Wireless Visual Visitor Verifier for Home Security Using Smart Phone

Bhargav B. Patel[1], Keyur Chauhan[2], Suchita B. Patel[3]
[1, 2] Assistant Professor, E & C Department, GTU University, Gujarat, India
[3] Assistant Professor, M.Sc IT Department, S.P University, Gujarat, India

This paper deals with the design of an intelligent home access control system based on visual authentication. It allows the user to grant entry to any visitor to his/her house remotely after viewing the visitor's picture. The design uses the Arduino Uno as the system processor. The whole system was implemented using wireless webcam through pop up message by Arduino and the Smartphone receives the picture from ip camera (webcam as ip camera here).When the visitor arrives and wishes to enter the home, the webcam continuously keeps on tracking any changes in its view and it takes the picture of the visitor. There will be a pop up message on the owner's phone asking about whether he wants to view the image or not, once he/she selects yes, it will receive the image from ip address of the webcam via Bluetooth pairing. Further after about 5 millisecond delay a message will be displayed to ask about owner wants to open the door or not. If owner wishes to open the door a signal will be sent to electronic lock via Arduino. If owner answers negatively the whole program will be terminated their itself. In this way our system will work.

Key Words: Arduino Uno controller, webcam as ip camera, Smartphone, android, electronic lock.

I. INTRODUCTION

Smart living is envisioned to be the standard of living for many people in near future. Smart living enables easy and understanding style of living where all computing is silently, seamlessly embodied in many
Human's life aspects. Many researches are geared towards realizing the function. An open-source platform Android has been widely used in smartphone [2]. It comes with Software Development Kit (SDK), which provides essential tools and Application Programming Interfaces (APIs) for developers to build new applications for Android platform in Java. And also Android platform has support for Bluetooth network stack, which allows Bluetooth-enabled devices to communicate wirelessly with each other in a short distance [last]. Bluetooth technology, created by telecom vendor Ericsson in 1994 [1], shows its advantage by integrating with smart phones
However, there are still few researches focus on security aspect of entry access related to smart home. Smart home authentication system is an urgent system to be installed within smart homes compounds. Conventional authentication systems use secret knowledge like password either from alphanumeric PIN to graphical click-based or pattern password.

II. RELATED WORK

With the introduction of the Internet of Things, the research and implementation of home automation are getting more popular [3]. Various wireless technologies that can support some form of remote data transfer, sensing and control such as Bluetooth, Wi-Fi, RFID, and cellular networks have been utilized to embed various levels of intelligence in the home [4].The studies in [5, 6] have presented Bluetooth based home security systems using Android Smart phones without the Internet. In previous year Biometrics appears to answer the problem related to conventional system. One of the ways to implement biometrics authentication system is by authenticating them via image or video captured using a dedicated terminal as biometrics enrollment module. This biometrics module is pricey and adding cost to overall cost of having smart home for people. In addition, it can be destroyed by thieves to bypass biometrics authentication after alarm system being turned off. We perceive that Smartphone camera can be used as replacement of dedicated enrollment module [4].It is a wireless technology developed to replace cables on devices like mobile phones and PCs. Although cable-replacement could create a point-to-point communication, Bluetooth allows wireless devices to be able to communicate with each other within range.

III. SYSTEM DESIGN

In order to address the mentioned issues of flexibility and functionality in the literature survey, we designed and implemented a novel, standalone, flexible and low cost home security. The controller is Arduino Uno ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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 an AC-to-DC adapter or battery to get started.
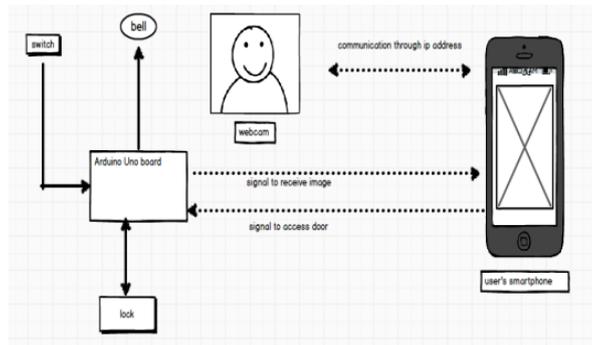
Fig: 1 Overview of conceptual architecture

IV.   TOOLS AND TECHNOLOGY USED

4.1 Android

Android is an intent based operating system. Using Android 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. Moreover Android is an open source platform and hence can be learned and implemented easily. We need an android application to receive an image from the webcam as well as we need it to interface with the user and device.
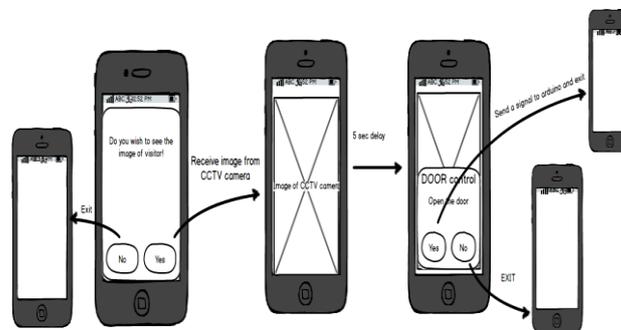

Fig2. Mockup diagram

4.2 Bluetooth Module V2.0

BTBee [10] is an easy-to-use Bluetooth SPP module compatible with existing Xbee sockets, designed for transparent wireless serial connection setup.

The HC-06 Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It has the smallest footprint as small as 12.7mmx27mm. So it will simplify your overall design/development cycle.

Software Features

- Default Baud rate: 38400, Data bits: 8, Stop bit: 1, Parity: No parity
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- When a rising pulse is detected in PIO0, device will be disconnected.
- Auto-connect the last device on power as default.
- Permit matched device connect by default. Auto-reconnect in 30 min when disconnected as a result of beyond the range of connection.

4.3 Wireless Sd Shield

Fig: 3 Bluetooth mounted on wireless shield

The Wireless SD shield allows an Arduino board to communicate wirelessly using a wireless module. The module can communicate up to 100 feet indoors or 300 feet outdoors (with line-of-sight). It can be used as a serial/USB replacement or you can put it into a command mode and configure it for a variety of broadcast and mesh networking options.

4.4 WI-FI

We need to receive an image over wireless network, use of Wi-Fi comes into picture here.We can use a router to satisfy our needs. Software called virtual router can also be used as a substitute to the router if it's not available.
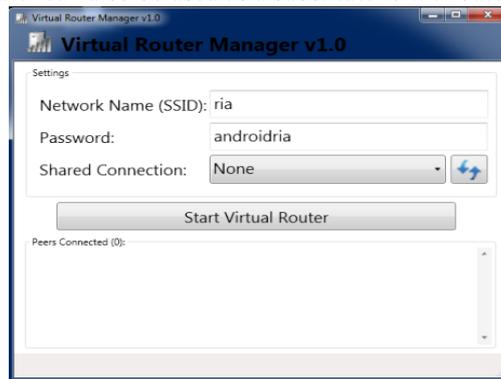

Fig: 4 Virtual routers

4.5 WEBCAM

A webcam is a video camera that feeds or streams its image in real time to or through a computer or computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be save, viewed or on sent there. Unlike an IP camera (which uses a direct connection using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable. If webcam is not available we can use webcam of a laptop using a software called Yawcam. [9]
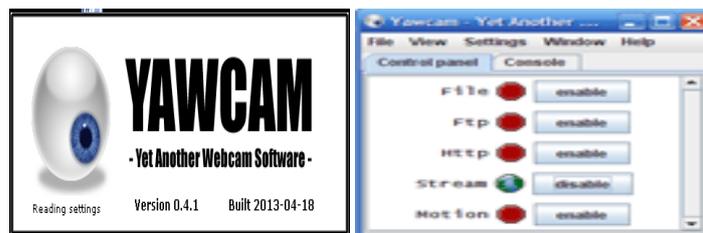

Fig: 5 Yaw cam

Features of Yaw cam:
-Video streaming
-Image snapshots
-Built-in web server
-Motion detection
-Text and image overlays
-Password protection
-Online announcements for communities
-Scheduler for online time.

4.6 AMARINO

Amarino is a toolkit to ease the development of innovative interfaces, in order to bridge the gap between smart phones and other interaction components by simplifying communication and interfacing among them. Having a toolkit like Amarino enables developers to connect and exchange data between Android smart phones and Arduino microcontrollers without designing communication protocols or dealing with connectivity and reliability issues.
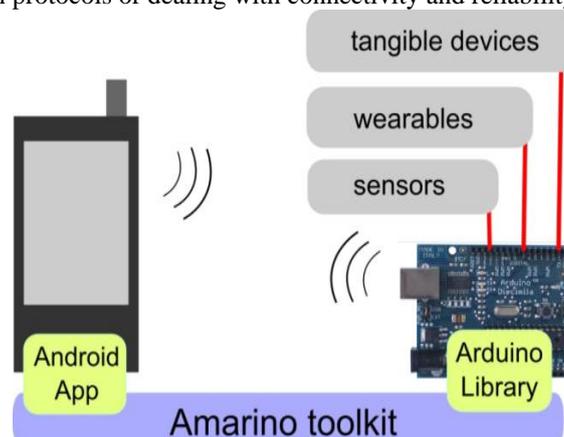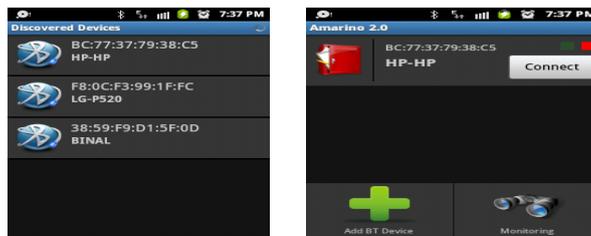
Fig: 6 Android toolkits

Apart from above mentioned hardware units we also require a motor to open a door or we can have an electronic lock which will operate the door.
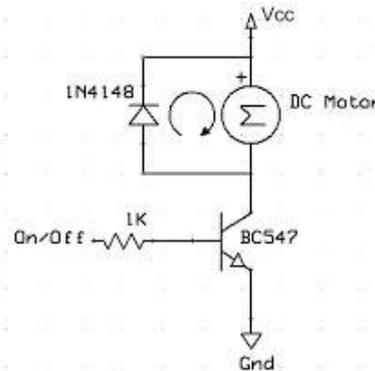

Fig: 7 Motor Circuits

Here BC547 is NPN transistor which drives the motor and IN4148 is a freewheeling diode.

V. SOFTWARES USED

The software's that is used are:

1. Arduino is an open source programming software to program Arduino board. It is flexible to write code and upload it to the I/O board. It runs on Windows, Mac OS X, and Linux.
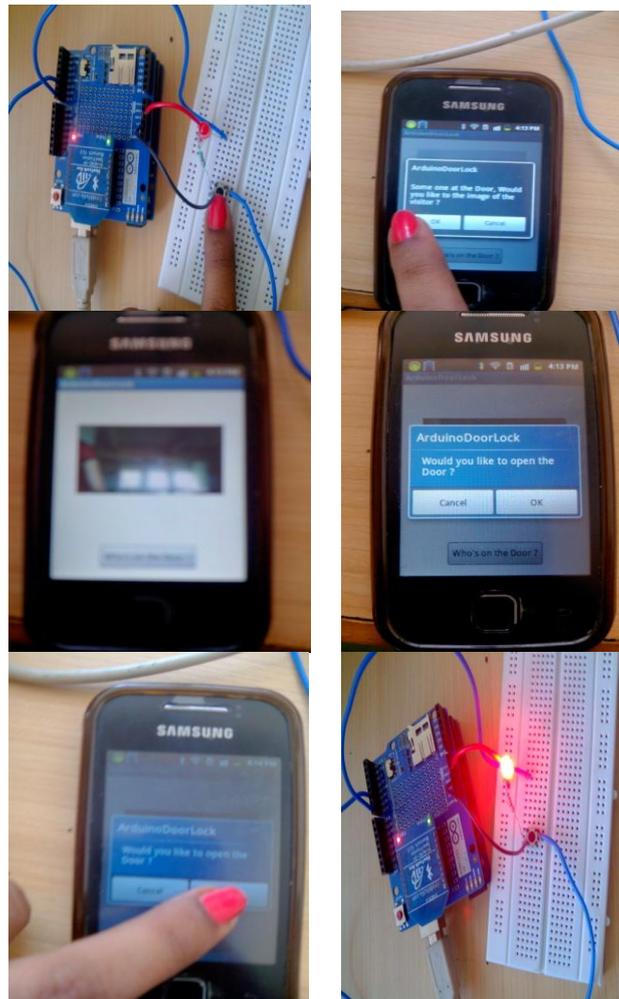

Fig: 8 Arduino & Eclipse software

2. Eclipse is software that provides a platform for developing an app in JAVA environment. And the code written in eclipse can be run in Android Emulator and also in a smart phone by loading the .apk file and installing it.

VI. RESULTS

VII.   CONCLUSION

About a Visual verifier security system for smart home envisioning seamless integration of ubiquitous device like Smartphone and webcam. We take the image recognition idea, which is images can be seen to the user who owns the system. We believe this idea will result on efficient and convenient authentication system when deployed in smart home.

VIII.   FUTURE WORKS

Further this can be expanded in order to use a single system for a whole flat or apartment by updating programming part, GSM module and upgraded controller which will provide very little time delay in displaying the image.

REFERENCES

[1]   Kortuem, G., Kawsar, F., Fitton., D.Sundramoorthy, V. "Smart objects as building blocks for the internet of things." Internet Computing, IEEE, vol. 14, no.1, 44--51 (2010).

[2]   Chung, C.-C., Wang, S.-C., Huang, C. Y., and Lin, C.-M.(2011) "Bluetooth-based Android Interactive Applications for Smart Living"(IBICA),2011.

[3]   Wikipedia. Home automation, http://en.wikipedia.org/wiki/Home_automation.

[4]   Rajeev Piyare and Seong Ro Lee, "Smart Home-Control and Monitoring System Using Smart Phone"ICCA 2013, ASTL Vol. 24, pp. 83 - 86, 2013.

[5]   Piyare, R., Tazil, M. "Bluetooth based home automation system using cell phone." In Consumer Electronics (ISCE), 2011 IEEE 15th International Symposium on, pp. 192-195, (2011).

[6]   Yan, M., Shi, H. "Smart Living Using Bluetooth-Based Android Smartphone." International Journal of Wireless & Mobile Networks (IJWMN), vol. 5, no.5, pp. 65--72 (2013).

[7]   The Android open source project, http://source.android.com/.

[8]   Yi Wang, Eric Keller "Virtual Routers on the Move: Live Router Migration as a Network-Management Primitive" SIGCOMM'08, August 17–22, 2008, Seattle, Washington, USA.

[9]   http://www.yawcam.com

[10]   BTBee Alliance, "Products and Certification Overview," *BTBee Alliance*.

[11]   Das, S.R., et al., "Home automation and security for mobile devices," IEEE PERCOM Workshops, pp. 141-146, 2011.

[12]   Piyare, R., Tazil, M., "Bluetooth based home automation system using cell phone," IEEE ISCE, pp. 192-195, 2011.

BIOGRAPHIES

Mr.Bhargav B Patel, working as a assistant professor in electronics and communication. Area of interest is in Embedded system, Microcontroller, VLSI, Microprocessor. Member of ISTE.

Mr.Keyur Chauhan, working as a assistant professor in electronics and communication. Area of interest is in Microcontroller, Microprocessor. Member of ISTE.

Mrs.Suchita Patel, working as a assistant professor in M.Sc IT department in ISTAR College,Gujarat.doing PhD in mobile networking. Area of Interest is in .Net, Wireless Networking, mobile networkingAndroid.Board.Member of S.P University, Gujarat, India.