SECURE BUDDY: An Intelligent Door Lock

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Abstract - *In this paper we present an intelligent door lock system for home automation. An intelligent door lock system is equipment which can make use of the digital information like passwords, smart cards, biometric finger print and the real time picture of the guest as a method of authentication. In the proposed system, the Amazon Web Services (AWS) are used with the main hardware component as raspberry pi. Technically the proposed system is an intelligent door lock system with server less computing as its main attribute. This system consists of the RFID module for the user Identification, LCD and keypad, camera module for real time face detection, motor module for opening and closing of the door. There are three main components for the control section Arduino, Raspberry pi, AWS. Arduino is used to control the action of the lock. Raspberry pi is used as a main component for hardware control. It controls the transactions between the camera module and AWS, AWS and the arduino, AWS and speaker and AWS and the user. The proposed system is designed specifically for the domestic purpose and can be installed without the requirement of any specialized infrastructure and proper planning. The user interface of the system allows user to conveniently monitor the actions of the lock. It also allows the user to monitor the situation while away from the home.*

Key Words: **AWS, Raspberry pi, RFID, LCD, Door Lock**

1. INTRODUCTION

The securities currently become a very important issue and this is why a lot of security systems have been purpose using an important process such as recognition especially for building access controls looking for evidence to support his decision. Face recognition is one example of process that improves the security application for building access control. The advantage of using face recognition instead of other identification process such as iris or fingerprint identification is because it least intrusive and more Secure.

Home automation system is a computerized and intelligent network of electronic devices designed to monitor and control the home appliances. Home automation is the emerging field that has tried to get the attraction of most of commercial and research fields. Although wired home networks were given importance in the earlier stages of home automation but now as technology is emerging a lot people have started adopting technology to a greater aspects. Wired system requires proper planning and construction works is also messy. It is the reason wireless communication has replaced the wired ones. Furthermore wireless system provides more flexibility and extensibility that is its installation is free from construction works as it requires no cabling cost.

Since Amazon Web Services has become so prevalent in cloud computing, it was seen as simple, low cost, secure solution for wireless network connecting a mobile device to home network system.

This paper proposes a novel system for the access monitoring and control on digital door lock that uses image recognition technology. By adopting the system, users can be provided with safe and convenient life. The objective is to develop a prototype system with a wireless module and a digital door lock providing one of the practical applications of Amazon Web Services. Implementation of the prototype system would be good solution of access monitoring and control system

1.1 Structure of the system

In this section, the brief description of proposed system followed by the operation of the Raspberry pi module, the digital door lock, AWS, and the sensor module has been provided. The term AWS will be the main component of the system. Smart digital door lock is a system to monitor the activity of the entries on the door. The smart digital door lock system can be divided into three parts: the control module, the communication module (server) and the I/O module. The control module is the brain of the system. The locking operation is controlled by the microcontroller. The communication module is used to connect the services to the microcontroller. The user can access to the door lock system through I/O module. The I/O module is connected to micro controller that will fetch the image and ID from the user or visitor.

1.2 Control Module

It controls camera, speaker and communication between server and all the important processes are done by this module. The control module is the center of the door lock system where all the process cycle starts. This module uses raspberry pi as its main component. This module connects the server for verification of the user image-id and to the microcontroller. Camera is connected to control module to capture the image of the visitor. All the operations are done by the control module which includes sending SMS, send notification to the owner, check that the door is open and if it is open then it will accordingly close the door.

1.3 Communication Module

In this module the Amazon Web Services are used. The main components among AWS for this module are AWS LAMBDA and AWS IOT. AWS IOT connects all the hardware components to the all AWS services. AWS LABDA helps user to create a serverless system. It provides proper communication between the AWS services. The communication module runes in only normal mode. It only notifies the details of the visitor to the user and wait for the response.

1.4 I/O Module

In the input systems we have both sides. There is input from the user/owner and the input from the visitor which system takes by asking few questions. The output sides we have the speakers which both user and the door lock have for the visitor. At the user side we have used ALEXA. Alexa is a tool used to convert speech to text and vice-a-versa. At the Door Lock we have used the normal speaker with amplified output with the Amazon POLLY working as Alexa.

2. Operation of the system

The Main task of this Door Lock is to recognize and remember a unknown guest. It works on the principle of Image Processing and IOT. The main software component used in building the software framework of this project is Amazon Web Services which is a complete package of all of cloud computing resource. After pressing the pushbutton located inside the doorbell the camera module attached to raspberry pi is triggered, which in turn captures and uploads the jpeg file i.e the image source file into the S3 bucket service provided by Amazon Web Services and also triggers a social networking service also known as SNS notification directly onto the phone of the registered mobile number. It also sends an email with the captured image file to the registered email address of the house owner, It also sends request for greeting text to AWS Polly which is a text to speech converter and playes audio greeting generated by AWS polly for the guest.

After receiving the notification from AWS SNS or email the house owner can ask the virtual assistant like amazon echo which has a inbuilt alexa or the google assistant to introduce the guest. After this the virtual assistant triggers a custom skill "Door Guard" which has some inbuilt skills like "alexa, who is there at the front door". After the custom skill is invoked the virtual assistant that is Alexa (in our case) triggers a lambda function which in turn reads the image uploaded to the AWS S3 bucket and sends a request for face search to AWS Rekognition and lastly after getting the result for face matches by Rekognition the AWS Lambda searches for the name in AWS Dynamo Database and returns the name to the virtual assistant if found. The virtual assistant provides name to the house owner and the administrator sends command to open the door, In this case lambda sends

open door command to AWS IoT to a specific topic. Raspberry pi receives the following command and sends the command to Arduino by using the serial port. The lock is controlled by Arduino.
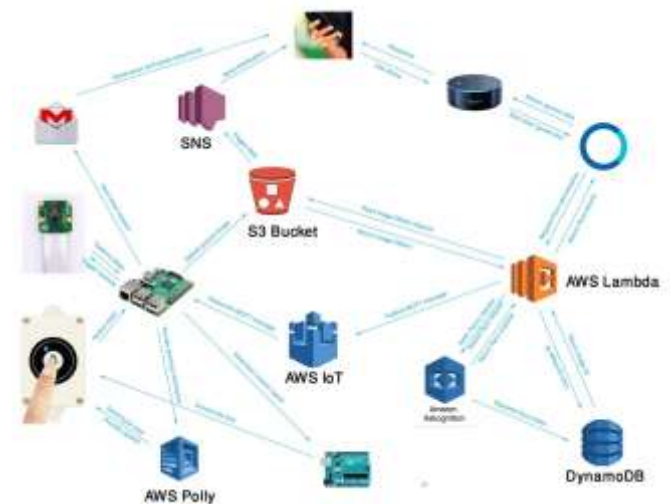
3. CONCLUSIONS

Digital door lock is one of the most popular digital consumer devices because of the user convenience and affordable price. In actuality, it is replacing a lot of conventional types of locks. This report tries to propose a wireless intelligent system consist of different phases:

1) Detecting user

2) Fetching image-id

3) Verification

4) Notifications

5) Process according to request

A low cost authentication system based on Amazon Web Services, making home automation more secure and cost efficient. This technology can surely make change in the society to drop the percentage of crime. Both NFC, RFID can be used in securing home but implementation cost and availability of supply to hardware requirements is not up to the mark. So Face Recognition has been considered.

REFERENCES

[1] Il-Kyu Hwang, Member, IEEE and Jin-Wook Baek."Wireless Access Monitoring and Control System based on Digital Door Lock", IEEE Transactions on Consumer Electronics, Vol. 53, No. 4, NOVEMBER 2007. 0098 3063/07/20.00 © 2007 IEEE.R. Caves, Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982. (book style)

[2] Yong Tae Park, Pranesh Sthapit,Jae-Young Pyun."Smart Digital Door Lock for the Home Automation", Department of Information and Communication Engineering, Chosun University Gwangju, South Korea,978-1-4244-4547-9/09/26.00 ©2009 IEEE.

[3] N.H, Ismail, Zarina Tukiran,N.N. Shamsuddin, E.I.S saadon,"Android-based Home Door Locl(s Application via Bluetooth for Disabled People", 2014 IEEE International Conference on Control System, Computing and Engineering, 28 - 30 November 2014, Penang, Malaysia.978-1-4799-5686-9/14/31.00 ©2014 IEEE.

[4] Pavithra.D,Ranjith Balakrishnan,"IoT based Monitoring and Control System for Home Automation ", 978-1-4799-8553-1/15/31.00 © 2015 IEEE.

[5] Shruthi Suresh, Sruthi P V, "A Review on Smart Home Technology", 2015 Online International Conference on Green Engineering and Technologies (IC-GET 2015),978-1-4673-9781-0/15/31.00 © 2015 IEEE

[6] Chi-Huang Hung, Ying-Wen Bai, Je-Hong Ren,"Design and Implementation of a Door Lock Control Based on a Near Field Communication of a Smartphone", 978-1-4799-8745-0/15/31.00©2015 IEEE.

[7] Chi-Huang Hung,Ying-Wen Bai, Je-Hong Ren,"Design and Implementation of a Single Button Operation for a Door Lock Control System Based on a Near Field Communication of a Smartphone", 978-1-4799-8748-1/15/31.00©2015IEEE.