Multi-Powered GSM based SMART Surveillance System

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ABSTRACT: In this paper, we implement a system that monitors an authorized area that makes use of live video streaming technology only at the time any intrusion thus, eliminating huge hard disk requirement. The system is built using Raspberry PI, Arduino, GSM modem, an IR Camera, and also PIR sensors. To make it smarter we make use of multiple power sources to provide power for the entire system working. It immediately gives alert to the user during a threat. To make it still smarter we have made the system to store the .jpeg format for each 5secs from the start time of video capturing.

Keywords: Raspberry-PI, Surveillance system, Arduino, Live video streaming, Smart security.

1. INTRODUCTION

Surveillance is the monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them. This can include observation from a distance by means of electronic equipment (such as CCTV cameras), or interception of electronically transmitted information (such as Internet traffic or phone calls); and it can include simple, relatively no- or low-technology methods such as human intelligence agents and postal interception. The word surveillance comes from a French phrase for "watching over" ("sur" means "from above" and "veiller" means "to watch"), and is in contrast to more recent developments such as surveillance. organizations to plan and commit crimes such as robbery and kidnapping, by businesses to gather intelligence, and by private investigators. In order to overcome the disadvantages of the already existing CCTV systems that makes use of huge hardware resources in order record video and store it safe without any use. So to overcome this we implement our system which does not make use of any external hardware for storage and also provides highly effective alert during any intrusion.To build this kind of a smart surveillance system we make use of Raspberry-PI processor, Arduino (microcontroller board), PIR sensors, GSM module (SIM900), LCD display and other building blocks.

2. SPECIAL CHARACTERISTICS

- System is multi-powered, to provide effective security form the intelligent thieves.
- Different power sources are solar, wind, battery and main supply.
- We make use of PIR sensors to detect the human intrusion.
- Provides alert to the user during a threat.
- Live video streaming of the authorized area is done once there is intrusion.
- User can take the decision of providing alert by sending a SMS to activate or deactivate buzzer.
- Also stores the snap shots of that area for every 5 secs in .JPEG format.

3. BLOCK DIAGRAM

Surveillance is used by governments for intelligence gathering, the prevention of crime, the protection of a process, person, group or object, or for the investigation of crime. It is also used by criminal
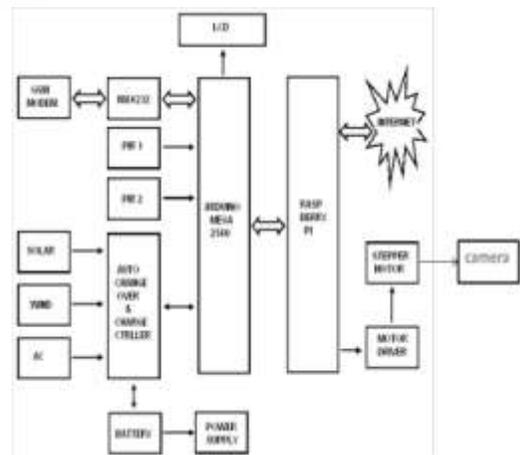
Fig :1 - Block diagram of the entire system

Arduino is the heart of the system. It controls the entire function of the system. PIR sensors, GSM modem, power controls and Raspberry-PI are connected to Arduino. LCD display is connected in order to display various information like power levels and the source with which it is working. Camera is mounted on stepper motor and connected with Raspberry-PI through a motor driver.

4.   DESIGN IMPLEMENTATION

Most of the security systems make use of a light bulb with light dependent resistor (LDR) Infrared LED or ordinary phototransistor as the sensor. These security systems work satisfactorily in darkness and cannot be used outdoors because of the chances of false triggering due to light sensed from other light sources like tube lights , CFL lamps , Sun light, etc., These systems are often offline , consume lot of power and use Hard disk as a video storage medium, and does not inform about any intrusion.

In this project, the complete system is activated by sending a code through SMS by authorized person. Once the system is activated the PIR sensor is active, whenever there is a human intrusion it detects and immediately gives an alert to authorized person by making a call and sending an SMS. Simultaneously, the Raspberry-PI is triggered such that the camera starts capturing the video of that area and uploads it online. Such that the authorized person at the other end could monitor that particular scene from his place and he can also rotate the camera through the front face provided to almost 270° thus enabling faster solution. On missing this we are also storing the snaps of that area for

every 5secs in .JPEG format. The user may then take the necessary action so as to activate the buzzer or any other solution.

This system is multi powered that it is provided with four different power sources such as solar, wind, battery and AC supply. The priority is first given to solar first then to wind then battery and finally to AC supply. Using an auto change over system the power source is selected and the system works on it. The system also gives an alert to the user when there is no power source to work.

A LCD display is used in order to display the present working condition of system. It is also used to display the various power levels of different power sources and displays on which power it is working at

temperature pattern. Thermal signals far below one microwatt are sufficient to trigger a sufficient output voltage change.

GSM SIM900: the sim900 is a complete quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the sim900 delivers GSM/GPRS 850/900/1800/1900mhz performance for voice, SMS, data, and fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3mm, sim900 can fit almost all the space

The block diagram of the entire system is as shown in fig, it consists of Arduino, Raspberry-PI, GSM modem, and other hardwar

that instant. for example, intruder detected, sms sent, calling, battery voltages, and buzzer on, buzzer off.

After providing the alert the system waits for a alert to activate the buzzer or to be reset, on encountering any of these two conditions it stops the live video streaming.

5.   HARDWARE AND SOFTWARE TOOLS REQUIRED
5.1. HARDWARE:

Raspberry-PI: the raspberry-pi is a credit-card-sized single-board computer developed in the UK by the raspberry pi foundation with the intention of promoting the teaching of basic computer science in schools. it is manufactured in two board configurations through licensed manufacturing deals with network element14 (premier farnell), RS components and ego man. these companies sell the Raspberry PI online. ego man produces a version for distribution solely in china and Taiwan, which can be distinguished from other pi's by their red colouring and lack of FOC/CE marks. the hardware is the sameacrossallmanufacturers. the raspberry pi has a Broadcom BCM2835 system on a chip (soc), which includes an arm1176jzf-s 700 MHZ processor, video core iv GPU and was originally shipped with 256 megabytes of ram, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.

Arduino 2560: the Arduino mega 2560 is a microcontroller board based on the atmega2560 (datasheet). it has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHZ crystal oscillator, 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. The mega is compatible with most shields designed for the Arduino duemilanove or diecimila. The mega 2560 is an update to the Arduino mega, which it replaces.

PIR sensor: Pyro-electric passive infrared sensor (PIR) is designed to pick up heat radiation of wave lengths in a band around 10 microns. It contains two active elements configured as balanced differential series opposed type. this results in good compensation of environmental temperature and excellent sensitivity for small changes of a spatial

requirements in your m2m application, especially for slim and compact demand of design. "sim900 is designed with a very powerful single-chip processor integrating amr926ej-s core". quad - band GSM/GPRS module with a size of

24mmx24mmx3mm "SMT type suit for customer application "an embedded powerful TCP/IP protocol stack "based upon mature and field-

proven platform, backed up by our support service, from definition to design and production.

LCD display: A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Solar panel: Solar panel refers either to a photovoltaic module, a solar hot water panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring. If we can harness the solar power efficiently, then we may not need to rely on burning fossil fuels for energy.

5.2. SOFTWARE:
Raspbian- OS for Raspberry-PI Sketch- Programming language for Arduino.

6. FLOWCHARTS REPRESENTING SYSTEM OPERATION
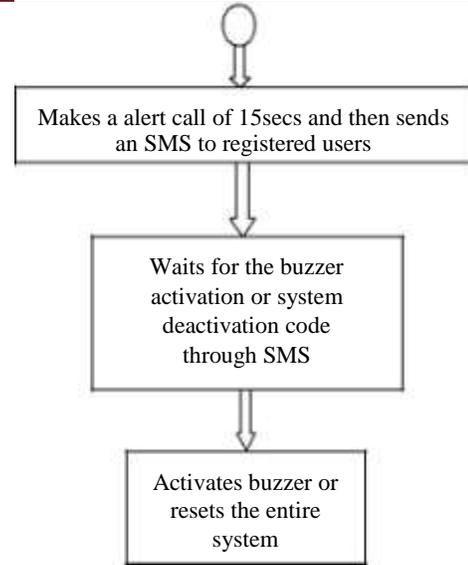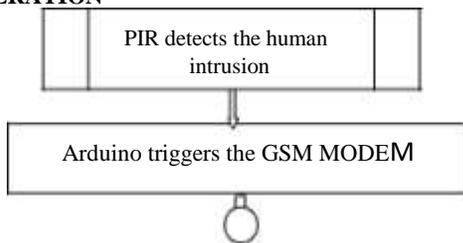
Fig 2 : Flow diagram of Arduino task 1
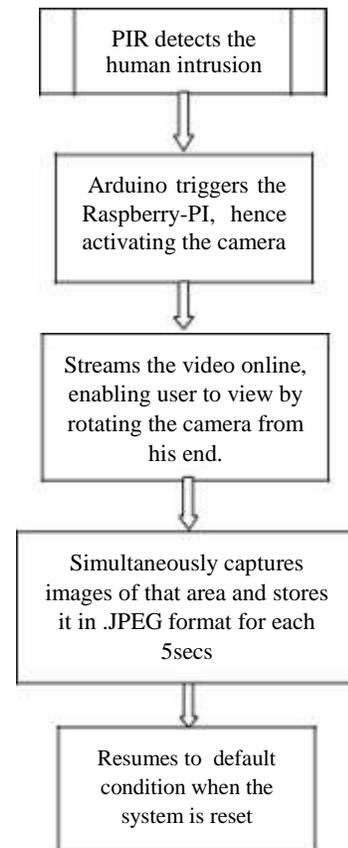
Fig 3 : Flow diagram of Arduino task

7. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

7.1. ADVANTAGES

- System is relatively cheap
- It uses multi-power supply
- System consumes low power.
- Highly secured compared to present system.
- No hard disk required.
- The entire setup is automated.

7.2. DISADVANTAGES

- Continuously uses the internet facility.
- Performance depends on mobile signal strength.

7.3. APPLICATIONS

- Military facilities, restaurants, banks, schools, colleges.
- Used in home security.
- Used in theft detection and surveillance units.

8. RESULT AND CONCLUSION

Implementation of this project is done successfully we are able to implement this in a 30 feet area with two PIR sensors, when an intruder is sensed it successfully alerts the user and streams the video online. This can be enhanced in future the storage can be built using cloud computing.

9. ACKNOWLEDGEMENT

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