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Android Application Control Arduino with IR Sensor for Detection Human Motion using GPRS Technology

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Abstract: This paper designed to develop an android mobile application which would enable the user to control an infrared or IR sensor device remotely along with detecting and notifying any movement that happens around that sensor via GPRS. It consists of three parts: Electronics part consist of a small electronic board name arduino (Ethernet Board) ,Web part running at the remote web server and to which the electronic board would be connected via LAN cable ,mobile part would be the actual application that will be developed on J2ME android platform. The mobile application will connect to an electronic chip to which an IR sensor will be connected. The mode of connection will be GPRS which use.

Keyword: infrared; GPRS; arduino; Android.

Introduction

As we know that the technology is advancing by leaps & bounds and mobile technology has become an integral necessity in our lives today. We wish to get everything done right from the place where we are. Be it Banking, News, Chatting, Networking, Talking, Locating somebody etc. We cannot imagine certain significant tasks without the mobile technology. To further enhance this idea, we have planned to interface the mobile technology with electronics. That is, through this application, we target to control the secured zones by turning ON/OFF the human motion IR sensors along with knowing about any movement that happens in the periphery of the sensor. The application of this idea can be very well assumed in the situations that are highly secured and in which in addition to manual security, electronic and mobile security measures are also required. These places could be large banks, cash chests, criminal jails, nuclear installations, secret and highly confidential research areas etc.

1- Main Structure and Overall Design of System

In this section, Fig 1 illustrates the structure of infrared & human motion detection with IR sensor. It is composed of four major function subject: cloud to Device Messaging (C2DM), Android mobile, Web Part, Electronics Part.

1.1 Electronics Module:

This module would consist of a small electronic board name Arduino that we would program in C. In addition to many other components, this board consists of a programmable microcontroller, EEPROM, Flash Memory etc. On the top of this (base) board, we would be mounting an Ethernet shield which would give us the freedom to connect it to a system which would act as the remote server in our project. We assume that the remote server would be in an ON state always and connected to internet. Once the electronic board is connected to the remote server, it will receive an IP which our mobile application would be using. We would also connect an IR sensor to this board which can be turned ON/OFF by the mobile application. This sensor will also sense the movement and signal about it via GPRS to the mobile part which will display a corresponding pop-up (flash) message.

1.2 Web Part:

This module would be running at the remote web server end to which the electronic board would be connected via LAN/Ethernet cable. This module would be mainly responsible for processing operations from the electronic board and the commands being received from the remote mobile handset via GPRS.That is, when the remote mobile handset sends any signal via GPRS to the remote server which is connected to the internet, it will send appropriate instructions or signals to the electronic board Arduino for switching ON/OFF the IR sensor connected to the board.That is, whatever command the user will give through the mobile application will be appropriately converted to the signal and transmitted to the electronic board. The web module would be developed in J2EE involving JSP, Servlets etc.This module would not be accepting any user input but would mainly act as the processing stub.

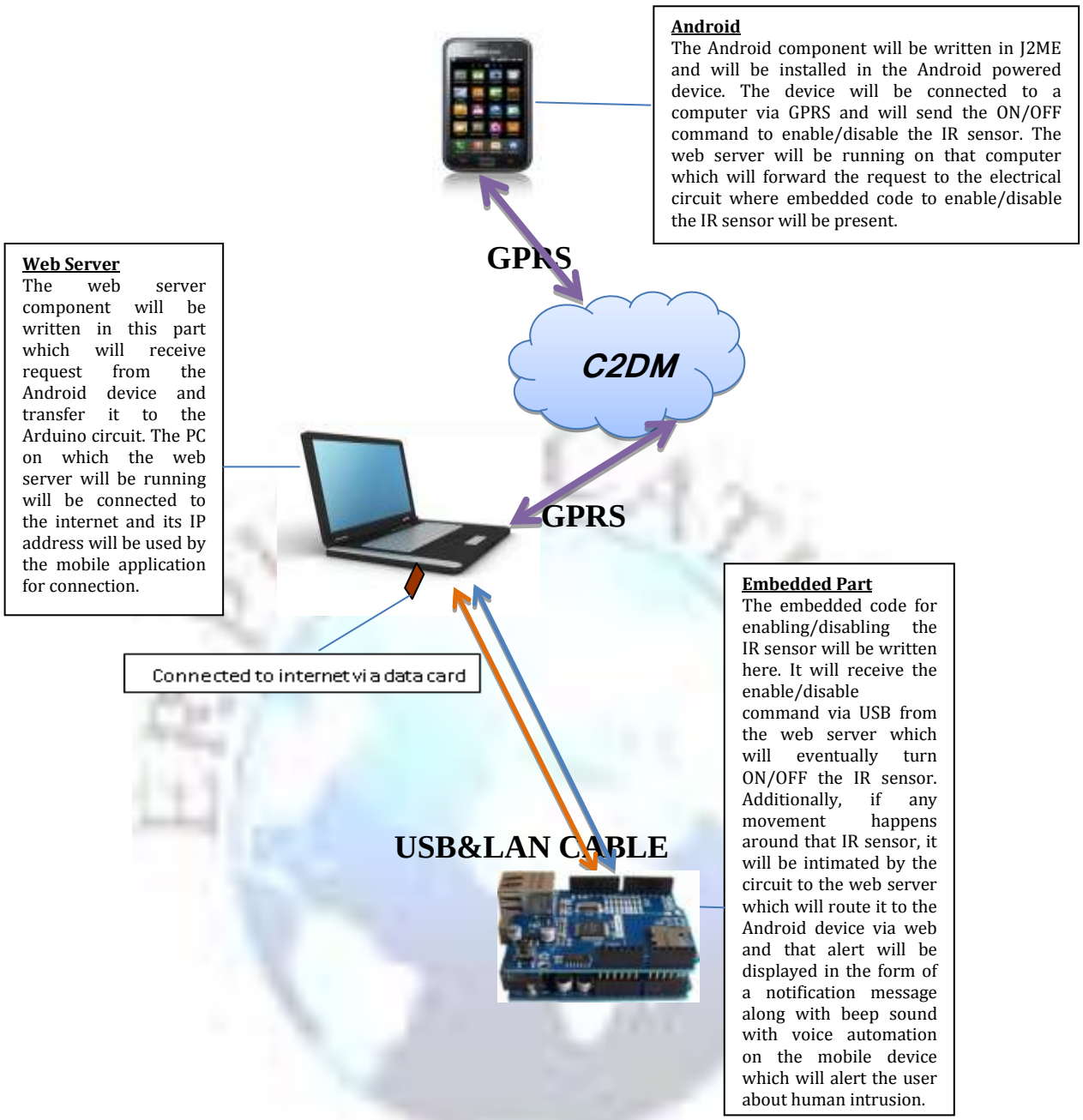

Fig. 1: The Structure of Remote-Monitoring System

1.3 Mobile Module:

This part would be the actual application that will be developed on J2ME for Android or normal Java enabled platform. Once this application is developed, its corresponding .jar file would be transferred from the system to the Android mobile device for installation. Once the application is installed, its mobile user interface will give the user 2 basic options to control the IR sensor device i.e. ON & OFF. Once the user pushes the ON button on the mobile user interface, the command will travel via GPRS to the IP of the remote server where the web part is configured. Additionally, when there is any intrusion detected near or around the IR sensor, it will be communicated by the electronic chip via GPRS to the mobile application which will indicate same on the handset through a pop-up message like Warning! An intrusion has been detected. Once the notification message is received an automated human voice shall also play on the device playing the same message in voice. The significance of this feature shall be, if the user is unable to view the notification message he would be able to listen to the voice. Furthermore, we shall also connect a camera to the system with the help of which, as soon as there is any intrusion happening, a photo of the miscreant would be captured and sent on the Android device wirelessly. This way, the investigation of the intrusion could be

performed based on the facial capture of the person because we assume that the camera shall be aligned in such a manner that smartly captures the face.

1.4 Google C2DM Module:

Under this module, we shall register our Google device / handset as well as the web server with the Google's C2DM service. C2DM service essentially means Cloud to Device Messaging through which Google keeps a track of the devices and initiates a server push when the device sends any signal. We need to register both the device as well as server with C2DM so that Google has the knowledge from where are the signal notifications coming and on which device does it need to perform the server push.We will program the mobile application in such a manner that it points only to the IP of the remote server and when the command is send from the mobile application, only the remote web server should attend & process it.Furthermore, we also assume that the mobile device would be GPRS enabled so that it connects to the internet and use that medium to connect to the remote server from virtually any location, irrespective of the geographical coordinates.Once the mobile command is received by the remote server, it will convert it to the appropriate electrical signals and send it to the board. In the board, we already have a running, embedded C program which will understand those signals and will switch ON/OFF the sensor as desired and selected by the user from his/her mobile application.

2- Practical work

The connecting mobile with a computer through C2DM needed to registration in C2DM is recorded with computer technology C2DM using HTTP POST and return token .As well as in case of connecting C2DM with mobile, Mobile request registration ID and return a special type of registration ID to mobile. After my server is registered with Google and has at last one device it can send message , C2DM is ready to be used and real data is fetched from my server.

Fig.2.: Connecting Hardware with Software

3- Related work

3.1 Android platform

The Android™ platform delivers a computer set of software for mobile devices: an operating system, middleware, and key mobile application. Windows mobile and apple's iPhone provide a richer, Simplified development environment for mobile application .However, unlike Android they're built on proprietary operating system that often prioritize native application over those created by third parties and restrict communication between applications and native data. Android offers new possibilities for mobile application by offering an open development environment built on an open source Linux kernel .Real hardware can be accessed through a series of standard API libraries, allowing the use to manage GPRS, Bluetooth, and GPS devices

3.2 What is Arduino

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicate with software running on your computer (e.g. Flash,

Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free

3.3 Sensor

Sensors are electronic devices that measure a physical quality such as light or temperature and convert it to a voltage. This process of changing one form of energy into another is called transduction. Often, sensors are also referred to as transducers. Sensors can be broadly classified in two categories: digital sensors and analog sensors. A digital sensor's output can only be in one of two possible states. It is either ON (1) often +5V, or OFF (0), 0V. Most digital sensors work with a threshold. Is the incoming measurement below the threshold, the sensor will output one state, is it above the threshold, the sensor will output the other state. In contrast to a digital sensor, an analog sensor's output can assume any possible value in a given range. Very often the output of an analog sensor is a variable resistance that can be used to control a voltage. Rather than only being able to toggle between two states and the analog sensor can output an almost infinite range of values. In the following examples we will take a look at a couple of digital and analog sensors. We will begin with the simplest digital sensor, the switch. When a switch is open, no current flows. In contrast, when a switch is closed, current flows (i.e. closed = ON). A switch that stays in the position it was put is called a latching switch. Switches can be spring loaded (e.g. micro switches/snap action switches), in this case they are called momentary. A simple switch can be Normally Open (NO) or Normally Closed (NC).

4- Conclusions

We can hereby conclude that:

- This application will help the users to monitor the sensitive installations remotely from an unauthorized human access.
- This application will enable the users to control the intrusion sensors remotely via GPRS so that when the remote sensing is not required, it can be turned OFF without human intervention.
- With this application, the user shall securely access Google's reliable cloud services in order to secure the sensitive locations.
- The case of programmable hardware arduino does not need to compile like in other Microcontroller.
- Can be reprogramming the same piece in more than one project. Any where there is no allocation.
- The application will smartly alert the Android user about the intrusion event through several modes like Notification and Human Voice Alert Pronunciation. This feature will ensure that the user becomes aware of the incident and can take prompt action to aver.

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