Wireless Technology for Smart Apartment Security

K Vijay, RRanjith Kumar
IT DEPT, KCG College of Technology,
Chennai, India

Abstract: This paper deals with the design of the smart apartment security by using Wireless Technologies.This smart apartment security system is built for enhancing the security at home using the advancing technologies around.When the visitor arrives to the gate of the apartment he is captured through the IP Camera kept near the gate.So every home inside the apartment which is connected to the Centralised WIFI will get an alert in their smart phone whether to receive the image or not.Every user will see the person who is entering the gate.They will reply with the yes or no button through their phone.If yes the electronic door for the particular home will open else it will not.This 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.

Key Words: Arduino Uno controller, Centralised WIFI,Webcam as ip camera, Smartphone, Electronic lock.

I. INTRODUCTION

Smart Apartment living refers to the use of computer and information technology to control home appliances and features (such as locking system or doors). Systems can range from simple remote control of lighting through to complex computer/micro-controller based networks with varying degrees of intelligence and automation. Smart Apartment is adopted for reasons of ease, security and energy efficiency.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.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

The project is based on a family of micro-controller board designs manufactured primarily by SmartProjects in Italy, and also by several other vendors, using various 8-bit Atmel AVR microcontrollers or 32-bit Atmel ARM processors. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards (so-called shields) and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides an integrated development environment(IDE) based on the processing project, which includes support for C and C++ programming languages.In order to address the mentioned issues of flexibility and functionality in the literature survey, we designed and implemented a novel, standalone, flexible and efficient Apartment 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.
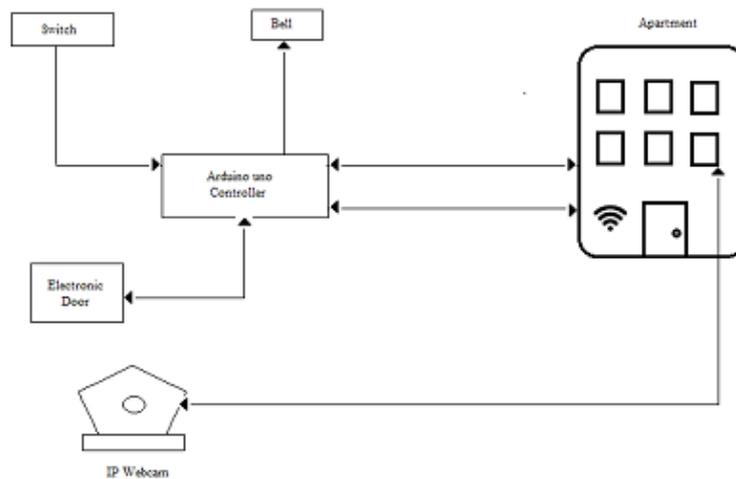
Fig.1 Overview of the conceptual design

IV. TOOLS AND SOFTWARES

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.

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) 3MbpsModulation 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

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.

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]

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.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.
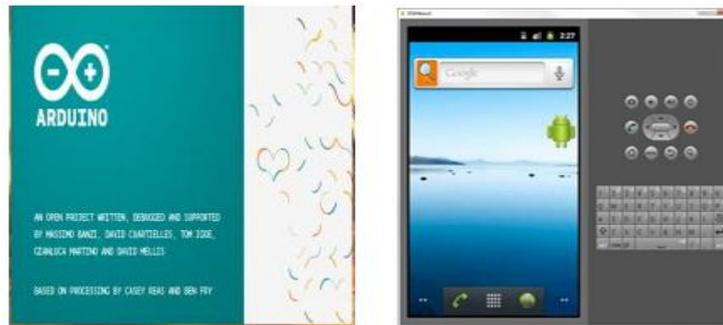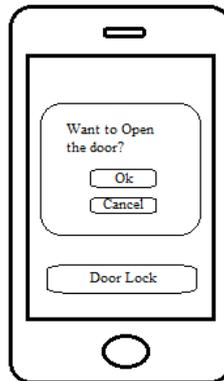

Fig.2 Arduino Programming Open Source Software

Fig.2 Door Lock open/close

4.7 Programming Software for Arduino

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.

4.8 Software

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

V. CONCLUSIONS AND FUTURE WORKS

This is about the Smart Apartment Security for providing security to the whole apartment with seamless integration of ubiquitous device like Smartphone and webcam.We integrate this idea using the IP Camera and other technologies by suitably programming the Arduinocontroller.We hope this idea will be efficient and convenient authentication system when deployed in Smart Apartment. Future work can be done to recognize the known face to the Apartment,thereby the people living in the apartment would be easy to use this security system with ease by using new technologies and by efficiently programming the uno controller.

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.

[13]   Bhargav B. Patel, KeyurChauhan, Suchita B. Patel , "Wireless Visual Visitor Verifier for Home Security Using Smart Phone",2015