

## MULTI TIER SECURITY SYSTEM USING ULK KIT FOR SECURE DOOR OPERATION

<sup>1</sup>Priya Vijay, <sup>2</sup>S.Bharatwaaj and <sup>3</sup>S.Bharadwaj

<sup>1</sup>Associate Professor, Department of CSE, Rajalakshmi Engineering College, Thandalam, Chennai, India

<sup>2,3</sup>Student, Department of CSE, Rajalakshmi Engineering College, Thandalam, Chennai, India

### ABSTRACT

Nowadays, Security is a major aspect that is currently existing to cause many crisis and data theft. In this paper, we are comparing almost all current standard security systems with one another and arriving at an architecture which is best suitable for a security based scenario. Here, we are bringing about a solution, which is a generic security system that enhances the current product's features and thereby improvising it, by providing the required high level of security. Comparing GSM based security systems, GPRS based security systems, Wifi based security systems, SMS based security systems, RFID based security systems, biometrics based security systems, password-entry based security systems, pin-entry based security systems, OTP based security systems, smart-card based security systems, bluetooth based security systems, facial recognition based security systems we have provided a solution that will be optimal and feasible using the ULK Kit. Our proposed architecture will be having the combined features present in the above-mentioned systems. All these systems have its own advantages and disadvantages which will be compared and contrasted in this paper. Nowadays, security systems should have enhanced features so that they cannot be cracked easily.

**Keywords—** *ULK Kit, UTLP Kit, Security System, GSM, Mobile Security.*

### INTRODUCTION

Security is one of the major aspects of concern in today's life. As the status and the lifestyle of a man increases, the security is ultimately need to him. But the ways by which the feeling of being secured can be provided are very limited. Security measures till date hasn't proved 100% in any field in which it has been engaged. But, here we have dealt with security by enhancing the same to a tier level mechanism that ensures the maximum assurance. The system encompasses various security aspects which will be discussed in the further divisions.

The world is moving at a faster pace and the technology is also simultaneously getting updated with this fast moving environment. As the technology increases, the need for security is also at the maximum, and

this need isn't properly satisfied till date. The main motivation rose when people started asking "if there are multiple lock methods for mobile phones to protect our personal information from getting accessed, why can't there be a system that functions in a similar manner to protect our belongings". This actually drove us to build the Multi-tier security system that encompasses a multiple locking levels and ensures in providing the maximum security. We went on to research in what ways the security is provided and what are the security measures that are leading the market, and also what are the measures that make people comfortable. These helped us a lot in building MTSS.

### LITERATURE SURVEY

#### UTLP Based Security Systems

P. Mohan et al. [1] proposed a system that covers Real time home monitoring using UTLP Kit, whereas our product when compared to it, not only serves as a home monitor but also provides three levels of security and provides additional administrative aspects to govern the system.

S. Kumaresan et al.(2015) has described a secure ATM feature in his theory. Their theory was to shuffle the keypad values entered in an ATM machine using the GLCD in the UTLP kit which thereby confuses the nearby person who intends to watch the pin entry. This is an additional feature we have added in our system which tends to confuse the user to find a person's pin entry. The below figure 1(quickembed) describes a generic UTLP Architecture.

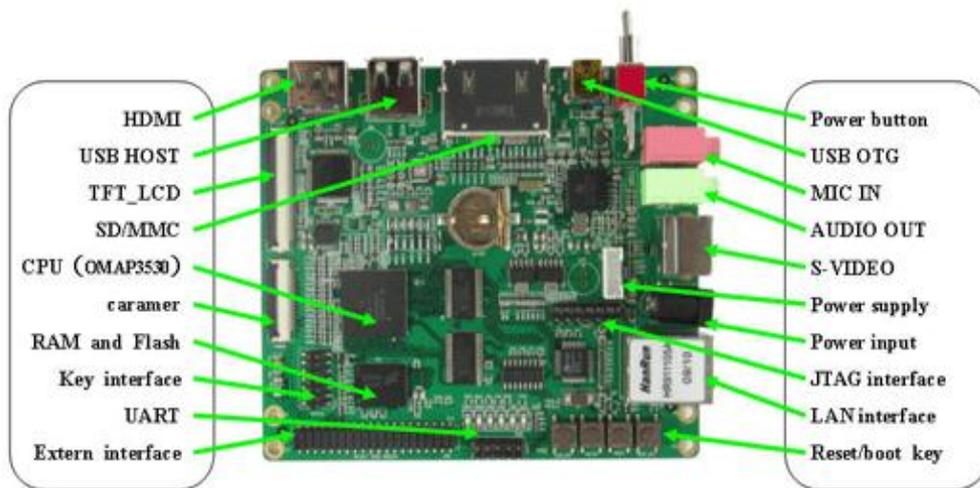


Figure 1.UTLP Architecture

**RFID Based Security Systems**

S.Nandhini et al. (2014) discusses about a RF id based secure toll system that enhances smart city facility. The system replaces the manual tolling system by using RF id's which is used to calculate the toll charges and amount the user and is also helpful in jotting down the car numbers in order to reduce the crime rates. Controversially our system can do the same if our system's features are customized based on it, except for the feature of an RF id, in our security system the car number has to be manually typed by themselves.

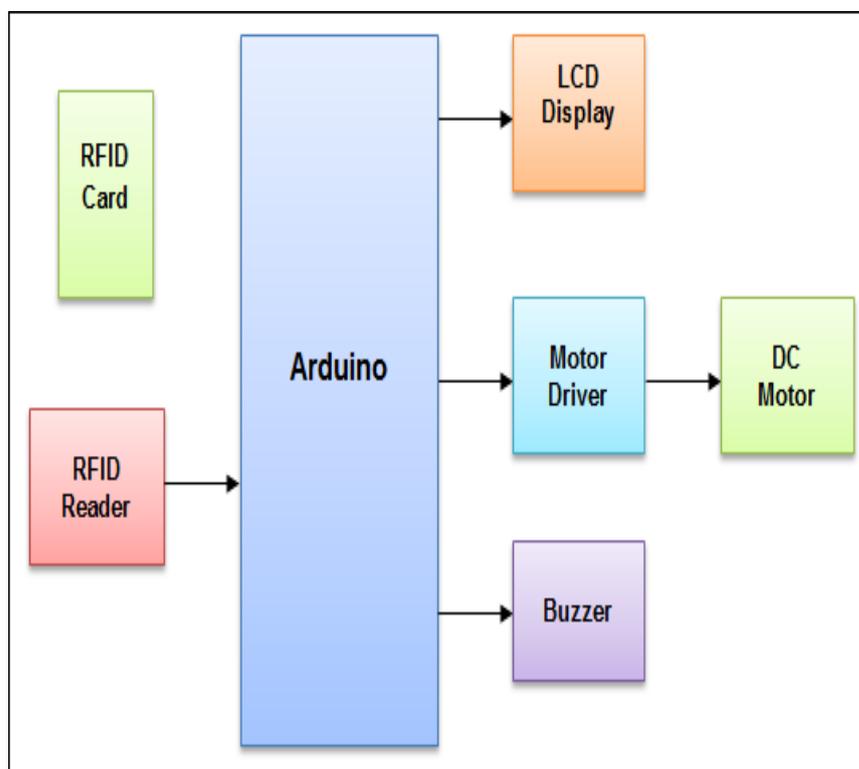


Figure 2. RFID Generic Architecture

Gyanendra K. Verma et al. (2010) has proposed a RFID tag based system that encompasses RFID feature which lets in or out the users. The main advantage is it is easy to use, it is more like a new form of a key. It is highly applicable for hotels and they prefer to use it there. But the same problem in key exists here. If it is lost, then new RFID tag has to be generated. The key code has to be highly encrypted or else it will be easy for the others to crack.

K. Srinivasa et al. (2013) proposes a security system based out of RF id's which is liable only for a shorter distance. It is a buzzer alert system, if there is any abnormal activity identified by the system,

then the user is alerted through the buzzer. It has a liquid crystal display to showcase the status of the system. The above figure 2 (powerof8051) describe a generic RFID based security architecture. Sucharita Jana et al. (2012) has proposed a door security system using RFID and PC based attendance to access a door without any wires. This system is mainly for usage at colleges and schools where the students' attendance are calculated manually. It detects students based on the RF ids and sends data. They have used ATMEGA chips to build this circuit. This can also be achieved by our system, since we have customizable modules, which users can customize to form it into any sort of security system.

**Biometrics Based Security Systems**

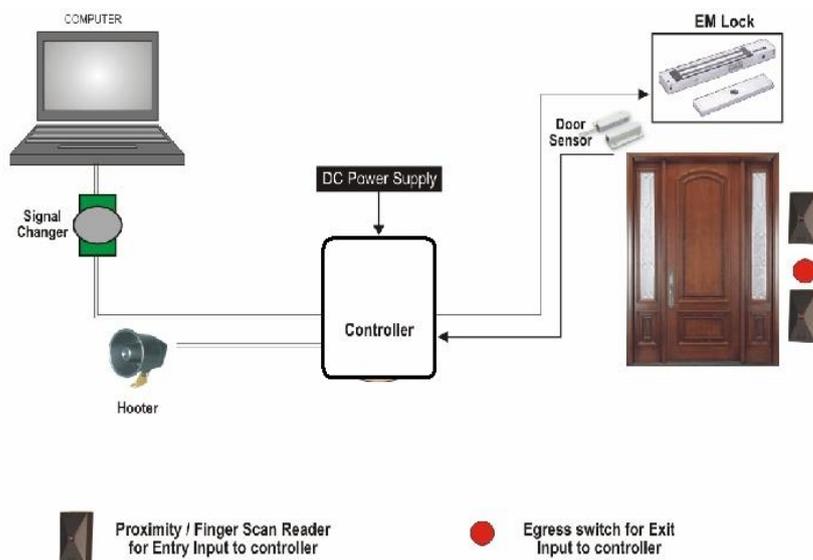


Figure 3. Finger Print Architecture

A. Aditya Shankar et al. (2015) describes a system that secures a door by using biometrics (fingerprint). The main advantage of this system is the same main disadvantage where only the pertaining user can access the door and the other people cannot access it. This gives an ambiguity, where our system provides access to any user based on pin inputs and their own images.

Mary Lourde R et al. (2010) proposes a fingerprint based door locking mechanism where the system is for limited access and is for personal identification. New users has to be created and not everybody can enter into the secured space. They are using two algorithms to detect and enhance the performance features of fingerprint sensors. The figure 3 (securitysystemacademy) describes a fingerprint based security architecture.

**GSM Based Security Systems**

Ushie James Ogri(2017) et al. proposes a system that can be remotely controlled using a gsm module. This system is flexible and can be controlled through instructions from a sim card. Here the security aspect is lost owing to control of access from a remote gsm module, which if lost any other user can access it. But remote access is an important feature that every user would want to use in these days. That is why we have it as a piece of execution in our proposed system. While we send an OTP to the user’s mobile phone.

Aman Singh et al.(2014) has created a GSM based home controller system, which is purely IOT based using ATMEGA microcontroller. It has a keypad in which passphrase has to be entered where the data is verified and checked with the system and then the door is opened based on it. This type of systems are hard to crack if dynamic passwords are generated which is encrypted with the current time as the key phrase. The below Figure 4 (elprocus) specifies a 8051 based security architecture using a GSM peripheral.

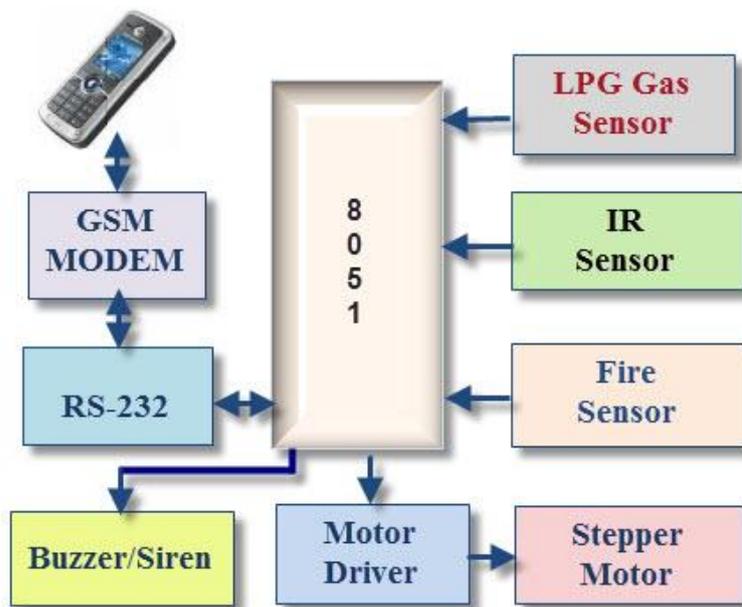


Figure 4. 8051 Based Architecture

**Combined Security Systems**

Pradnya R et al.(2016) have compared all door security based systems and have given an idea on all the security system which has helped us to choose what would the exact needed modules and we jotted down the three security aspects of a pin entry, OTP entry and at last the face recognition aspect. If we had the face recognition in the first, there might be a problem of making the user to force to open it.

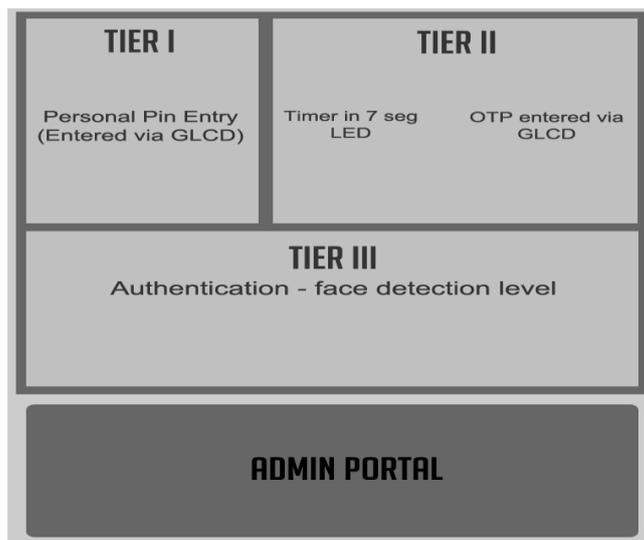
**PROPOSED ARCHITECTURE**

Our proposed ULK Kit architecture has been drawn below in Figure 5 which consists of which consists of three tiers. They are Pin-Entry, OTP Entry and then the facial recognition. We are including various peripherals to the ULK kit to verify the user’s entry combining all the discussed architectures and papers.

The personal pin entry is the first module in MTSS and it is very essential to ensure the whole process is safe and secured. There are some emergency and safety measures that can even capture the intruder’s image at the first stage.

There are a series of steps that has to be taken before the personal pin entry is setup.three tiers. They are Pin-Entry, OTP Entry and then the facial recognition. We are including various peripherals to the ULK kit to verify the user’s entry combining all the discussed architectures and papers

The personal pin entry is the first module in MTSS and it is very essential to ensure the whole process is safe and secured. There are some emergency and safety measures that can even capture the intruder’s image at the first stage.There are a series of steps that has to be taken before the personal pin entry is setup.



*Figure 5.* Proposed Architecture for Multi Tier Security System

Once the personal pin Entry is validated, the second level – OTP Entry is opened. An OTP is sent to the user’s mobile number through the activation of the system call to trigger the processing of GSM module.

This OTP that has been sent to the user’s mobile phone, stays for 30 seconds after which the Sent OTP becomes invalid. However, There is a special option called “Resend OTP” by which the user can request

for a new OTP. This 30 second gap is mainly for situations where there is a major signal drop, or the person is committed with a call.

Further, if there are three wrong attempts in the OTP entry, the whole product will be locked and is only viable to the Admin’s pin. This is again one of the major anti-hack security feature of MTSS.

The last level of verification is the face capture and detection. Here, the user, after have successfully completed the first two levels has to stand before the camera, where the face of the user is captured using the UVC camera. This image is captured and stored in the system, which is verified later. Thus, for an access to be granted, the user has to undergo all these robust security levels. MTSS, when connected to a mechanical device like a motor or any other motion controlling device, is even capable of controlling that particular component.

The proposed architecture is given in figure 5 below which includes three level security system as pin entry, OTP verification and face recognition system. The door will be opened only when all the verification are valid. The flow architecture for the above process is shown below in figure 6 below

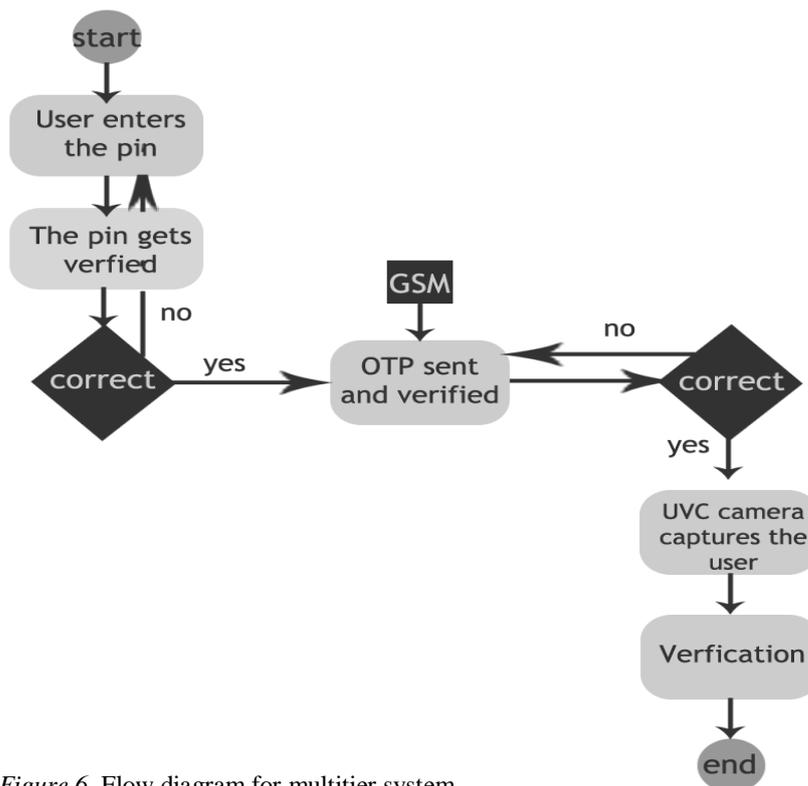


Figure 6. Flow diagram for multitier system

## IMPLEMENTATION

Wipro UK kit is connected with camera and GSM module to implement the module. First level verification is done with ULK kit to do pin verification in the kit itself to login to the system. Second level verification is done with connecting the kit with GSM module to send OTP numbers via mobile. Third level of verification is done with connection ULK kit camera to do face recognition. The system was implemented using Embedded C and python to connect the kit with GSM and camera.

### Steps to set ULK kit as security System

#1 The user, if have not signed up with the kit, has to contact admin, who has the control over adding and deleting entries. Else, if the user has already got his/her pin, enters the pin using the keypad displayed in the GLCD (Touch Interface).

If there are three wrong entries by the user, MTSS has an in-built feature of capturing the user who has made three wrong entries, considering him as an intruder.



Figure 7. Screen shots for pin verification

On the other hand, if the pin is entered properly and correctly, the MTSS intimates this on CLCD, and then proceeds to the next level of verification.

#2 Here, an OTP (One time password) is sent to the user's mobile number.

This is done using the GSM module thereby installing the .ko file of the same. A span of 30s is given to the user to enter the received OTP onto the kit. This span is mainly to avoid the mishaps caused due to signal delays or phone calls.

Once this span is over, a keypad is displayed for the user to enter the password. Here again, for 3 wrong feeds, the whole kit gets locked and is only viable to admin's pin. There is another special option called the 'Resend OTP' option which solves the need perfectly.

#3 The final level in MTSS is Face detection, where the user faces the camera that gets activated by a system call on a positive response from the second level of verification.

This is the ultimate and the top level of security as the face of the user is detected. Highest level of authentication is done here.

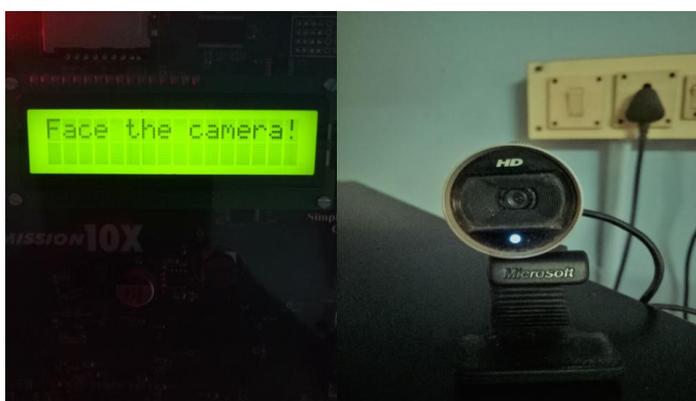


Figure 8. Screen shots of Camera recognition

The Face Detection is done using the pre-requisite libraries Opencv and Dlib. Opencv has been evolved from the graphic libraries of OpenGL which has been incorporated in the system. The conversion of the image into the dimension 320 x 240 pixels to fit into the graphic liquid crystal display, an algorithm 'yale' is handled. With this the image processing feature and the face detection is implemented as the third and final level of security to the system

## CONCLUSION

Thus, various security systems based out of various peripherals and architectures were contrasted and another security system has been proposed using the ULK Kit which is a generic security system offering multi levels of security which is customizable based on the user's interests and easiness. The proposed system uses WIPRO Unified Learning Platform Kit which is a ARM Processor embedded kit. The kit can control the doors with sensors and motors and embedded coding can be done in the embedded kit itself using C and Python to implement the system.

**REFERENCES**

- A. Adithya Shankar(2015) FingerPrint Based Door Locking System. *IJECS vol. 4 issue 3*.  
Arduino based security system Architecture, Digital Image, Retrieved from [www.projectsof8051.com](http://www.projectsof8051.com).  
Biometric/card based access system, <http://securitysystemsacademy.com/why-biometric-door-access-control-systems-are-critical-for-any-electronic-security/>  
Home Based Security System with GSM using 8051 Microcontroller, Retrieved from <https://www.elprocus.com/gsm-based-home-security-system-working-with-applications/>  
K.Srinivasa Ravi, G.H.Varun, T.Vamsi, P.Pratyusha(2013). RFID Based Security System.*International Journal of Innovative Technology and Exploring Engineering. Volume – 2. Issue - 5*  
Jana Sucharitha(2012). Design of a PC Based wireless door security system. thesis.  
K Verma Gyanendra, Pawan Tripathi(2010). A digital security system with door lock system using rfid technology. *International Journal of Computer Applications. 0975–8887. Volume 5–No.11*.  
Mary Lourde(2010). Fingerprint Identification in Biometrics Security Systems. *Ijcee. vol.2 issue 5*.  
Ogri Ushie James(2017). Design and Construction of door locking security system using GSM.*IJECS vol. 2 issue 7*.  
P. Mohan(2012). Real Time Home Appliances Monitoring By IoT Using UTLP.*IJARMATE*.  
R Pradnya(2016). Literature survey on door lock security systems.*IJCA vol 153 number 2*.  
S.Kumaresan(2015). Design of secured ATM by wireless password transfer and shuffling keypad. IEEE.  
UTLP ULK Kit Architecture, Digital Image, [www.quickembed.com](http://www.quickembed.com).  
S.Nandhini(2014). Automatic Toll Gate system using advanced RFID and GSM Technology.*IJAREEIE, vol 3, issue 11*.  
Singh Aman, Abhishek Yadav(2014). GSM Based Security System.*Ijates. vol. 2 issue 4*.



