM DESIGN AND IMPLEMENTATION

The Web based Preschool Child Monitoring System was designed using various development tools. The client side application was designed using the Hyper Text Mark Up Language (HTML) in conjunction with the Hypertext Pre Processor (PHP) scripting language to provide the website portal with its information processing functionalities; Java Script Query and Real Time Media Protocol (RTMP) while the server side application was designed using the PHP and RTMP development tools. Information used by the system was stored on the internet with the use of the MySQL database, RTP server and File storage.

A. Components of the Design

The design of the proposed system comprised the following components;

Database

The database system used to store the information for this system is MySQL. Below are the descriptions of the database files used by the system:

Access Database Table Design

This database table stores the authentication details for all users of the application.

Applicants Database Table Design

This database table contains the information on recent children who applied for admission in the preschool.

Pins Database Table Design

This database table contains the encrypted information of scratch card pins used in registering new students/pupils.

Privy Database Table Design

This database table contains the various user levels and privileges. It also determines the pages accessed by the authenticated user..

School Departments Database Table Design

This database table contains the various school departments which Teachers/students/pupils can be assigned to.

Interfaces

The interfaces are the input and output forms.

The input interfaces

System Login Form

This form lets the Admin, parents/guardians submit login details to gain access into the system.

Administrator Input Form

This is the portal's Administrator Page used by the system administrator to add information about the parents and children into the system.

Admin Viewing Dash board form

This enables the admin to start the video streaming data. The primary job here is to start the camera, connect the RMTP server and publish to site/portal.

Parent/Guardians/Children Registration Input Form

This form is used to register the parent/guardian and children into the system's web portal.

Video Server Application Form

This is the interface for the Video server that listens for Video requests from the parents of the children in the preschool classes

Output Interface Forms

Output is the result of computer operations. The output is being generated from the databases. In each module, the output format is exactly the same with input except that the input format allows entries of data while the output format displays the output of the processed information

Admin dashboard

Admin views and configures his profile and settings for the application

Registered Users Dashboard

Here Admin views and manages registered users data

Data streaming Dashboard

This is where data streaming sessions are viewed and managed

Parents/Guardians Dashboard

Parents view and manage their own profile

Parents/Guardian viewing dashboard

Parents selects and views video streams

Graphical User Interface Design

This serves as the key environment where menus/ links web object forms are held in place. It is designed with php, html, jquery. It runs on a browser with the menu and submenu designed into it.

Main menu and submenu design

When this is displayed the user then selects any of the options available by clicking on it.

B. Program Design and Specification

Program Design:

The program design for the proposed system is illustrated in figure 1

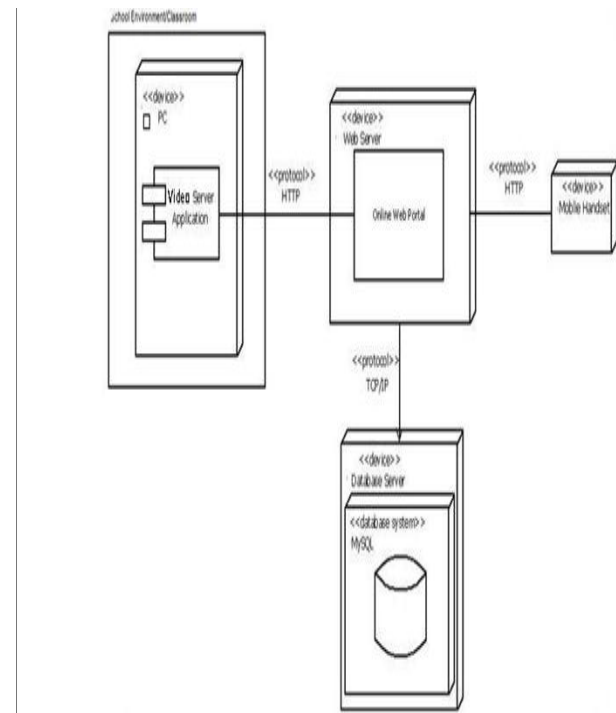


Figure 1: UML Deployment Diagram

Program Specification:

The specification of the program is described as follows:

The program consists of 2 parts:

- A. (i) **The Client Side Video Server:** - Its functions include:
 - Connects to the internet and waits for requests from parents personal computer, tabs, palmtops, gprs enabled phones etc for video streams of the classroom/environment

- Gets the Video stream from the camera through the RTMP server and send to the requesting parents.
- (ii) Real time messaging protocol (RTMP) Encoding and Media Storage: The client side video server stores the video in a specified location in Admin personal computer, which ensures an off-line version of the streams. On the other hand, the server side encoder stores copies of the currently streaming video in batches in a video on demand (VOD) database.

B. (i) The Admin Portal Application

- Allows the Admin to login and add parent, children and users/Admin data
- Enables authentication of parents and request of videos
- Allows admin to connect and start video streaming server
- Allows Admin to view video streams

(ii) The online mobile website application: - Its functions include:

- Allows the administrator to login and add children details and their parents’ details to the database as well as start the video streaming
- Enabling parents login from their PC, laptops, GPRS enabled phones and request for the video streams of their child’s classroom or environment

C. Interface Input/output Forms

System Login Form

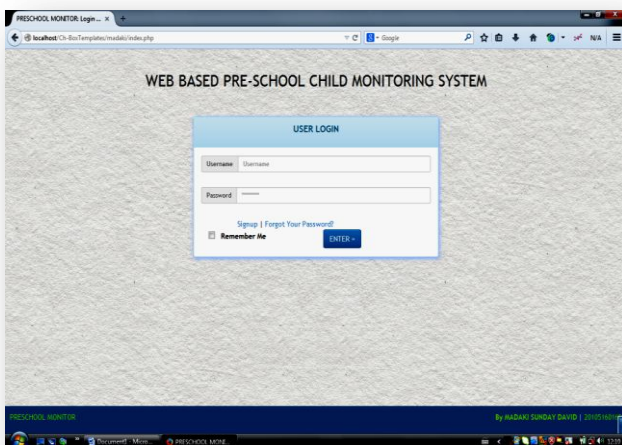


Figure 2: System Login Form

Admin Viewing Dashboard

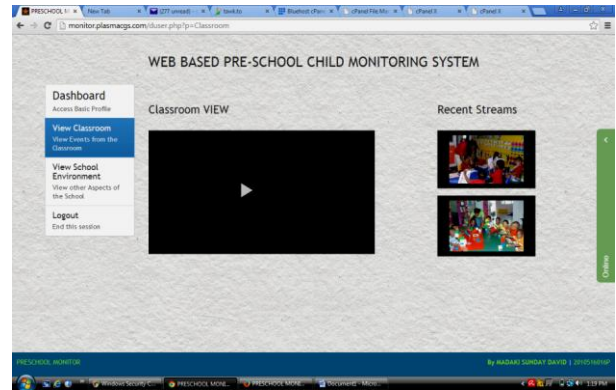


Figure 3: Admin Viewing Dashboard

Parents Live Chat Feedback

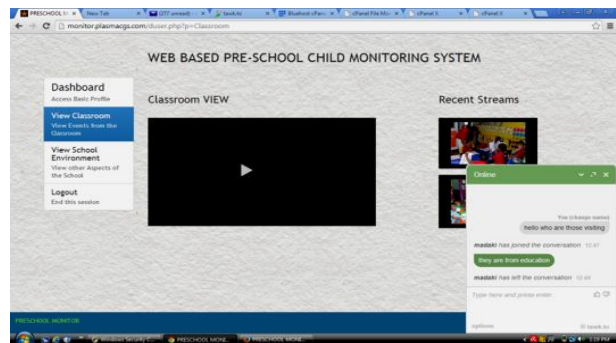


Figure 4: Parent Live Chat Feedback

Video Server Application Form



Figure 5: Video Server Application Form

V. RESULT/ DISCUSSION

This work concentrated efforts in exploring the potentials of wireless technologies, especially mobile technology to help in monitoring of children in the Preschool. Surveillance has been considered as the monitoring of

the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protection. The Web based Preschool Child Monitoring System was implemented in two main parts. The server side application was a live streaming server connected to a computer system in the classroom, whose main purpose was to record live streams (video) of the environment to the surveillance portal. The client side which was a website portal to which the parents/guardians can login and have access to real time video streams served into the web portal by the server application, as well as access previous videos saved on the server through the use of palm tops, laptops, personal computers, GPRS enabled mobile phones. This can enable the parents to check on their children at any given time. Parents can monitor their children without the aid of a third party, thus making them independent. Incidents of child abduction can be reduced if not eliminated as the abductors would be captured on the camera thus aiding the law enforcement agents to identify the culprits. There was prompt feedback/response of request as opposed to when parents/guardians would have to wait for a third party. Therefore, this work presented a great assistance to the efforts of the parents/guardians, school management and law enforcement agencies to improve on safety, security, and wellbeing of school children. Indeed there were few things as important to us as our children. As a result, we take their safety and security very seriously, especially when we left our children in the care of others. We want to make sure that they were safe and secured when at school, day care, or elsewhere. Parents would want to know that their children were safe at school. Hence, Installing a security camera system in a preschool as depicted by the work gives the parents a sense of security and assurance that if anything untoward happened to their children while in school, the video surveillance installed would be of immense assistance to all concerned to get to the root of the matter

CONCLUSION

In order to achieve the maximum goals set out to be achieved by this work, the following suggestions are hereby put forward

- The online portal should be hosted on a foreign web server as there will be more guarantee of reliable access to the system as the problems such as power outages and poor service delivery, which could be experienced when hosting the application locally, can be reduced

- Information stored on the online database should be stored in an encrypted format so as to further provide protection against intrusion.
- Provision should be made for a database backup system in the event that the current database is damaged

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