

Home Automation and Security using Arduino Micro-controller

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Abstract: Home security is essential for occupants' convenience and protection. At entry point the system should be secured this is the main purpose to design this system. This paper aims to develop a low-cost means of home security system using sensors like motion sensor, PIR sensor etc. This system also deals with the OTP (One Time Password) generation which will be used as entry password for user. Data from all these sensors is continually received and processed by Arduino Uno board which acts as a microcontroller unit. In case of untoward situations, the Arduino will trigger an alarm and alert messages will be sent to user's mobile via GSM. Thus the system ensures home safety as well as security.

Keyword: OTP (One Time Password), GSM (Global System for Mobile), RMN (Register Mobile Number), Arduino Uno.

I. INTRODUCTION

In today's day to day life home security is very important factor. It is trending issue in 21st century.

This system helps to protect the home especially entry point of the home from burglars and crooks. At the current situation all the industries, banks or organizations use the security system to protect their premises from burglars.

Home automation means the automated home i.e. controlling the lighting appliances, HVAC (Heating, ventilation and air-conditioning) appliances and other electrical devices over the GSM enabled phone.

We are making this possible i.e. home security as well as automation using Arduino micro-controller. In this system while developing security section we concentrate on entry point of the home i.e. entry gate. We gave entry to those who know default password and OTP (One Time Password). Default password is already known to user which is confidential. OTP is password which is generated by the system on demand of user using his registered mobile number which is registered with the system.

In automation section we can control lights of our home using registered mobile number by sending messages or SMS to the system.

This paper is based on an embedded system where micro-controller is used for home security and automation system. This system can operate using cellular phone with the help of GSM technology.

This system is to implement a microcontroller-based control module that receives its instructions and command from a cellular phone over the GSM network. The microcontroller then will carry out the issued commands and then communicate the status of a given appliance or device back to the cellular phone.

II. LITERATURE REVIEW

As per our survey currently there exists system neither at cheaper rates nor easy to handle.

Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary, closed and not very user friendly. Based on Arduino or GSM or low cost home security system and home automation system we discuss some system in detail as below:

a. Advanced low cost security system using sensors, Arduino and GSM communication module :-

In this importance of home security measures are elaborated using easily available programmable

sensors like PIR sensors. This also helps in the variation and also maintains low cost. Digital Signal Processors and finger print reading which can be added to the current installation of security system so as to eliminate any occurring ambiguities in the current system. Also the work for developing a smart GUI using an Android application is under the purview with Ethernet servers using an HTTPS internet website, so as to communicate with the standalone system from anywhere. This will also help in the versatility and bring down the operation cost.

b.Home automation using Arduino UNO:

In this system we required Arduino UNO, Remote controller. By connecting all connection correctly apply a simple C or C++ code on Arduino. Sensor senses the motion so that it will give alert to user. User can control the system by remote controller

c.GSM based Control system:-

The extensive capabilities of this system are what make it so interesting. From the convenience of a simple phone, a user is able to control and monitor virtually any electrical device. This makes it possible for users to rest assured that their belongings are secure and that an electrical appliance was not left running when they left the house.

d.Implementation of low-cost home automation system:

The home automation system has been experimentally proven to work satisfactorily by connecting sample appliance were successfully controlled from a wireless mobile device. The Bluetooth client was successfully tested on different mobile phones from different manufactures, thus proving its portability and wide compatibility.

III. PROPOSED WORK

Future Work for Security of the System: -

The Future activities planned for the project is that the system will be designed such that the onetime password (OTP) will be generated at Owner/Customer mobile. When user/Owner requests for OTP (One Time Password) from the system by sending a message to it from its registered mobile number (RMN), system is supposed to identify that the message came is from the authorized user/owner and should request the message and send the OTP(One Time Password) to the owner. The system

for the very first time is using the OTP(One Time Password) option which will be used by Admin or House user/owner if he/she forgets the default password. The password has a limitation that is it can be send to only the registered mobile number and not to any random mobile number. The system is designed in a way to provide a security like asking a security question for getting access to the home. The proposed Security systems can also include motion sensors that will detect any kind of unauthorized movement and will alert the user by sending the notification. Scope of this project can be expanded to many areas by not restricting it to only home. The system is flexible in supporting to various technologies namely wireless technologies like GSM module, Bluetooth, Wi-Fi, World Wide Web i.e. WWW.

Proposed work for Automation: - In the Automation part of the project an android application has been proposed which will act as a user interface through which a menu like display will be created from which a user according to his wish can select any option for any automation in the home designed. It's First in a kind of attempt to automate the home using an android application.

IV. METHODOLOGY

The system is basically segregated into two sections, the first part deals with the security related mechanism for the system, and the other deals with the automation. In security all the efforts are made for which the system can be secured. In the automation part of the system all the techniques and method for ease of operating is handled. The security system made is generally mounted at the entry point of the system. The home or the user/owner have default password. In case if the password is forgotten or in case of any emergency System also generates the OTP for more security purpose. The OTP is then send to the Registered Mobile Number (RMN). A note has to be taken that it cannot be send to any random mobile number but the RMN. The mechanism is set so that the RMN should send the message/popup to the system for the generation of the one-time password (OTP) and then the system will send the OTP to the registered mobile number. The Mobile is connecting to the microcontroller through a GSM-Shield. The GSM-Shield we are using is used for the transfer of the messages and for the communication with the microcontroller. For the automation part of the system Using RMN the user/owner sends the

message for the appliance /electronic device to be state ON or OFF. User/owner then sends the message to the system with the help of the GSM-Shield in which a SIMCARD is been placed. When the System receives the message, system will perform the respective operation assigned.

a. Algorithm for OTP

- 1) Accept Numbers from Keypad. 2) Convert taken number into string and further typed numbers get concatenate with that string.
- 3) Store default Password in one string and compare it with typed string.
- 4) If it matches then user get entry else can't. Generate one key or number using Random () in Arduino IDE.(This is treated as OTP)
- 5) Compare this OTP with Typed Key or number.
- 6) If it matches then user get entry else can't

b. Software Requirements:-

Arduino Environment ARDUINO 1.6.1:-

It is the open source software (IDE) makes it easy to write code and upload it on the micro-controller board. It runs on various platform s like Windows, Mac OS and Linux. The environment is written in Java and it is based on other open source software. Arduino programs are written in C/C++.

c. Hardware Requirements :-

- i. Arduino Uno
- ii. Different Sensors
- iii. GSM module
- iv. Keypad
- iv. Mobile Phone (GSM phone)

i. Arduino Uno –

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a ACto-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

ii. GSM module:

GSM is an international standard for mobile telephones. it is an acronym that stands for Global

System for Mobile Communications. It Sometimes referred to as 2G, as it is second-generation cellular network. This is a very low cost and simple Arduino GSM-Shield. We use the module SIMCom SIM900. It is the cheaper module now available in the market.

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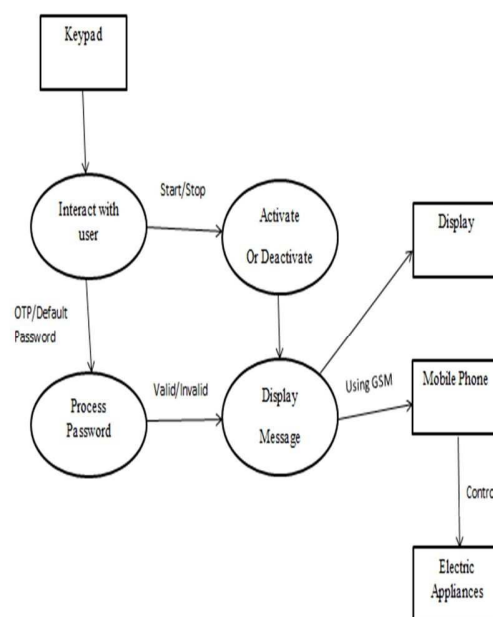


Figure1: Data Flow Diagram of System.

V. FUTURE SCOPE

Android app will also develop for easily use. In Android app there will be direct buttons for ON or OFF the system or to receive the OTP.

For more security purpose camera module can also be implemented on the system. If any person attempt to enter in home with more than three time wrong password then at that time camera module will be activate. And camera module will capture the image of person who trying to attack on system.

a. PROBLEM FACED

In this system GSM-Shield is a very important part for communication between mobile phone and microcontroller. GSM Shield requires the SIM card, due to range fluctuation or busy network sometimes GSM-Shield will not work properly.

b. CONCLUSION

In this paper, a novel architecture for low cost and flexible home security and monitoring system using Arduino microcontroller is proposed and implemented. Overall Arduino is easy to understand & its coding is easy. By implementing this type of system we can secure Entry point of our Home as well as for more security we can use various sensors.

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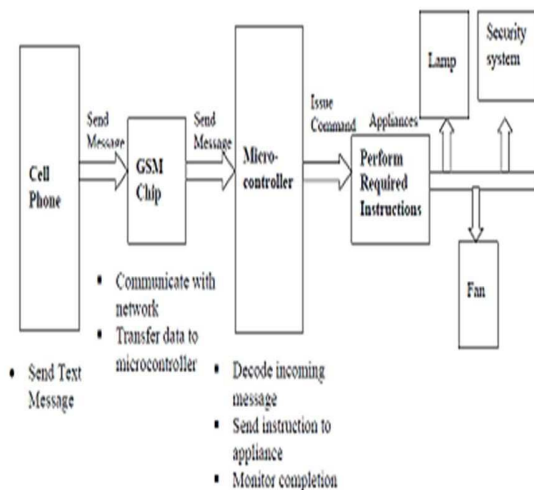


Figure2: Block Diagram of home Automation System

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