Arm-Cortex Based Automated System for Business Activities in Remote Area

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Abstract— *The paper presents modelling and implementation of an automated system which can be used to manage business activities Educational institutes in remote location. ARM NXP CORTEX-M3 LPC1768 version is employed in which DTMF, mobile SMS and 3G network facilities has been incorporated. An RFID module is interfaced along the controller to track the number of absent and present students. The detailed information about the student can be seen on the central computer system as a single application created on Visual Basic which thus can be printed. Also the integrated GSM module to the arm-controller is used to send a message to the absent student and employees. Auto-surveillance and power saving arrangement can be done by using various peripheral devices.*

Keywords— *ARM-Cortex based-controller, Visual Basic, RFID module, GSM module, PIR Sensors, DTMF module, Android OS based Smart Phone*

I. INTRODUCTION

Recent years have witnessed a rapid increase in the proliferation of new technological innovations in the office. The interest in office technology has been associated with many factors, among which are the growing number of people working in the information sector, escalating office costs, complexity and turbulence in the business environment, advances in technology and decline in equipment costs, competitive pressures, and new opportunities for enhancing productivity and gaining a competitive edge.

The appearance of the microprocessor was considered a revolutionary development as it was accompanied by a significant drop in the size and cost of computer hardware. Exaggerated claims made by many vendors of the new technology, contributed to its widespread adoption by large as well as small business firms. The incorporation of computer-based technologies into the office - generally referred to as office automation - brought many people into more direct contact with the technology, and provided faster and easier access to information, and computing power in general.

Office automation refers to the varied computer machinery and software used to digitally create, collect, store, manipulate, and relay office information needed for accomplishing basic tasks. Raw data storage, electronic transfer, and the management of electronic business information comprise the basic activities of an office automation system. Office automation helps in optimizing or automating existing office procedures. Office payrolls have been automated which means no one has to manually cut checks, and those checks that are cut can be printed through computer programs. Direct deposit can be automatically set up and this further reduces the manual process and most employees who participate in direct deposit often find their pay checks come earlier than if they'd have to wait for their checks to be written and then cleared by the bank.

Other ways automation has reduced employee manpower on tasks is automated voice direction. Through the use of prompts, automated phone menus and directed calls, the need for employees to be dedicated to answer the phones has been reduced, and in some cases, eliminated.

In this paper an automated system has developed to manage the premises like remote location education classes. Each student attendance is maintained by punching the RFID cards to the RFID module located inside the office and the validation and authentication has been done by ARM CORTEX controller which is the central processing unit of the system. The complete record for the student and employees is maintained using special software developed on Visual Basic. The GSM module has been interfaced with the ARM CORTEX to provide a messaging scheme in case of important announcements, absent or present information of the student and office employees.

II. DESIGNING

The designing begins with understanding the requirements of the system, which is consisting of different functionalities to achieve the results to control the automated system. The functional block diagram of the complete model is shown in Fig.1

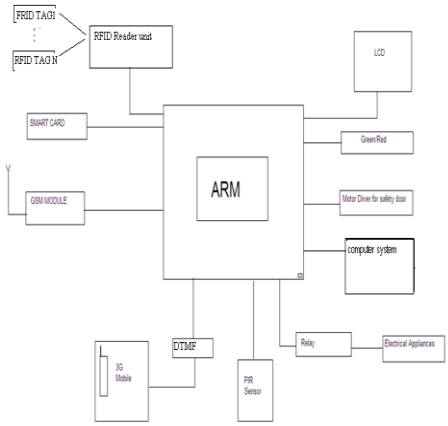


Figure 1 Architecture of ARM based system

Controller based on ARM cortex M3 is connected with RFID module and GSM module in order to maintain the attendance system along with making the provision to send the messages as per the requirement. Here interfacing is done with the computer system so that new entry of the employees and students can be made on the data base. LCD display is used to indicate the authentication of user. A sharp PIR sensor is used to sense the heat signature for the human body to get information whether class is operational or closed and as per that all the electrical appliances will be controlled.

The status of business premises is observed by the main administrator by 3G calling to the premises. A call initiated will automatically picks up the mobile situated in the class room with the help of android application and video capturing will be performed. With the connected DTMF module to the ARM controller and the mobile, a control on all the electrical appliances can be achieved in order to save electricity.

A detailed internal process of the design is explained in flow chart shown in Fig.2. When is system is powered on, the authentication is performed from the by executing the subroutine program having a complete database of the all the employees and students. The status of the attendance record will then be sent to the main administrator also. The sharp passive infrared sensor which is integrated in the system will continuously check for the heat signature from human body to investigate whether a premise is operational or not. If no activity is senses by the PIR sensor, then the electrical appliance will be shut down. All these operations are executed by a special subroutine project which gets executed if the respective conditions are satisfied. The subroutine for sending message and controlling the PIR sensor is shown in Fig. 3 a-b respectively

The system is will get activated for different activities to be performed at the remote location such as maintaining the attendance records of employees or students, database of all records like contact cumberers, any special event for authorized user or Admin, sending messages, updating the database on the computer system with the application based on VB, keeping a track on business activities taking place at remote location, controlling the electrical appliances from remote location to save power and save electricity as per the signal generated with the help of specific device connected on the system as shown in Figure 2-3.

RFID module is initiated to make attendance record and perform special activities given to the administrator, RFID tag with specific number whose database already created on the database of system is compared and different activities are performed as per that related to database pupation with recent records.

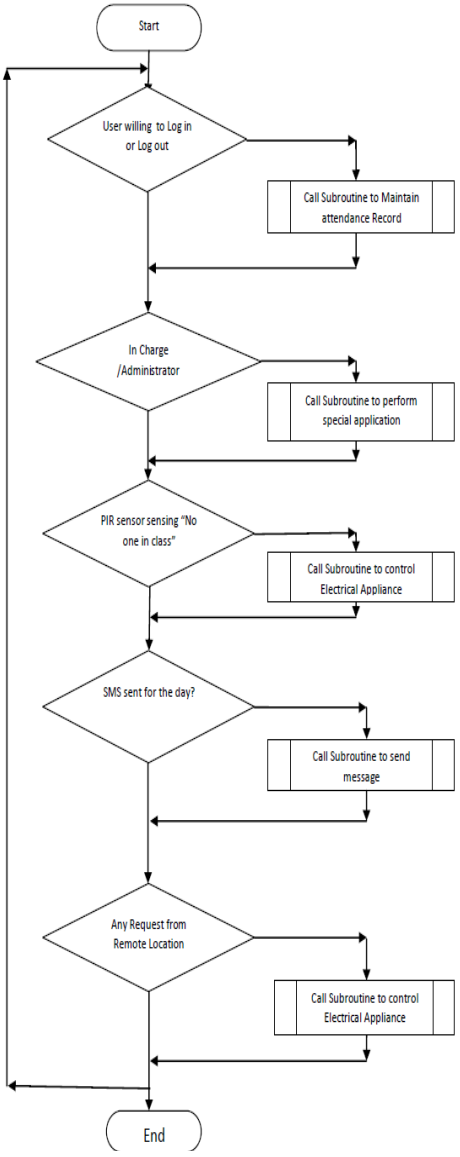
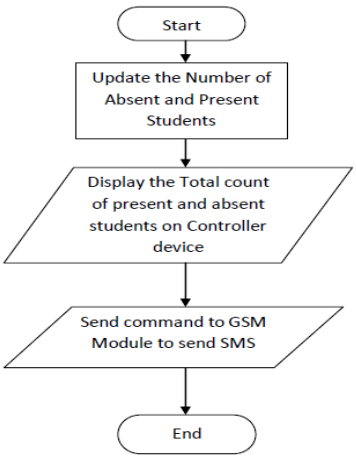
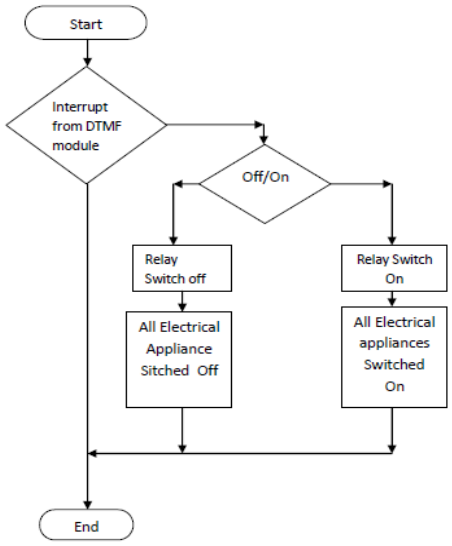


Figure 2 Flow chart for automated system



Flow Chart for sending message

(a)



(b)

Figure 3 Subroutine algorithm for (a) sending message, (b) controlling with DTMF module

The process of communicating with the GSM module is done through a number of "AT Commands" (the commands with which an application can communicate with modems). When a specific AT command is sent to the GSM module requesting to sent the SMS to specific number with the SIM card inserted. SMS is also sent to the main administrator with the total count of absent and present numbers of students and employees.

In-order to perform control on electrical appliances from remote location DTMF module can be used to generate specific signal or command sent from remote location with the help of Auto pick up call facility on smart phone with android application. Also the surveillance can be performed with the help of smart phone supporting 3G network, which is initiated by main administrator and answered with the help of auto pick up facility developed with the help of android application.

III. IMPLEMENTATION

Figure.4 shows the complete interface of the GSM and RFID modules with the ARM CORTEX controller and hardware implementation controller based on ARM-cortex is integrated with RFID module and GSM module and communication with the computer system on which application is developed to maintain the attendance records using VB.

Figure 4 Complete assembled system and authentication verification

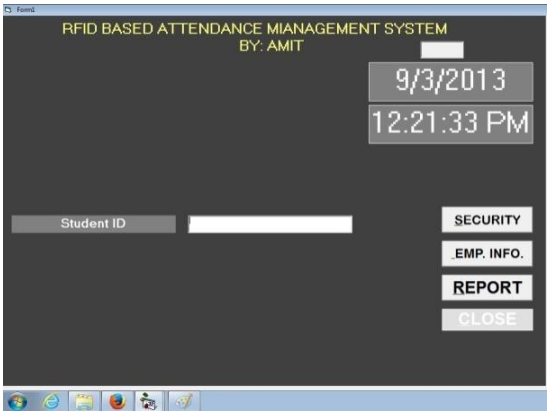


Figure 5 Software interface for attendance

Figure 5 shows graphical user interface to created using VB programming where user will be able to interact with the system as to make entry of new record.

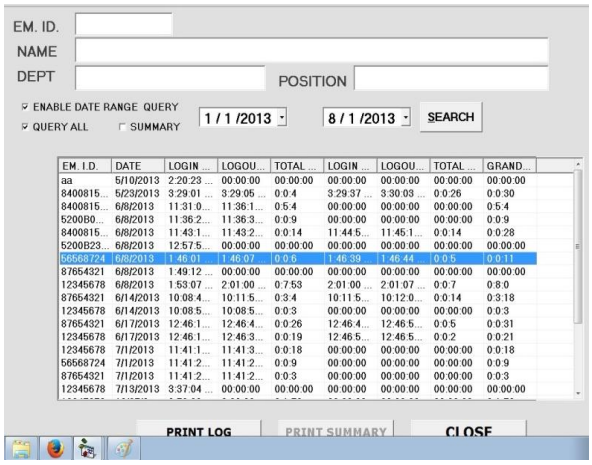


Figure 6 Database record

Figure 6.shows graphical user interface created with VB programming which gives detailed description of various database record stored on the system to maintain the database for attendance which also offers the facility print the record of specific user ,all users with the range of dates specified. When the user swipes the RFID smart card to the system, it is being then authenticated from the database which is maintained on the database of controller for authenticated used the record will be updated in the main database which is incorporated with the VB application as shown in Fig.5-6. which is running on the computer system so that record for years and years can be made and produced whenever it is required for further reference for improvement of attendance records and management of the premises. Once the authentication verification will be done by the controller, the detail will be displayed on the LCD panel which is attached to the system. The login time frame is fixed in the ARM controller. After the logging time is reached, SMS will then be sent to the absent students and employees and total count of present and absent will also be sent to the main administrator. Also with the help of PIR sensor and relay switches all electrical and electronic devices can be controlled if no one is inside premises. Also with the help of DTMF module ,relay switches and Android based smart phone with Auto pickup call facility auto surveillance can be done based on video recording from remotely located centre all electrical and electronic devices can be controlled from anywhere outside the premises.

IV. CONCLUSIONS

It can be concluded from the above discussion that a reliable, secure, fast and an efficient system has been developed replacing a manual and unreliable system. Results have shown that this system can be implemented in academic institutes or any Business premises for better results regarding the management of attendance, saving power and electricity and surveillance of remote located premises with automated controlling systems with the help of latest and efficient technology like 3G,Android Applications and Controller based advanced features. This system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. Also auto-surveillance and saving of electricity can be achieved from remote location. Hence a system with expected results has been developed but there is still some room for improvement.

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