ARM-Cortex Based Control System to Generate Attendance Monitoring System

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Abstract— The paper presents modelling and implementation of an automated system which can be used to generate attendance monitoring system. ARM NXP CORTEX-M3 LPC1768 version is employed in which 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.

Keywords—ARM-Cortex based controller, Visual Basic, RFID module.

I.   INTRODUCTION

The microcontroller market is vast. A bewildering array of vendors, devices, and architectures is competing in this market. The requirement for higher performance microcontrollers has been driven globally by the industry's changing needs for example; microcontrollers are required to handle more work without increasing a product's frequency or power. In addition, microcontrollers are becoming increasingly connected, whether by Universal Serial Bus (USB), Ethernet, or wireless radio, and hence, the processing needed to support these communication channels and advanced peripherals are growing. Similarly, general application complexity is on the increase, driven by more sophisticated user interfaces, multimedia requirements, system speed, and convergence of functionalities. The ARM Cortex™-M3 processor, the first of the Cortex generation of processors released by ARM in 2006, was primarily designed to target the 32-bit microcontroller market. The Cortex-M3 processor provides excellent performance at low gate count and comes with many new features previously available only in high-end processors. The Cortex-M3 processor builds on the success of the ARM7 processor to deliver devices that are significantly easier to program and debug and yet deliver a higher processing capability. Additionally, the Cortex-M3 processor introduces a number of features and technologies that meet the specific requirements of the microcontroller applications, such as non-mask able interrupts for critical tasks, highly deterministic nested vector interrupts, atomic bit manipulation, and an optional Memory Protection Unit (MPU). These factors make the Cortex-M3 processor attractive to existing ARM processor users as well as many new users considering use of 32-bit MCUs in their products. 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.

In this paper an automated system has developed to manage the premises like remote location education classes. Each student attendance is maintained by swiping 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 where Visual Basic is a legacy third-generation event-driven programming language and integrated development environment (IDE) from Microsoft for its COM programming model first released in 1991. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects.

A programmer can create an application using the components provided by the Visual Basic program itself. Over time the community of programmers developed third party components. Programs written in Visual Basic can also use the Windows API, which requires external function declarations.The GSM module can 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

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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
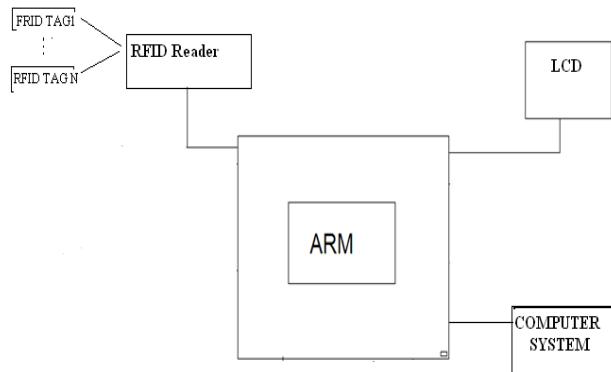

Figure 1: Block Diagram of ARM based attendance system

Controller based on ARM cortex M3 is connected with RFID module in order to maintain the attendance system. 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. All information of user can be seen on LCD display whether uses is valid and authenticated or not in case of unauthorized user making entry in will be displayed as unauthorized user.

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. Attendance record of each student or employee will be generates as and when use swipe the RFID tag .Database for authenticated user will get generated on Arm-Cortex controller which further given to the computer system where stand-alone application is created which create permanent database for each and every individual who is authenticated and whose valid record entry is already created on the system with the admin of the system who keeps the track on the students or employees joining with the business premises.

The system 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 numbers, any special event for authorized user or Admin, updating the database on the computer system with the application based on VB. Software is written in VB which allows the database to get create on computer system with login time and logoff time where one can find the weekly database, Monthly database or yearly database for attendance which is saved as permanent storage which can be referred as and when needed.

Through the studied made in factory, currently they do not have any automated system, the existing system is not user friendly. Factory's workers record their attendance by using punch card [1]. With the large amount of workers in the factory, this will be a difficult task for the manager to manage the attendance record and avoid ―buddy punching Besides that, every work is done manually include the calculations to generate report [2]. This is quite a hard task and it may cause calculations errors and contribute to the repetitions of work. The repetitions of work are time consuming and the calculations must be check many times to ensure that there is error free. Moreover, current management works still in paper-based which mean that everything and every detail are written down manually on paper [3]. In case loss of a single record may lead to difficulty of report generation during the end of months or year. In addition, the workers will need to fill in an application form if he wants to apply leave and submit it to their manager. It will take quite a long time for the manager to approve the leave. In case of attendance system using face recognition The first attempts to use face recognition began in the 1960's with a semi-automated system. Marks were made on photographs to locate the major features; it used features such as eyes, ears, noses, and mouths. Then distances and ratios were computed from these marks to a common reference point and compared to reference data. In the early 1970's Goldstein, Harmon and Lesk [4] created a system of 21 subjective markers such as hair colour and lip thickness. This proved even harder to automate due to the subjective nature of many of the measurements still made completely by hand. Fisher and Elschlagerb [5] approaches to measure different pieces of the face and mapped them all onto a global template, which was found that these features do not contain enough unique data to represent an adult face.

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 population with recent records.
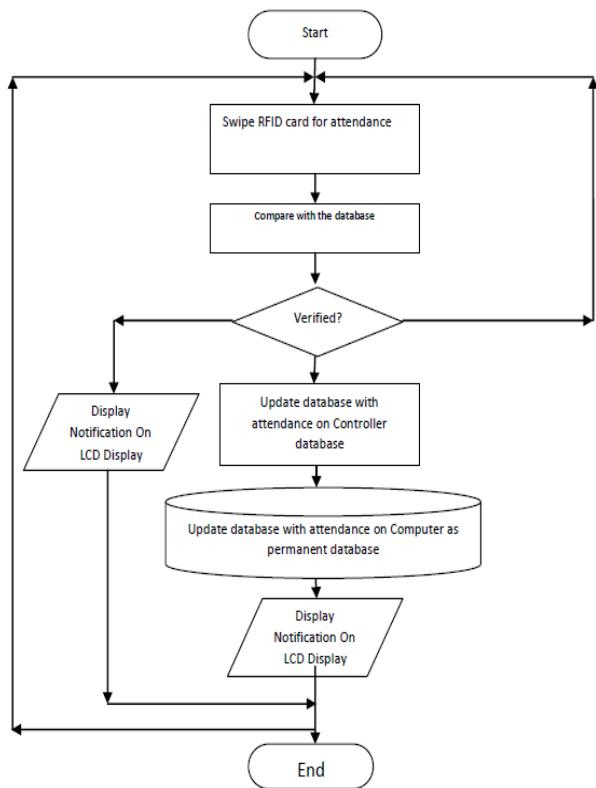
Figure 2: Flow chart for attendance system

III.   IMPLEMENTATION

Figure.3 shows the complete interface of the RFID modules with the ARM CORTEX controller. The hardware implementation of controller based on ARM-cortex is integrated with RFID module and communication with the computer system application is developed to maintain the attendance records using VB.

Figure 3: Complete assembled system and authentication verification

Figure 4 shows a sample of the attendance system stored in VB i.e. Software interface for attendance where individual user can enter the records or report of individual can be checked.
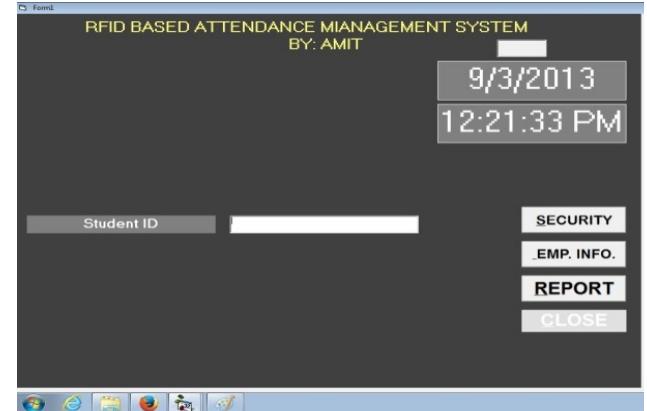
Figure 4: Software interface for attendance

Figure 5 shows graphical user interface to created using VB programming where administrator can check the attendance record of every individual who is the element of attendance system.

Figure 5: Database record

Figure 5 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.4-5.

This 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. Database created can be referred to keep proper monitoring of each and every individual with respect to log in log off time, daily hours spent in the premises.

IV. CONCLUSION

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 for making attendance record. Results have shown that this system can be implemented

In academic institutes or any Business premises for better results regarding the management of attendance can be achieved which will replace the stationery material with electronic apparatus. Hence a system with expected results has been developed but there is still some room for improvement.

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