

Ingenious Lock using Arduino & Android

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Abstract- It's been a coon's age since we have been handling all the mainstream keys for our locks. Smart devices make life of a person feasible and updated. There is a plethora of technology available today that allow us to control devices without the need of any human intervention, the same work can be done by either by remote controls, voice commands or our on the click of smart phone itself. Our smart lock basically is a step to aggrandize the security for our house but in a more effortless manner. The proposed system describes improvement of a security system that is integrated with an Android mobile phone device using Bluetooth as a wireless connection protocol. The application is designed to allow the user to also check the status of the door. The mobile has an explicit need for the password to ameliorate the security. The hardware on the door uses a microcontroller that acts as the locking mechanism. Reason behind choosing Bluetooth protocol as the medium of communication lies in the fact that security is already integrated into many Android devices and is secured through the protocol as wells. It also fits well into the design requirements of the project for a short range, wireless connection method.

Keywords-

Arduino; Android; Home automation, smart lock, microcontroller, Wi-Fi module.

I. INTRODUCTION

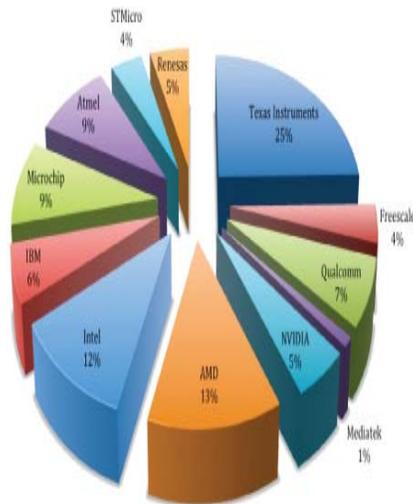
Home automation is a boon that enables you to control appliances/devices in your home from a mobile device from anywhere to anywhere in the world. The term may be used for isolated programmable devices but home automation more accurately describes homes in which nearly everything from lights, appliances, electrical outlets, to heating and

cooling systems - are hooked up to a remotely controllable network.

Our aim is to implement a cost efficient, reliable and scalable home automation system that can be used for remotely locking and unlocking the door, using an electromagnetic lock & Android connectivity.

When it comes to securing the front door, a well-made conventional front door lock does the job just fine. It is tried and tested. Also, its inner workings have been perfected for nearly two centuries. But consider this: Thanks to technology, a "smart lock" can add entirely new dimensions to a lock's convenience, utility and security and this is the main objective of the project, to basically ease its users from the general conundrum of keys and lock system and to lock and unlock the door without the keys when the user is in the proximity of the door using Bluetooth, Android application and electromagnetic lock. The project aims design a door lock system which will perform authentication of the user as well as opening and closing of the door.

Home automation or smart home is the residential extension of the building automation and involves the control and automation of lighting, heating etc. and smart is a vital part of it. The model that we have contemplated is the one that has similar interests in benefitting the users but in lesser budget and more ease than the already on-shelf models.



1. (Arduino usage in various MNC)

II. THE INGENIOUS LOCK SYSTEM

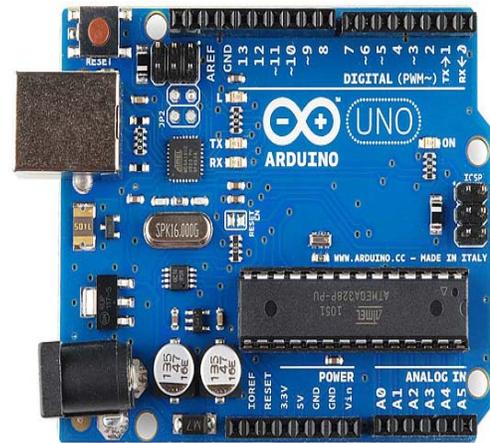
In our system, the Admin will be provided with the unique Id and password. The Id and password provided will help the Admin to log in. Once logged in with the obscure Id and password provided the user is capable to apprehend the current status of the lock whether it is locked or not. The Admin after he has logged in can generate an OTK (One Time Key) which is a key provided for the particular lock uniquely. The user can use the OTK only once for lock, once used the key becomes inutile by all means. The lock will have its own unique Id. The admin can generate the e-keys. These e-keys can be shared by the admin with the users. The other guest users can sign up with their Id and an authorized permission from the admin. The admin will be well acquainted with who all have the access to the lock.

III. COMPONENT ANALYSIS

A. Arduino

Arduino is an open source h/w which is introduced to provide feasibility to the usage of the hardware. Arduino is not some hardware you should be afraid of. Arduino comes in various forms for suiting various tasks. It is used by artists, hackers, hobbyists, and professionals to easily design, prototype and experiment with electronics. Use it as brains for your robot, to build a new digital

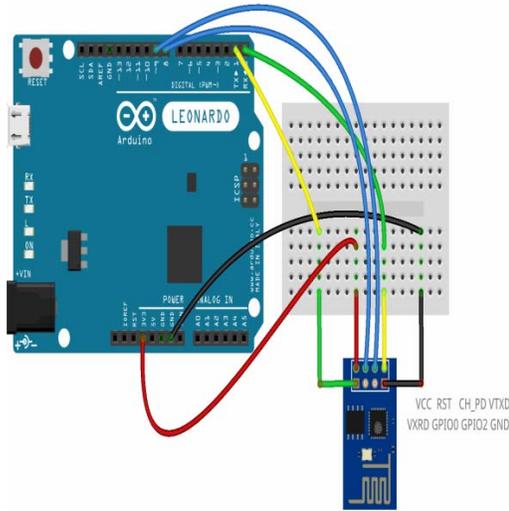
music instrument, or to make your house plant tweet you when it's dry. An Arduino contains a microchip, which is a very small computer that you can program. You can attach sensors to it so that it can measure conditions (like how much light there is in the room). It can control how other objects react to those conditions (room gets dark. LED turns on).



2. (Arduino Uno)

The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. Microcontrollers use inputs and outputs like any computer. Inputs capture information from the user or the environment while outputs do something with the information that has been captured. A switch and a sensor could be a digital and an analog input respectively into the Arduino. Any object we want to turn on and off and control could be an output. It could be a motor or even a computer. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed *shields*) and other circuits. The boards comprises serial communication interfaces. For the purpose of programming the microcontrollers, the Arduino project extends an environment which is known as Integrated Development Environment (IDE) based on a programming language:- C and C++. The Arduino language is very similar to C. It's almost the same language but Arduino provides us with several libraries to make things a bit easier.

The primeval Arduino was introduced specifically aiming to provide a low cost, easy way for the professionals to create devices that can easily and efficiently interact with environment and that too along with using sensors and actuators. A Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.



3. (Circuit diagram of Wi-Fi module in implementation of the idea)

B. Android

Android has a dictionary meaning of being a human that resembles automation. The real feature is the Google created software stack for creating comprehensive Mobile Applications and Software to actualize the complete potential of one's Mobile handset and its probabilities.

Android is a comprehensive software stack of mobile devices that includes an operating system, middleware and key application.

C. Application in Android

Android initially came into existence with the sure fire idea that developments are given the power and freedom to create enthralling Mobile applications while taking advantage of

everything that the mobile handset has to offer.

Android is built on open Linux Kernel. This particular software for Mobile Application is made to be open source, thereby giving the opportunity to the developers to introduce and incorporate any technological advancement. Build on custom virtual machine android gives its users the addition usage and application power, to initiate an interactive and efficient application and operational Software for your phone.

Google's mobile operating device, the android is its awesome creation in the definitive creation of Software Applications for the mobile phone arena it also facilitates the g-juice in your mobile thus initiating a whole new world of Mobile Technology experience by its customers.

In our project we are using the Android application for the ultimate control to be provided to the user on the click of a button. The synchronization of the android application with arduino facilitates our system. As the android application are today acting as a savior for all our primeval needs to the most advance ones. Hence we are using the same means to entrust the ease of using the system for our users.

IV. LITERATURE REVIEW

A. Nest Labs

It is an enormous producer of machine-learning, sensors and detecting devices and list includes many other such vital devices.

Tony and Matt Rogers are the founders of this massive production team called Nest lab. The idea popped when Tony Fadell was constructing a holiday home and found all of the provided thermostats on the market to be inadequate and this ignited the motivation to bring something more efficient in the market.

It was on June 2014 that it was in public that Nest is going to buy the camera startup Dropcam. In this system the

Dropcam is hugely and closely integrated with various products. If the Protection alarm is triggered and rings the Dropcam can automatically start analyzing, and the Thermostat can take the help of the Dropcam to sense motion.

B. Smart Lock

A smart lock is a device which is an electrical and mechanical locking system which is developed to perform the general locking operations on a door when it receives required instructions from an authorized and authenticated device using a wireless protocol. It also looks after the access and sends alerts for the different activities it monitors and some other critical events related to the status of the device. Smart lock is an imperative part of the smart home.

Smart locks, like the traditional locks, need two main parts to work, the lock and the key. In the case of these electromechanical smart locks, the key is not a physical key but a smart phone or a special key designed and configured explicitly for this purpose which wirelessly will perform the authentication and verification needed to automatically unlocking and locking of the door.

Smart locks give to the users the ultimate control an authority to provide the access to an unknown user by the means of a virtual key. This key can be sent to the recipient smart phone over standard messaging protocols such as e-mail or SMS. When this key is retrieved the recipient gains the charge to unlock the smart lock during the limited period that's pre-specified by the previous user.

Smart locks are used in way where we are allowed to grant or deny access through the simple use of a mobile app. A strata of smart locks comprises a built-in WiFi connection that privileges us with the monitoring features such as access notifications or alerts and cameras to identify the person requesting the access.

C. Lockitron

The first iteration of Lockitron replaced the deadbolt, but the newer iteration which is

shown in figure 1, is placed on the door lock from the inside, thus allowing the use of the product even for renters since it can be easily removed and installed elsewhere. An issue would be that there are many different variations of door locks, therefore the user can print out a template to check if Lockitron would fit on the door lock, or send a picture to Apigy, which they would evaluate. Its batteries can last up to one year, and can send a notification when they are running low.

Lockitron allows the user to lock their door from anywhere in the world through WiFi. There are applications for both iOS and Android. It also functions with other mobile phones through the use of simple text message commands. Bluetooth 4.0 is only available for some currently released Android smart phones and the Iphone 4S and 5. The user is also able to share access with family and friends, by using their email address or phone number. The consumer also receives notifications when the lock is being used by someone else. Apigy has released an API which allows the user to write their own programs to control the lock through scripts, applications and websites.

The above models possess the following limitations:-

1) Being forgetful of the pin is a big limitation. You may be the one to forget your keys now and then, and it can be easy to forget you PIN code for the lock and when your in a rush to get into the room or building or it is night time and dark, you don't want to be changing the code in the middle of the night or when it's raining!

2) Power Failure is in itself a major problem for such systems. There is a category of digital door locks that are powered through the electricity, but in the worst case when your home has a power failure, then the door lock will be clogged which restricts you from going into your own house. Getting a battery powered lock will not pose a problem for you if there is a power failure.

3) Limiting the PIN Code Length should be a major step. Some digital door locks have a

PIN code length ranging up to 10 digits – this is not at all effective or helpful to us. Digital Door Locks will be much more advance and strongly secure if they are 4 digits long. Buy a lock with appreciable quality that you can alter the PIN code on, don't buy locks that are provided with a pre-existing PIN code because it is extremely vulnerable for the security that could be compromised easily.

V. FUTURE SCOPE

The mobile application is constrained by the system interface to the Bluetooth within the mobile phone. The presence of a single system and a single user makes the system interface likely to be the same. But, there may be a difference between what navigation features each of them provide. The Bluetooth range is one of the constraint for the application. Since the application authenticates the user and the key one may use the Bluetooth range and camera capturing function of the application to fulfill a more versatile nature of the working of the project. A rechargeable battery can be provided which can give power backup of 3-4hrs in case of power failure. GSM and GPS system can be used in case someone tries to hack the lock password/ cause any physical damage. The GPS and GSM system would track the thief's location & also our location, thus sending us an alert message regarding the attack on our smart-lock. It can also be implemented using cloud computing where user can control the lock irrespective of his location. Use of camera can also be done for surveillance. For further security, fingerprint scanner, face detector etc can be used. To avoid opening of door every time, voice conversation can also be done with the person on the other side of the door. This system can also be installed with a fire alarm. Usually at home we don't have fire alarms, so this system can work as both - lock and fire alarm. This system can be used in hotels, banks, motels, or any other place as an alternative lock for additional security.

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