Abstract

Multiple sensors are used in this modified surveillance system. The whole system is monitored and controlled wirelessly so there is a huge requirement of power to transmit the data which can be compensated with the use of sensors in a smart way, when the sensor detect the need of surveillance then the camera gets triggered based on the collective decision taken by the user and power is saved accordingly. The sensors are developed to visually capture the image. The project consists of camera (wireless) and stepper motor programmed with Arduino nano (to control the direction of object). Both camera and stepper motor is controlled wirelessly. The camera recording and streaming can be configured by connecting it via Wi-Fi and can be controlled with android application Plug & Play. The stepper motor is programmed by assembly language programming and the program will be dumped through a USB cable with the help of a pc and it can be controlled by interfacing the motor with serial Wi-Fi wireless transceiver module.

Keywords: Surveillance, Intrusion Detection System, Wireless, Power Consumption.

1. Introduction

The border region is too big and surveillance is huge so it becomes difficult to monitor. The security forces that have the job to monitor the border faces challenges when it comes to move from one region to other so, it brings attention towards renovating it[IV]. Surveillance plays important role in minimizing the collateral damages. Therefore, to meet all these needs a sensor network system has been made that can detect, classify and locate the enemy 24 hrs in all-weather condition. In this regards few sensors have been used accordingly which is PIR, Acoustic and MEMS. PIR sensor is used to identify moving object in the field, Acoustic sensor for sounds and MEMS sensor is used to detect the intruder carrying arms and ammunition. Based on these outputs intruder presence is identified and in order to confirm it the surveillance system is triggered and therefore the collective decision is taken from the control room by concerned personal to respond to that activity[VI,X]. The system involves image and video processing over the wide range from field to control room. The whole system is made wireless for better controlling. The camera is made movable with the help of a programmed stepper motor in order to change the view.
direction. Whole system can be controlled by the android application over a phone; it can also be controlled from the computer by installing certain emulators[VII,IX,XIV].

II. System Architecture

The idea is to have a camouflage look so it would be difficult for a person to identify the surveillance system. For this the whole circuit is placed inside a camouflage housing system[XI,XII,XIII]. The circuit consists of camera (wireless) and stepper motor programmed with Arduino Nano (to control the direction of object). Both camera and stepper motor is controlled wirelessly. The camera recording and streaming can be configured by connecting it via Wi-Fi and can be controlled with android application Plug & Play. The stepper motor is programmed by assembly language programming and the program will be dumped through a USB cable with the help of a pc and it can be controlled by interfacing the motor with serial Wi-Fi wireless transceiver module.

2.1 Stepper motor

A stepper motor is a brushless DC motor in which the full rotation is converted into a number of equal steps. The motor's position can be changed by giving command and can stay at certain steps without any feedback output according to their speed and torque[II,III,VIII]. There are two types of stepper motor unipolar and bipolar, however bipolar stepper motor is preferred in our current application as we require the movement in both the directions.

4 micro-controller pins are needed to govern the motor. L293D is used with 5V supply. We need voltage at which the motor needs to operate. Both drivers IC been used so we will affirm the enable pin for those. We are connecting this motor with Arduino Nano and to control it wirelessly an android application acting on Bluetooth module named as “Bluetooth terminal HC-05”. The signal will be given after connecting the motor along with Arduino Nano to Bluetooth dongle in order to control its view direction[I,V]. The input signal will be in the form of steps and direction depends upon positive and negative sign. If the input is , then motor will rotate in right direction and if – then left direction. Fig 1 indicates the interfacing diagram of motor with L293D driver.

Fig 1: 3-phase induction motor

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2.2 Arduino
We have used Arduino Nano instead of Uno as the size of Nano is small and it can easily fit into the housing.

2.3 Bluetooth Module
It is a wireless technology standard for exchanging data over short distances. With the help of this we are controlling the direction of stepper motor by giving the command from android application “Bluetooth terminal HC-5”. Fig 2 indicates the Bluetooth module.

![Bluetooth module]

2.4 Wireless camera
It plays very important role in surveillance system. It is controlled using Wi-Fi. We interface this with an android application as “WIFIDVR”. This application will automatically detect the camera whenever it turned on and through which image and video processing can be done. The weight of this camera is about 45gm and dimension is 10.2*6.6*5.6 cm. This tiny hidden camera is world's smallest Wi-fi hidden camera, and fit at all the places, it records both photos and video without any beeping sound so that no one gets their attention towards it. This is a network camera and there is distance bound to view or record live video streaming after accomplishing the network configuration on the phone APP in the P2P mode. We can view or record live video streaming at any place. It Support PC Computer and Smartphone Tablet APP Remote View and Control. The camera start recording automatically when motion or movement is detected, this tiny widget will faithfully record uninvited guest's or intruders action in real-time and each video file size could be set from 1 to 60minutes. The battery is of high capacity and it will last long for several days and it is rechargeable. It supports recording and charging at the same time, 24/7 hours video recording, loop video recording and 32GB micro TF Card in Max. This tiny Wi-fi IP Camera produces HD Video Resolution at Video Frame Rate 1/10fps, so recorded events are always pellucid.

![Wireless camera]

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2.5 Battery with 5V supply
It is required to power the Arduino and Motor as well but the batteries are of 9v, so to get the supply of 5v we have to reduce it from 9v using voltage regulator 7805.

2.6 Dongle
It is a small gadget of hardware that connects to another device to provide it with added functionality. There are certain devices where a particular thing is not present at the time of manufacturing but we can have it by connecting a dongle as we know that a computer doesn’t have Wi-Fi but it can be enabled to Wi-Fi by connecting a Wi-Fi dongle in it. There are different ways to install these dongle to the system which differs from what kind of result we are expecting from it. There are two types Bluetooth and Wi-Fi dongle.

2.6.1 Bluetooth Dongle
Many computers come with built-in Bluetooth connectivity while few don’t have it so to make it Bluetooth enable this dongle can be used. Dongles are USB network adapters that permit a computer to communicate with Bluetooth devices such as mobile phones, mice, keyboards, remotes, and headsets. This surveillance system is tested on mobiles which have these features but to test it on computer a dongle is required in order to control the direction of stepper motor.

![Bluetooth dongle](image)

2.6.2 Wi-Fi
We use this in order to enable a computer to connect with Wi-Fi.

2.7 Android Emulator
It is a hardware or software that enables one computer system (called the host) to behave like another computer system (called the guest). Suppose the android phone so if we want to use android application over the computer we need certain emulator which can emulates as of android phone. An emulator enables the host system to run software or use auxiliary devices designed for the guest system. Emulation is the ability of a computer program in an electronic device to imitate another program or device. Many printers, for example, are made to imitate Hewlett-Packard LaserJet printers because so much software is written for HP printers. If a non-HP printer imitates an HP printer, any software written for a real HP printer will also run in the non-HP printer emulation and generate same printing. We need android emulator because the whole system is controlled using an android application so in order to
control it from pc we need android emulator. There are many android emulators in the market such as AMIDuOS, Andy, Blue stacks, Genymotion, Koplayer, Manymo, MEmu, Nox, Windroy and You wave. But mostly we prefer blue stacks because it is easy to use and free as well. After the installation of blue stacks on the particular software is done, the android application wifidvr and Bluetooth terminal HC-05 is installed to operate camera and stepper motor respectively.

III. Internal Connection Diagram

This will show the inner body of housing and the components that in what manner they have been placed. Fig 5 shows the internal connection diagram whereas Fig 6 shows the housing overlook.

![Fig 5: Internal Connection diagram](image1)

![Fig 6: Housing overlook](image2)
This housing is made through recyclable material and it has been made camouflage so that it will be difficult for intruder to detect. It has more realistic features like of penguin. The neck part is removed and between the eyes the wireless camera has been placed whereas the battery of camera is placed inside the body. The stepper motor is fixed over the body while its shaft is connected to the neck so whenever the signal to change its direction is given it will turn to that direction. Both camera and motor is controlled separately using Wi-Fi and Bluetooth module respectively. Remaining circuit and Arduino Nano is placed inside the body.

IV. Conclusion

Surveillance system operated wirelessly and tested. Low power consumption is achieved as the system is not triggered until and unless there is requirement of surveillance which will be decided based on the results of different sensors placed in the field. A suitable camouflage body has been created with recyclable material. Stepper motor have been programmed with Arduino Nano to change view of wireless camera. Image processing has been successfully achieved.

References


