ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Design and Implementation of Anti-Theft ATM Machine Using Embedded Systems

K. Hema Sai Sivaprasad
M.Tech (ES)
Department of ECE
Jogaiah Institute of Technology and Sciences,
Kalagampudi, Palakol - 534 268,
West Godavari Dt., A.P.

Mr. B. Kanna Vijay, M.Tech
Assistant Professor
Department of ECE
Jogaiah Institute of Technology and Sciences,
Kalagampudi, Palakol - 534 268,
West Godavari Dt., A.P.

ABSTRACT

Nowadays security is the main concern and that too in case of ATMs it is very critical. The main aim of this project is to provide the security to the ATMs from theft as well from physical damage. Automated Teller Machines (ATMs) security is the field of study that aims at solutions that provide multiple points of protection against physical and electronic theft from ATMs and protecting their installations. M2M communications is a topic that has recently attracted much attention It provides real-time monitoring and control without the need for human intervention. The idea of M2M platform suggests new system architecture for positioning and monitoring applications with wider coverage and higher communication efficiency. The aim of the proposed work is to implement a low cost stand-alone Embedded Server based on LPC2148 microcontroller.

The setup is proposed for ATM security, comprising of the modules namely, authentication of shutter lock, sensors and message alert. If burglars try to theft the ATM by destroying it, then the vibration sensor will activate and buzzer will give alert and the alert message was sent to the authorized person. If any person locked inside the ATM after lock of the ATM, then the PIR sensor will activate and send the alert message again. For locking and unlocking the ATM we are using a switch in the prototype. If the smoke was detected in the ATM, the smoke sensor activates and switch on the gas spray by using the relay. SD card was used to store the sensor values along with date and time for future monitoring.

INTRODUCTION

The rapid growth in Automatic Teller machines (ATM) has made life easy for the day to day man, but it is not so for operators who manage it. ATMs are not owned by banks; rather they are outsourced to managed service providers (MSPs) from purchasing to maintaining the machines. Several factors like the maintenance, money filling, security and therefore the passive assets within the ATM rooms are responsible for keeping the ATM active.

Typically, an ATM site consists of anywhere between 8 to 12 passive assets which include two air conditioners, two light collection boards, Associate in Nursing inverter/UPS, a security camera and a minimum of eight to twelve lightweight bulbs. Currently, since the security and passive assets in ATM rooms are managed manually, it ends up in larger physical interaction, that increase the time period and therefore shrinks the gross margin of ATM operators. These MSPs are duty-bound and every ATM site is up as costs of downtime are too high. With rising overheads ATM operators struggle to pass on the cost and so are looking for a reliable remote monitoring solution to revitalize ATM maintenance.

OBJECTIVE OF THE PROJECT

The prime objectives of this system are as follows: (a) it saves the ATM holders if any danger occur in bank, (b) If the Gas was leaked in the ATM, then the gas sensor activates and switch on the relay to spray to exhaust the gas and (c) it also sending them critical situation message if any unauthorized access taken place.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

AIM OF THE PROJECT

The main aim of this project is to provide the protection to the ATM terminals from the physical damage and from theft. For this we are using different sensors namely, Gas sensor, PIR sensor and the vibration sensor. To alert the authorized person, we are using the GSM module. The authorized person's mobile number was stored in the system by sending the sample message to the SIM card inserted in the GSM modem.

LITERATURE SURVEY

In this chapter, we will discuss about the information found by study and research that is critical and have an important value in the contribution of the whole project. It also gives some basic knowledge or theoretical base and is used as a foundation to successfully achieve the main objectives. Most of the literatures are from the related articles, journals, books and previous works of the same fields. These literatures are then compiled and use as a guidance to the work of this project.

The purpose of this project is to increase the security that customer use the ATM machine. Once user's bank card is lost and the password is stolen, the criminal will draw all cash in the shortest time, which will bring enormous financial losses to customer, so to rectify this problem we are implementing this project. The chip of LPC2148 is used for the core of microcontroller in ARM7.

Automated Teller Machines (ATMs) security is the field of study that aims at solutions that provide multiple points of protection against physical and electronic theft from ATMs and protecting their installations.

From anti-skimming defend systems to silent indicate systems, integrated ATM video surveillance cameras and ATM monitoring options, security specialists are ready to help the people get more out of the ATM security and ATM loss prevention systems. The implementation is achieved with the use of Machine-to-machine (M2M) communications technology. M2M communications is a topic that has recently attracted much attention It provides real-time monitoring and control without the need for human intervention.

Similar Projects

Design of Security Based ATM theft Monitoring system:

The Idea of Designing and Implementation of Security Based ATM theft project is born with the observation in our real life incidents happening around us. This project deals with prevention of ATM theft from robbary. So overcome the drawback found in existing technology in our society. Whenever robbery occurs, Vibration sensor is used here which senses vibration produced from ATM machine. This system uses ARM controller based embedded system to process real time data collected using the vibration sensor. Once the vibration is sensed the beep sound will occur from the buzzer. DC Motor is used for closing the door of ATM. Stepper motor is used to leak the gas inside the ATM to bring the thief into unconscious stage.

Camera is always in processing and sending video continuous to the PC and it will be saved in computer.

RTC used to capture the robber occur time and send the robbery occur time with the message to the nearby police station and corresponding bank through the GSM. Hear LCD display board using showing the output of the message continuously. This will prevent the robbery and the person involving in robbery can be easily caught. Here, Keil tools are used to implement the idea and results are obtained. keil tools is used for run the DC motor and stepper motor for automatic door lock and also leak the gas inside the ATM.

Design and Implementation of High End Multiple Security Based ATM Monitoring System:

Design and Implementation of High End Security based ATM Monitoring System is invented as a result of observations made in our real life incidents happening around us. This Implementation deals with prevention of ATM robbery with added high end

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

algorithm to the existing technology found in our society. Whenever ATM theft attempt occurs, vibration produced from the machine will be sensed by attached sensor module to it. A panic switch is another module for additional security. Once Vibration is sensed or panic switch activated, a high alert message will be sent to the nearest police station and Bank Authorities using GSM module and a buzzer beep sound will occur at the same time.

This system uses PIC controller based embedded system to process real time data collected using sensor and panic switch module. In addition it also restricts the number of occupiers of the machine to single within the pre defined area. This is achieved by processing 3 dimensional real time IR sensors data using ONE_AT_TIME algorithm.

EXISTING SYSTEM

In the existing system, if any of the sensors activates, then the alert message sent to the authorized person. If anybody wants to verify the previous sensor data at any particular time, there was no chance. To avoid this we are incorporating the SD card, in which the sensors data was stored.

PROPOSED SYSTEM

In the proposed system, we were incorporating the SD card interfaced to the microcontroller in which the data of the sensor values are stored along with time and date. In this project, we are using the Gas sensor, Vibration sensor, PIR sensor. If any of the sensors activates, then buzzer will alert sound and corresponding alert message was sent to the authorized person.

Besides that we are using the SD card to store the sensor values in that for every particular time period. If the Gas was leaked in the ATM, then the gas sensor activates and switch on the relay to spray to exhaust the gas. Like that if remaining sensor activates, the alert message sent to authorized person.

BLOCK DIAGRAM

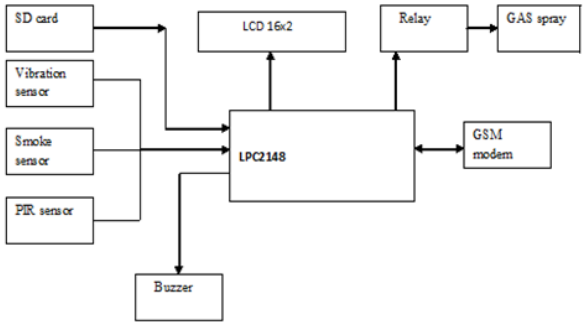

Fig 2.1: Block diagram of proposed system

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-SCPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32 kb to 512 kb. A128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kb up to 40 kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

ARM7 MICROCONTROLLER

ARM is an acronym for advanced RISC machine and is manufactured by Phillips. ARM7 is based on reduced instruction set computing architecture. ARM7 is most successful and widely used processor family in embedded system applications. The advantage of low power consumption and low cost increases the range of applications from portable devices to almost all embedded electronic market. It is preloaded with many in-built features and peripherals making it more efficient and reliable choice for an high end application developer. It also supports both 32-bit and

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

16-bit instructions via ARM and THUMB instruction set.

LPC 21XX series of microcontroller are based on ARM 7 TDMI – S architecture.LPC stands for Low Power Consumption, because for the reason it have different voltages for operation and not like other controllers where the entire controller (CPU + peripherals of controller operate at +5V Vcc).

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro-programmed Complex Instruction Set Computers. This simplicity results in a high instruction throughput and Impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory.

Pin Diagram

ARM7 LPC2148 microcontroller is a 64 pin dual-in package. There are basically 2 ports in LPC2148, Port0 and Port1. Port0 has 32 pins reserved for it. And Port1 has 16 pins. So total it comes to 32+16 = 48 pins. If it were really 2 ports then the number of port pins should have been 32 + 32 = 64 pins.

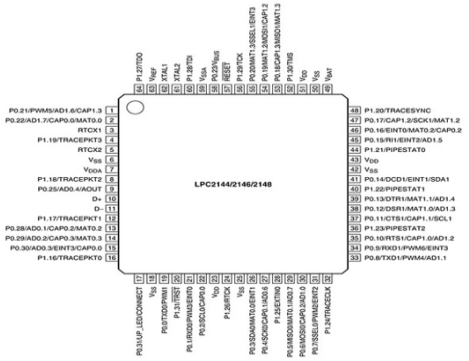

Fig 2.11: Pin Diagram of LPC2148

Architectural Overview

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC).

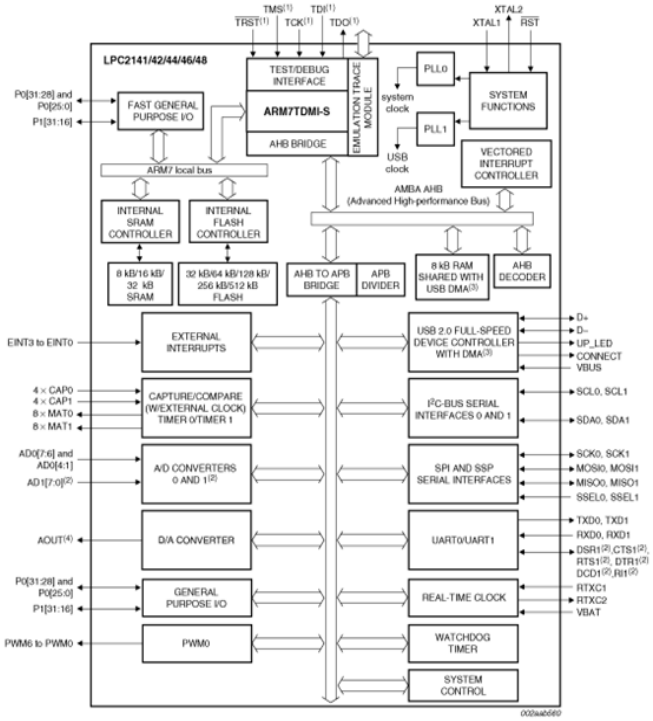

Fig 2.12: Architecture of ARM7 LPC2148

This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Essentially, the ARM7TDMI-S processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code.

Thumb code is able to provide up to 65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system. The particular flash implementation in the LPC2148 allows for full speed execution also in ARM mode. It is recommended to program performance critical and short code sections (such as interrupt service routines and DSP algorithms) in ARM mode. The impact on the overall code size will be minimal but the speed can be increased by 30% over Thumb mode.

Operating modes in ARM7

The ARM processor has several Operating Modes which are described in bellow

- ARM supports 7 modes of operation.
- ARM core modes of operation:
- User (usr): Normal program execution state
- FIQ (fiq): Data transfer state (fast irq, DMA-type transfer)
- IRQ (iqr): Used for general interrupt services
- Supervisor (svc): Protected mode for operating system support
- Abort mode (abt): Selected when data or instruction fetch is aborted
- System (sys): Operating system 'privilege'-mode for user
- Undefined (und): Selected when undefined instruction is fetched

The User Mode has limited access to the hardware (non-privileged) whereas all other modes have full access (privileged) to the CPU resources.

ADVANTAGES AND APPLICATIONS

ADVANTAGES

1. This system can monitor remote area ATM machines from theft.
2. It can avoid fire accidents
3. We can see status of ATM machine through web server
4. It can capture image of person who is trying to theft ATM machine
5. It can spray some kind of GASs on person who trying to theft ATM machine

APPLICATIONS

1. ATM Applications
2. Security applications
3. All security applications

RESULTS

The implementation of realization of "Design and Implementation of Anti-theft ATM Machine using Embedded Systems" is done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements.

PROPOSED SYSTEM RESULTS

If burglars try to theft the ATM by destroying it, then the vibration sensor will activate and buzzer will give alert and the alert message was sent to the authorized person.

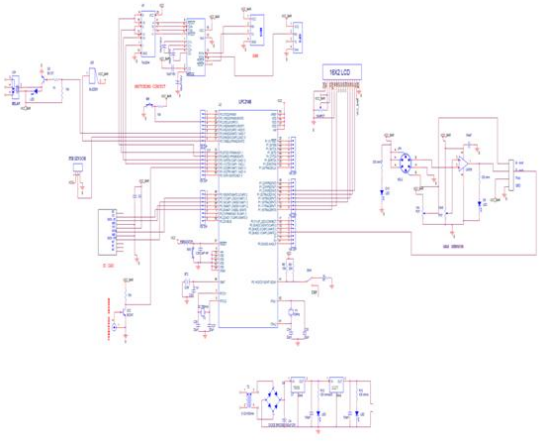

Fig 5.1: Schematic diagram of proposed system

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

If any person locked inside the ATM after lock of the ATM, then the PIR sensor will activate and send the alert message again. For locking and unlocking the ATM we are using a switch in the prototype. If the smoke was detected in the ATM, the smoke sensor activates and switch on the gas spray by using the relay. In any case of the sensor detection, then the alert message was sent to the authorized person. Besides that the sensors data was stored in the SD card for every some time period. By reading that SD card, one can know the details of the sensors activation along with date and time. Besides that all the sensor values and messages are displayed on the LCD. For this project, we are using the LPC2148 microcontroller and the coding was written in the embedded C language and the code was compiled using the KEIL compiler. The generated hex file was dumped into the microcontroller using the Flash Magic software.

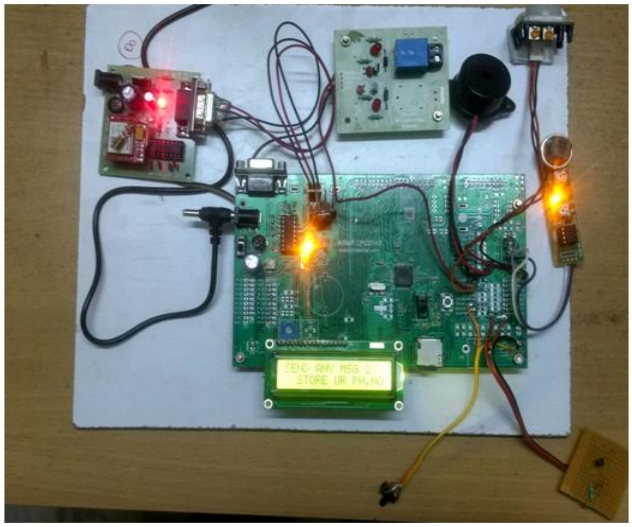

Fig 5.2: Storing phone number of the user

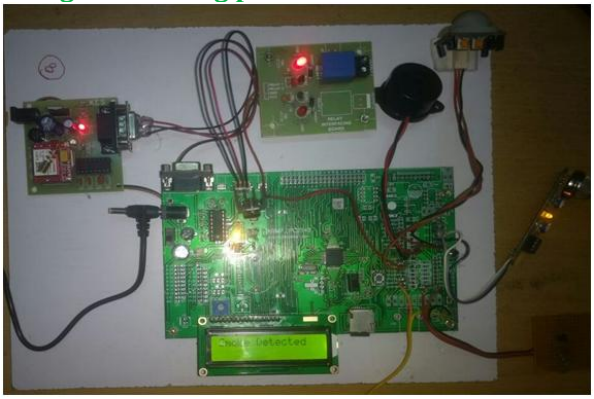

Fig 5.3: Smoke sensor detected

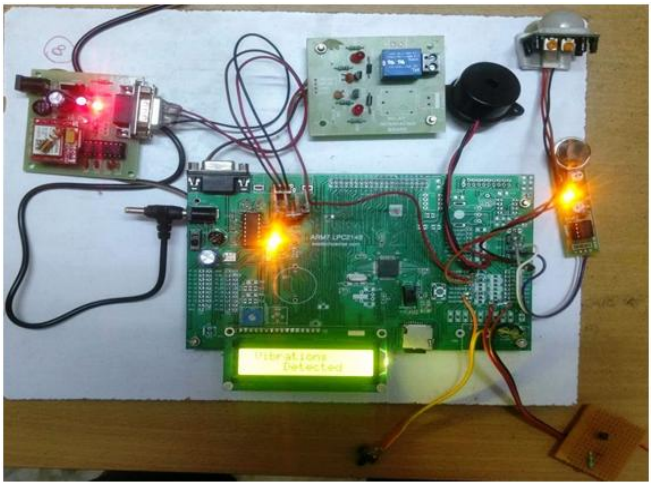

Fig 5.4: Vibration sensor detected

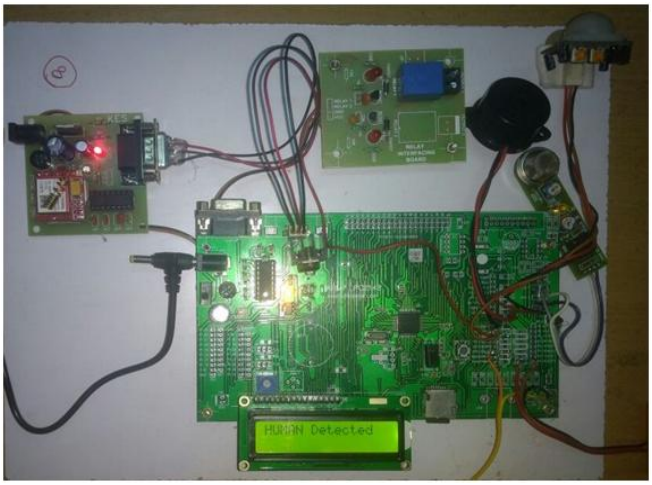

Fig 5.3c: Human(PIR) sensor detected

Fig 5.5: Message alert if any sensor detected

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

CONCLUSION

The proposed system ensures to develop advanced ATM anti theft system. In this project an advance and cost effective approach for ATM security has been proposed. It can be installed in the ATM at some hidden place so that it cannot be approached by thieves. Proposed system is distinctive in many ways from existing ATM intrusion and theft control systems; already used systems are either very expensive or ineffective from distance. It is reliable, inexpensive and appropriate design.

FUTURE SCOPE

In future we will use Raspberry Pi 3 processor as a core, which has in-built Wi-Fi module using which the sensors data was sent to the web server like Thingspeak to monitor the sensor data in graphical format. To do this we should provide internet to the Wi-Fi module. Anyone can monitor the sensor details from anywhere in the world by opening the server.

REFERENCES

[1] Kannamma, M. Barathi, B. Chanthini, and D. Manivannan. "Controlling and monitoring process in industrial automation using Zigbee." Advances in Computing, Communications and Informatics (ICACCI), 2013 International Conference on. IEEE, 2013.

[2] Kim, Jaewoo, Jaiyong Lee, and J. Yun. "M2M service platforms: survey, issues, and enabling technologies." (2013): 1-16.

[3] Dujak, Mico, et al. "Machine-to-machine communication as key enabler in smart metering systems." Information & Communication Technology Electronics & Microelectronics (MIPRO), 2013 36th International Convention on. IEEE, 2013.

[4] Kannan, P, and Ms P. Meenakshi Vidya. "Design and Implementation of Security Based ATM theft Monitoring system".

[5] Ajaykumar M (2013). "Anti-Theft ATM Machine Using Vibration Detection Sensor" International Journal of Advanced Research in Computer Science and Software Engineering, pp: 23-28.

[6] Liu, Yakun, and Xiaodong Cheng. "Design and implementation of embedded Web server based on arm and Linux." Industrial Mechatronics and Automation (ICIMA), 2010 2nd International Conference on. Vol. 2. IEEE, 2010.

[7] http://blogs.webnms.com/m2m/2014/08/28/bid-adieu-toguards-welcome-atm- site-manager/

[8] http://www.engineersgarage.com/rfid-radio-frequencyidentification-and-detection [9]. http://www.engineersgarage.com/electroniccomponents/rf-module-transmitter-receiver

[9] http://blogs.webnms.com/m2m/2013/05/31/webnmsintegrates-google-maps-in-m2m-solutions/