

Remote Security Surveillance by IoT Based Robot

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Abstract – This paper presents the control of terrorist attack throughout the world by monitoring and controlling of mobile robot via internet through Raspberry pi board. The monitoring and controlling of robotic movements through wireless network by using a web browser and accessing a webpage through an IP address. A camera is mounted on the robot to get better visibility of the objects. The programming language of the robot is based on the LINUX platform which will be interfaced with Raspberry Pi board. The PIR sensor detects a person or an object enters into a surveillance area and the smoke sensor detects the fire accidents by sensing the smoke level increase in the atmosphere. Proximity sensor is used to detect the metal. The output of the sensors can be indicated via alarm and message through GSM to the user. This mobile robot can be operated from everywhere in the world by using internet of things (IOT).

Index Terms – Raspberry pi 3, Sensors, Python, HTML, PHP.

1. INTRODUCTION

The web based robotic system is used in automated industries and military based applications to perform the risky jobs which cannot be done by the human. The mobile robot was fully controlled by webpage and the commands from the LINUX platform via raspberry pi received by the microcontroller. Here the system is proposed with the help of low cost PIR sensor, smoke sensor and metal sensor to trace out the intruders and to detect the fire accidents by using raspberry pi. The web based robotic system is implemented to control a robot. The control can be done by using a pc, mobile or laptop which is controlled via accessing webpage by its IP address the presence of control buttons will be available on webpage for controlling robot. Live streaming is continuously done by camera and can be seen on webpage using IOT technology. The internet of things(IOT) is the inter-networking of physical devices, vehicles(also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The IOT allows object to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world in to computer based systems and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

2. RELATED WORK

2.1 Overview of Raspberry Pi

The Raspberry Pi 3 Model B is used in project which is faster than pi2 version of Raspberry Pi. A credit-card sized single board computer can be used to perform many applications. Model B brings you a more powerful processor, improves in its speed that is 10times faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs. Speed -1.2 GHZ Quad Core ARM V8 Processor 64 bit, Inbuilt WI-FI and Inbuilt blue tooth, It contains 1GB of RAM 40 pins, 4 USB Ports, 1 HDMI Port, Ethernet Port, 1 micro USB slot, Micro SD card slot, 1 CSI, 1 DSI, 3.5mm audio jack, Video core 4 model GPU.



Figure.1. Raspberry pi 3

2.2 QHM495LM Night Vision Camera

QHM495LM Night vision camera is used for live streaming. It is connected to USB2 port of raspberry pi. Camera captures and sends the live images using internet at a rate sufficient to make them as like a live video to the human eye.



Figure.2. Night Vision Camera

Live streaming is possible by this camera and streaming process is visible on webpage connected to raspberry pi through an IP address.

2.3 DC Gear Motors

A. Motor driver circuit The motor driver circuit is a low current amplifier that drives the DC motor. The GPIO pins are made high or low according to the user input. This input is used to control the robotic vehicle movements.

B. DC motor The motor driver circuit is used to power the DC motors, which controls the movements of the robot. It has the voltage of about 5volt and current is about 600milliamperere.



Figure.3. Torque DC Gear Motor

2.4 Sensors

In case if any default occurs in the camera in future means the sensors can detect the object motions and provide the information to the user. Passive Infrared sensor is used in order to detect the human or an object at the certain distance by sensing the radiation emitted from the objects. They are commonly used in burglar alarms. When an object in front of the background such as wall, it rise the room temperature to body temperature. Smoke sensor detects the fire accident and bomb blast by sensing the smoke level in the atmosphere. Proximity sensor is used to detect metal all these are connected to raspberry pi and updates the webpage.

2.5 GSM

GSM is connected to raspberry pi USB port according to the sensors update to the webpage gives a message alert to registered mobile number.



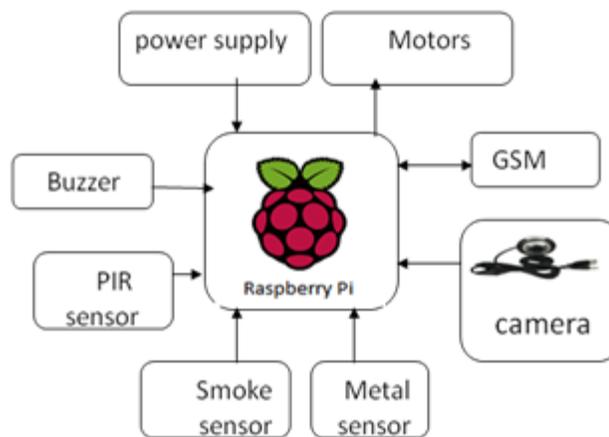
Figure.4.GSM

3. PORPOSED MODELLING

Block diagram of the proposed system is shown in Figure 5. The construction of Mobile robot with the help of programs an internet connection is established between the robotic vehicle and the user. This robot motion can be controlled by the webpage through Raspberry pi board. The robot captures the images using a webcam and stored them into the memory. It captures and sent the live images using internet at a rate sufficient to make them as like a live video to the human eye.

By overcoming the existing technique, the sensors are included to increase the efficiency of the project. In case of any fault occurs in the camera the PIR sensor detects the object motions and also introducing an advanced future of Smoke sensor that detects the smoke produced during fire accidents and bomb blast. proximity sensor that detects the metal. when sensors are detected updates the webpage and communicate to user by message using GSM The LINUX operating system is used for coding. The PC connection and the block diagram of proposed method are given

Robot Section



Controlling Section



Figure. 5. Block Diagram

4. HARDWARE IMPLEMENTATION

Remote Security Surveillance by IOT Based Robot is controlled by using raspberry pi board and accessing is done by using webpage. A step down 230Va.c transformer is used as power supply to the hardware and power supply to the raspberry pi board is given through a socket. 5v d.c is required for the functioning of hardware so, we Use converts. This project consists sensors, buzzer, camera as input to raspberry-pi which updates the webpage accordingly by using IP address to access a raspberry pi page Coded with HTML, PHP and LINUX. Smoke sensor is used to detect smoke if smoke is detected it gives an alert through buzzer and updates the webpage smoke detected. Sends message to mobile through GSM. PIR (passive infrared sensor) detects the objects if object is detected it gives an alert by Buzzer and updates

webpage PIR detected. sends message to mobile through GSM. Inductive proximity sensor is used for metal detection if any metal is found 2 inches near to sensor it gives an alert through buzzer and updates webpage metal detected and sends message to mobile through GSM . Driver IC L293D is used drive the motors for robotic movements which moves according to the direction given on raspberry pi page.

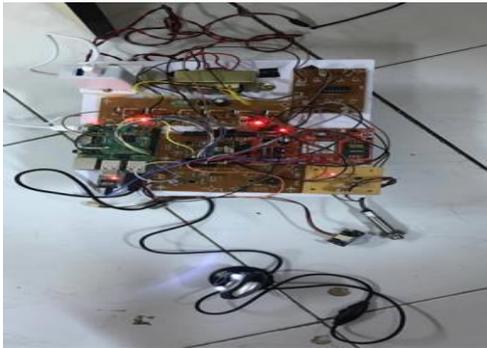


Figure.6. project kit

Raspberry Pi uses Raspbian jessie operating system and is programmed in Python. Execution process begins with initially booting up the Raspberry Pi. A 16GB micro SD card is given a proper format using SD Formatter and setup with latest Raspbian OS. To do so, the Raspbian OS is downloaded from official website in Zip file format. After Downloading unzip the file downloaded files are then extracted to the micro SD card, after which it is inserted into the SD card slot on the Raspberry Pi. WINR32 Disk Imager is downloaded to write the operating system on to memory

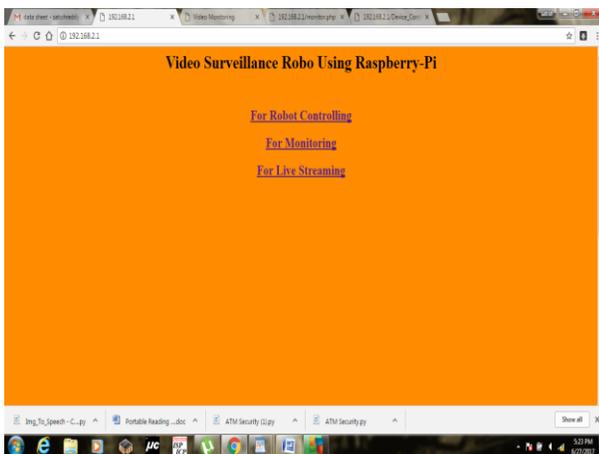


Figure.7. Access to webpage

The Raspberry Pi is then connected to the internet over WI-FI using an IP address. Monitoring and control of robot is done.

Functional flow chart is represented in Figure.8. notation for how project process is done.

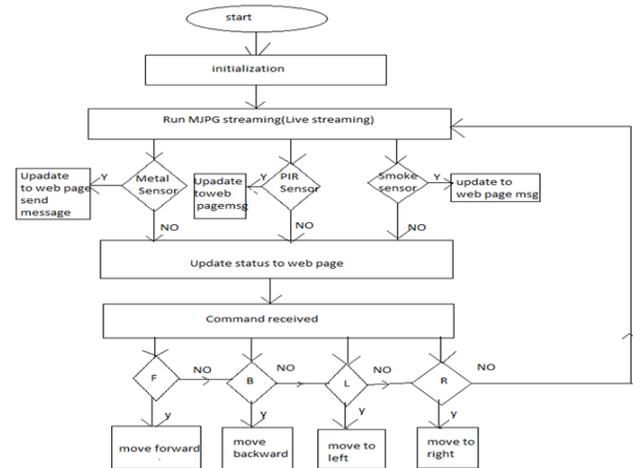


Figure.8. Flow Chart

5. RESULTS AND DISCUSSIONS

The Raspberry Pi board is interfaced with webpage through an IP address internal path is set by using code which is written in python, HTML and PHP when module is powered provides camera live streaming on to webpage. Monitoring the sensor status and controlling is done by webpage.

RASPBERRY PI PAGE

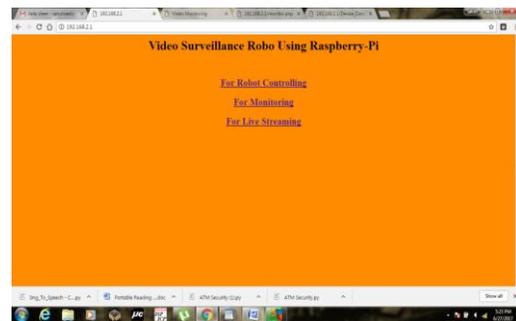


Figure 9: Raspberry Pi page

Monitoring and controlling of mobile robot is done by using this page we access this page through an IP address. As WI-FI is inbuilt.

1) ROBOT CONTROLLING OUTPUT

CASE-1 : By using this web controlling unit the movement of robot is possible in this case robot is moving in forward direction by using this particular web based command

```

<input type="submit" class="button" name="Device1On" value="Forward" style="font-size:20px; width:150px; height:60 px"/>
    
```

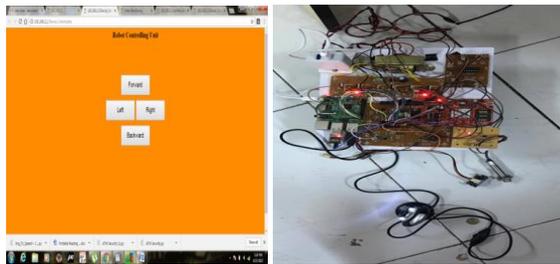


Figure 10 :Controlling robot in forward direction

CASE-2 : By using this web controlling unit the movement of robot is possible in this case robot is moving in Backward direction by using this particular web based command

```
<input type="submit" class="button" name="Device1Off" value="Backward" style="font-size:20px; width:150px; height:60px">
```

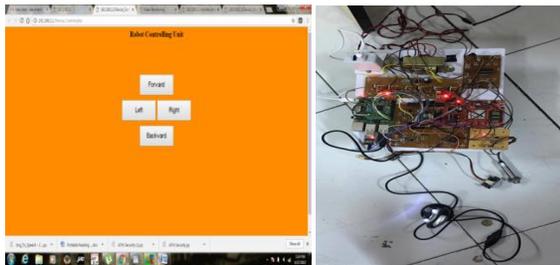


Figure 11 :Controlling robot in backward direction

CASE-3 : By using this web controlling unit the movement of robot is possible in this case robot is moving in right side direction by using this particular web based command

```
<input type="submit" class="button" name="Device2Off" value="Right" style="font-size:20px; width:150px; height:60px" />
```

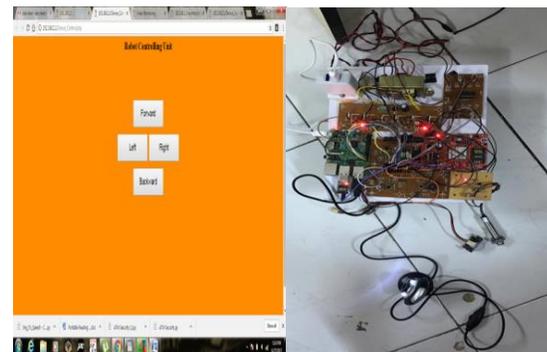


Figure 12 :Controlling robot towards right

CASE-4 : By using this web controlling unit the movement of robot is possible in this case robot is moving in left side direction by using this particular web based command

```
<input type="submit" class="button" name="Device2On" value="Left" style="font-size:20px; width:150px; height:60px"/>
```

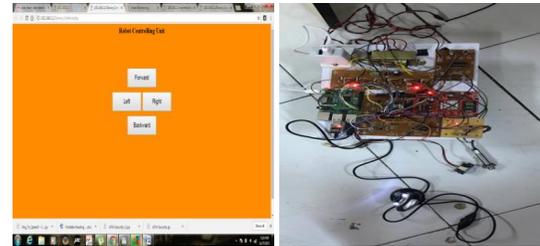


Figure 13 :Controlling robot towards left

This robot controlling unit controls the movement of robot. forward ,backward ,left and right through webpage .

2) MONITORING OUTPUTS OF ROBOT

CASE-1 :

Inductive proximity sensor is used for metal detection if any metal is found 2 inches near to sensor it gives an alert through buzzer and updates webpage metal detected and sends message to registered mobile through GSM using AT commands.

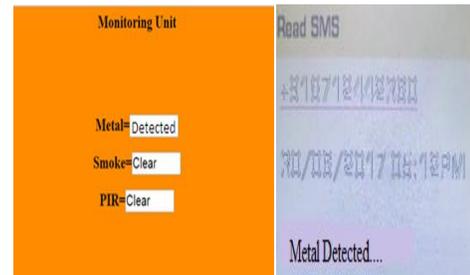


Figure 14 : Output for metal detection and GSM output

CASE-2 :

Smoke sensor is used to detect smoke if smoke is detected it gives an alert through buzzer and updates the webpage smoke detected. sends message to mobile through GSM

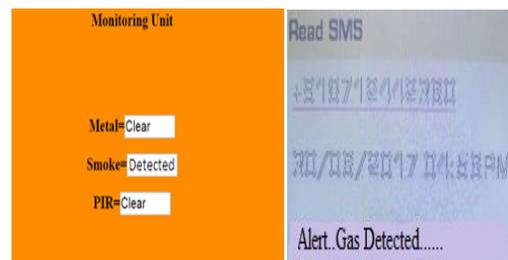


Figure 15 : Updates the webpage smoke sensor detected and GSM output

CASE-3 :

PIR (passive infrared sensor) detects the objects if object is detected it gives an alert by Buzzer and updates webpage PIR detected. sends message to mobile through GSM.



Figure 16: Updates the webpage PIR sensor detected

3) VIDEO MONITORING OUTPUT OF ROBOT

A camera is mounted on robot which provides live streaming at robot surveillance area.



FIG 17 : Live Streaming

6. CONCLUSION

The project “REMOTE SECURITY SURVEILLANCE BY IOT BASED ROBOT” has been successful. It needs only WI-FI based connection which can be obtained by wireless communication network. There is no interrupt can be occurred during the commands to the robot from the user and the response from the robot to user. The robot can be easily controlled by using the personal computer or a smart phone. The webpage created to control the robotic movements is

secured by the unique user name and password which cannot be hacked by anyone.

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