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Smart Home Based Security System Using Android Application

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Abstract: Smart Home System (SHS) is incorporating a communication network that gives security system and services permitting them to be remotely regulated, monitored or accessed. SHS includes completely different approaches to attain multiple objectives starting from enhancing comfort in lifestyle to modify a lot of freelance life for senior and unfit individuals. A sensible home automation system has been developed to mechanically deliver the goods some activities performed often in lifestyle to get lighter and easier life setting. Security has changing into a crucial issue all over. Home security is changing into necessary today because the prosp ects of intrusion area unit increasing day by day. Safety from thieving is that the most vital demand of home security system for folks. The main objective is to cut back human effort however conjointly to achieve energy potency and time saving. This paper presents a technology wherever the user controls the devices through sensible phones. Automation provides access to a good vary of helpful libraries and tools that may be accustomed build made applications. This paper presents the hardware implementation of a multiplatform system for a sensible home system and combines each hardware and computer code technologies. The technologies utilized in this paper area unit GSM (Global System for mobile communication) and Arduino UNO that's supported ATMEGA328P Microcontroller. This system is a lot of versatile and can be implemented in any homes. The sensible home system results shows that it are often classified as a cushty, secure, private, economic and safe system additionally to its nice flexibility and dependability.

Keywords: Smart home system, Android Application, Smart phone, Arduino UNO and GSM

Introduction

Smart home is an rising perception that attracts the areas of science and engineering. A lot of research has been going on for more than 8 years now in order to increase the power efficiency at the consumer level of the power administration systems. Smart Home is used to define a residence that integrates technology and services all the way through home connectivity to increase power effectiveness and improve the quality of living. This paper presents the overall design of Smart Home System (SHS) with low cost and wireless remote control. Also, the smart home concept in the system improves the standard of living at home. A specific android application has been designed for maintaining a secured system that can be controlled using a smart phone remotely.

2. Smart Home System

An Arduino which uses the microcontroller ATMEGA 328 is implemented in our project. It can also be set by the android app provided that only one mode can be set at a time. The Electromagnetic lock is used to lock and unlock the door which is controlled by an access code activated through both Keypad (placed near the main door) and an android application. Only the authorized person can access the door. The limit switch is used for opening and closing of window which is run by DC Servo motor. The slide switch is used to set the three modes in the smart home system i.e., in, out, night.

MODES	DOOR	WINDOW	PIR
IN	OFF	OFF	ON
OUT	ON	ON	ON
NIGHT	Change in status	Change in status	ON

Table-1: Modes Vs Status of Door, Window and PIR

The PIR sensor is used for human detection which is indicated by a buzzer when in and night mode and notified in app during out mode and also displayed in LCD. The GSM module sends a sms to the user during out mode when human is detected and sends an acknowledgement after closing the window when command is given through app to the window

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by the user to close it after checking the status on the app. An android application is developed to set the modes and control our entire smart home system. Power supply is given to the microcontroller. The microcontroller is interfaced with the LCD display.

3. Hardware Design & Development

3.1 Block diagram

Fig-1 depicts the block diagram of the planned smart home and security system design with its hardware components and connections. The main components used are: Microcontroller (ATMEGA 328P), GSM, Matrix Keypad, LCD, LM293 driver, Electromagnetic Door locker and power supply.

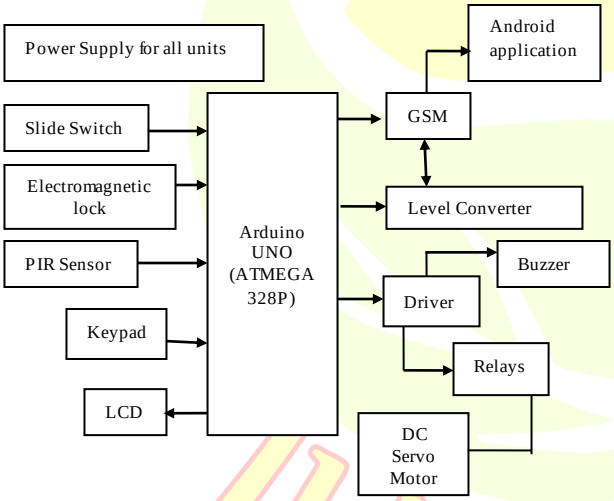

Fig-1: Functional block diagram of smart home system

3.2 Arduino UNO

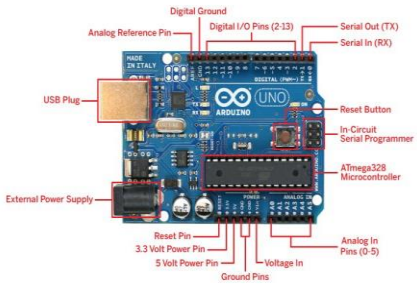

Fig-2: Arduino UNO

The Arduino Uno could be a microcontroller board supported the ATmega328P that has 14 digital input / output pins (of that 6 are used as PWM outputs), vi analog inputs, a 16 MHz ceramic resonator, a USB affiliation, an influence jack, associate degree ICSP header, and a push button. The ATmega328 provides UART TTL (5V) serial communication, that is on the market on digital pins 0 (RX) and 1 (TX). The RX and tx LEDs on the board can flash once information is being transmitted via the USB-to-serial chip.

3.3GSM

Fig-3: GSM

GSM (Global System for Mobile Communications) is associate degree open, digital cellular telecommunication system developed by the european Telecommunications Standards Institute (ETSI) to explain protocols for second generation (2G). A GSM electronic equipment could be a device that modulates and demodulates the GSM signals. The electronic equipment used is SIMCOM SIM800 that could be a quad-band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz and has GPRS multi-slot category 12/ category 10 and supports the GPRS cryptography schemes CS-1, CS-2, CS-3 and CS-4. it's associate degree integral Bluetooth associate degreed FM radio support with an operational vary of 3.4V to 4.4V.

3.4 Electromagnetic lock

Fig-4: Electromagnetic lock

An electromagnetic lock is a locking device that consists of an electromagnet and an armature plate. By fixing the electromagnet with the door and the armature plate to the door, a current passing through the electromagnet attracts the armature plate, holding the door shut. It works by the principle of electromagnetism to lock the door once energized.

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The magnetic lock is appropriate for each in-swing and out-swings door and is put in on the within (secure side) of the door.

3.5 Matrix keypad

Fig-5: Matrix keypad

When there are a lot of digital inputs that has to be read into the microcontroller, it is not feasible to allocate one pin for each of them. So, a matrix keypad arrangement is employed to decrease the number of pins. Therefore, the amount of pins that are necessary to interface a specified count of inputs decreases with increase in the order of the matrix. Initially all switches area unit assumed to be free. Therefore there's no association between the rows and columns. Once anybody of the switches is ironed, the corresponding rows and columns area unit connected (short circuited). This can drive that column pin (initially high) low. Victimization this logic, the button press will be detected.

3.6 PIR Sensor

Fig-6: PIR Sensor

A passive infrared sensor is an electronic sensor that measures infrared light radiating from objects in its field of view and senses motion to detect whether a human has moved in or out of the sensors range. They are undersized, economical, low-power and friendly. They are basically made of a pyroelectric sensor which can detect levels of infrared radiation and has a bunch of supporting circuitry, resistors, capacitors and Micro Power PIR Motion Detector IC (BISS0001). The lens in PIR is Fresnel lens which is thin and flexible and is nearly 0.017 inch. A Fresnel lens captures more IR radiation and converges it to a point. This focal point passes across the sensor as the IR source moves and exposes one element at a time. It can extend its detection range to about 100 feet.

3.7 Driver

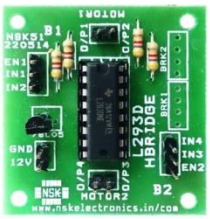

Fig-7: Driver

L293D is a typical Motor driver IC that permits DC motor to drive on either direction. It's a 16-pin IC which might management a group of 2 DC motors at the same time in any direction. It works on the construct of H-bridge. H-bridge could be a circuit that permits the voltage to be flown in either direction. In an exceedingly single L293D chip, there are 2 h-Bridge circuits, within the IC which might rotate 2 dc motors severally. Due to its size and voltage demand, it's often utilized in artificial intelligence applications for dominant DC motors and in Arduino comes.

3.8 LCD

LCD (Liquid Crystal Display) screen is an display module which is more cost-effective, easily programmable and also finds various applications.

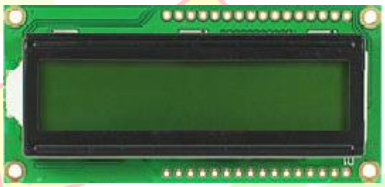

Fig-8: LCD

A 16x2 LCD display is a very common basic module which can display 16 characters per line with 2 such lines. Each character is displayed in 5x7 pixel matrix and has two registers, namely, Command and Data.

3.9 Slide Switch

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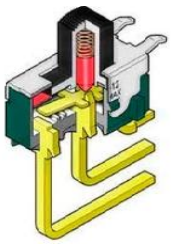


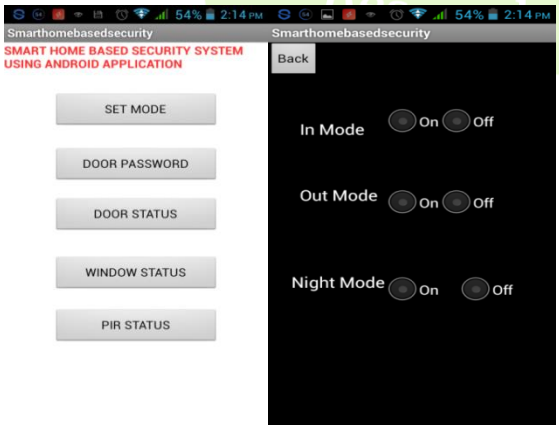
Fig-9: Slide Switch

Slide switches are mechanical switches using a slider that moves (slides) from the off position to on position. They permit control to current flow in a circuit without having to manually cut or splice wire. Slide switches are maintained-contact switches that stay in one state until actuated into a new state and then stay in that position until other cycle.

4. Software Description

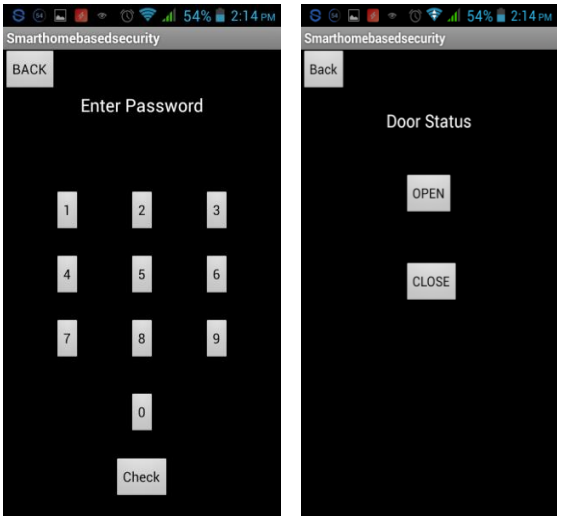
4.1 Android

A Smart phone has advanced computing potential and connectivity than a conventional phone. There are quite a lot of platforms for increasing smart phone applications such as Windows Mobile, iOS and Android. In the proposed system, the Android app is developed for phones and handy devices support Android OS. Android is a software for mobile devices that adds an operating system, middleware and key applications with a platform that feel very unlike on every different handsets. It gives us tools for creating apps that looks great and takes more advantage of the hardware capabilities available on each device. Android applications are written in the Java programming language based on Linux operating system. The main purpose of using android is to send the control signals from smart phone through GSM.



(i) **(ii)**

Fig-(i) shows the homepage of the android app that is created. Fig-(ii) shows the three modes of in, out and night which can be turned or off.



(iii) **(iv)**

Fig- (iii) requests the user to enter the right password to unlock the door. Fig- (iv) shows the current status of the door.

The android SDK provides tools for code compilation and packaging information and resource files into an archive file with '.apk' extension known as as an android package. The android devices use this '.apk' file to put in the applying. The SDK includes an entire set of development tools like program, libraries, and a handset emulator with documentation, sample code and tutorials. Eclipse (running on Windows ten development platform), that is that the formally supported integrated development surroundings (IDE) has been used on in conjunction with the golem Development Tools (ADT) Plug-in to develop the sensible home app. In our android application, the current standing of door, window and PIR can perpetually be highlighted on the screen. It additionally simple to travel to the homepage from whichever page the user is in by pressing the rear. For accesing the door, the correct four digit password must be entered, only then the access is granted. If wrong password is given, then access is denied to the door.

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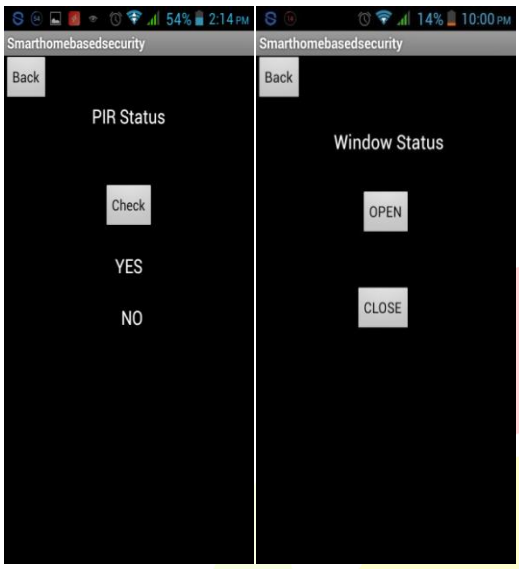

(v) **(vi)**

Fig- (v) shows the current status of PIR sensor. Fig-(vi) shows the current status of window.

Fig-9: Screenshots of Smart Home System Application

5. Conclusion

In this paper the look and implementation of an effect and monitor system for good home has been established. Our project goal of implementing a SHS by dominant the door associated window reception at a far off with transportable and to receive alert message at the intrusion of unknown persons controlled by an golem application is achieved with success. The system design is that it is operated in 2 totally different conditions; either the good phone user is present reception or situated far dominant by GSM. The system is enforced not just for restricted space however is beneficial for all needed space. As per the purpose of security, there's associate access code for the most door. Necessary commands are given through application for accessing door and opening-closing of window. Once the command is dead, associate acknowledgement is shipped to the user via sms and conjointly alert sms is sent whereas intrusive into the restricted area. For this, PIR sensing element is effectively used for human detection. The SIM800 GSM module was used for communication between the microcontroller unit and also the mobile phone. As well, it will send a message to the U.S.er for action once the owner is out of station and also the home is locked that helps us to stay safer of our home. Moreover, this project can increase the living standard of each person whosoever implements this good home system in their home.

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