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Home Appliances Control Using Android ADK

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Abstract - Today we are living in 21st century where automation is playing important role in human life. Home automation allows us to control household appliances like light, door, fan etc. Home automation not only refers to reduce human efforts but also energy efficiency and time saving. The main objective of home automation is to help handicapped and old aged people which will enable them to control home appliances and alert them in critical situations. This paper put forwards the design of home appliances control using Android ADK. The design is based on a standalone embedded system board Android ADK(Accessory Development Kit) at home. Home appliances are connected to the ADK and communication is established between the ADK and Android mobile device or tablet. The home appliances are connected to the input/output ports of the embedded system board and their status is passed to the ADK. We would develop an authentication to the system for authorized person to access home appliances. The device with low cost and scalable to less modification to the core is much important. It presents the design and implementation of automation system that can monitor and control home appliances.

Keywords **– Home Automation, Android ADK, Control, Authentication, Embedded System, Arduino.**

1. Introduction

Home appliances control is automation of the home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, and other systems, to provide improved convenience, comfort, energy efficiency and security. The concept of home automation has been around for a long time and products have been on the market for decades, though no one solution has broken through to the mainstream yet.
Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care. It can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet, to provide control and monitoring via a smart phone or web browser. This paper will describe the approach which we are implementing to control various home appliances with Android smart phone.

2. Literature Survey

As per our survey currently there exists no system at cheaper rates. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary and closed, not very customizable by the end user.

N. Sriskanthan explained the model for home automation using Bluetooth via PC. But unfortunately the system lacks to support mobile technology.

Hasan has developed a telephone and PIC remote controlled device for controlling the devices pin check algorithm has been introduced where it was with cable network but not wireless communication.

Pradeep G proposed home automation system by using Bluetooth which saves lot of power and time.

Al-Ali and Al-Rousan presented a design and implementation of a Java-based automation system through World Wide Web. It had a standalone embedded system board integrated into a PC-based server at home.

3. Brief Explanation

3.1 Android

For this home automation and security system we are targeting Android platform since it has huge market and open source. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android OS is based on Linux.

Android Applications are made in a Java-like language running on a virtual machine called 'Dalvik' created by Google. Accessory mode is a feature of Android OS since version 2.3.4 Gingerbread and 3.1 Honeycomb and above.

3.2 Software Design

As discussed earlier we are developing Android application. The application consists of main function like Light controlling, Door controlling and Smoke detection. When the application starts user is first authenticated, if user is authorized he will be navigated to main screen. The main screen has a list of all functions among which user can select any one function which he want to control. After selecting a function he would be able to see a current status of a particular device. If user wishes, he can enable or disable intended device.

The system is smart enough to activate alarm when smoke is detected.

3.3 Arduino UNO ADK

Fig. 1 Arduino UNO ADK

ADK stands for Accessory Development Kit. Android accessory is a physical accessory that can be attached to your Android device. Particular devices perform specific actions. The Android Open Accessory Development Kit (ADK) is a reference implementation of an Android Open Accessory, based on the Arduino open source electronics prototyping platform. The accessory's hardware design files are provided as part of the kit to help hardware builders get started building their own accessories.

The Arduino ADK is a microcontroller board based on the ATmega2560. It has a USB host interface to connect with Android based phones, based on the MAX3421e IC. The main hardware and software components of the ADK include 'Arduino UNO ADK' shown in Fig.1, which was designed to work with Android. With an Android device and the 'Arduino ADK', you can use whatever sensors and actuators you require to create your own accessories. This may include a LED outputs, and temperature and light sensors.

3.4 Android Open Accessory Protocol

When an Android-powered device is in accessory mode, the connected accessory acts as the USB host and the Android-powered device acts in the USB accessory role. Android Open Accessory Protocol , allows to detect Android-powered devices that support accessory mode. Accessory mode is ultimately dependent on the device's hardware and not all devices support accessory mode.

Android Open Accessory support is included in Android 3.1 (API Level 12) and higher, and supported through an Add-On Library in Android 2.3.4 (API Level 10) and higher. Android 4.1 and higher has support for audio output over a USB connection or Bluetooth. An Android USB accessory must adhere to Android Accessory Protocol, which defines how an accessory detects and sets up communication with an Android-powered device. In general, an accessory should carry out the following steps:

1) Wait for and detect connected devices
2) Determine the device's accessory mode support
3) Attempt to start the device in accessory mode if needed
4) Establish communication with the device if it supports the Android accessory protocol.

The Android Open Accessory Protocol 2.0 adds two new features: audio output (from the Android device to the accessory) and support for the accessory acting as one or more Human Interface Devices (HID) to the Android device.

4. Tables and Figures

4.1 Tables

Table 1: Component Specifications

Sr. No.	Component	Operating voltage	Current	Typical power Dissipation
1.	Arduino UNO	5V	46.5 mA	232.5mw
2.	Bluetooth module	3.3V	50 mA	162.0mW
3.	GSM module	5V DC	40mA	200mW
4.	ULN2003A	5V	500mA	2500.0mW

5.	16x2 LCD	3V DC	2.5mA	7.5mW
6.	Relay	5V DC	40mA	200.0mW
7.	Combustible Gas Sensor – Analog Out	5V DC	180 mA	900.0mW
8.	Solenoid Door Lock	12V DC	0.6A	7.5W

4.2 Figures

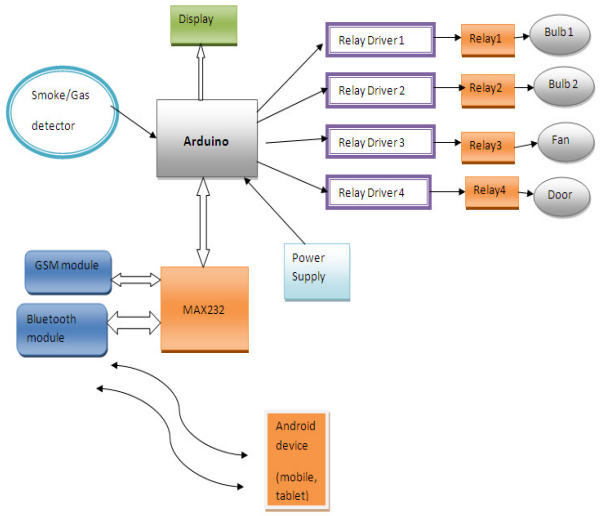

Fig. 1 Block diagram of home automation and security system using android adk

4. Conclusion

This is a working project. Our prime objective is to assist handicapped/old aged people. This paper gives basic idea of how to control various home appliances and provide a security using Android phone/tab. This project is based on Android and Arduino platform both of which are FOSS(Free Open Source Software). So the overall implementation cost is very cheap and it is affordable by a common person. Looking at the current scenario we have chosen Android platform so that most of the people can get benefit. The design consists of Android phone with home automation application, Arduino Mega ADK. User can interact with the android phone and send control signal to the Arduino ADK which in turn will control other embedded devices/sensors. We have discussed a simple prototype in this paper but in future it can be expanded to many other areas.

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