

SMART SURVEILLANCE ROBOT

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Abstract –

This project is about surveillance robot where we will discuss how we can use it to patrol in a particular area where poaching is done to prevent it. It can reach in some section where human cannot reach actually. Moreover, it is also cost effective and accurate also. We can even also use it for any type of surveillance work in a any area. These types of robot is actually playing a huge role in day to day human life in 21st century to make their work more easy. The camera attached to has various security purpose like in road side, office house etc. The system is mainly designed to patrol in such a section where it can used to detect different unusual activities with real time tracking signal.

These types of surveillance robot work in a particular area that is assigned to it or it can be even wirelessly controlled by the specialists. The camera that is used is a 360 one which will take the video and can monitor the area perfectly. As the video will be sent to the receiver directly, so required actions can be taken immediately.

The system that we are building consist of two sections. In one section there is the heart of the system that is the raspberry pi, camera, motor, L293D motor driver, chassis, and connecting wires. On the section we can have a remote to control it

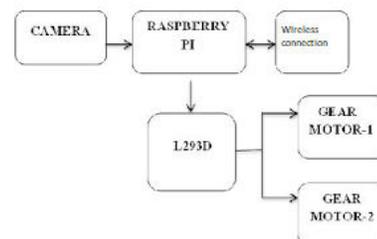
The relevant working details is discussed in the later section.

INTRODUCTION

This project is all about helping the defence team out there whom are working days and night for our safety. This project will help them to solve many unturned stones. These robots can go to sections or areas where human cant reach actually. There are different types of robots out there like AGVs, pick and place, painting etc which are blessings to human life created by human themselves. But now a days these surveillance robots are having some sort of popularity due to its compactness and efficient working and also due to technology used to built those things are way more advanced which will help in building a stronger antiterrorism unit. These whole systems are connected to a computerized system wirelessly and whole controlling is done form there.

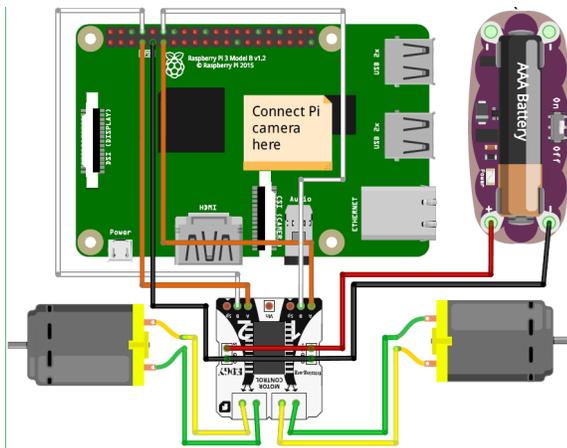
Details on surveillance robot

As we have discussed earlier that the surveillance robot is mainly designed to perform more than one task at a time, cost-efficient and a feasible machine that can be used to implement for the different patrolling purpose. These robotic machineries might replace any defence department soldiers and dogs that are located at the borders during the time of war for saving the nation from any sort of damage and from environmental condition such as extreme cold and heat.



As discussed earlier, the system has two units mainly a robotic section and a wireless control section. The robotic section has a microcontroller, the microcontroller present here is referred as the raspberry pi which is the central control unit which is connected to a network wirelessly and is controlled by a user. The whole system is run by a motor-driver and the power is driven by a 12v battery. A pi vision camera is there to monitor the area and if it detects any intruder it maps a green rectangle around it and sends an alert indicating the presence and can be viewed on the monitor screen by the user. The programming part is done on a python platform and the video captured by the pi camera is displayed on the monitor.

Design and descriptions



The above diagram states about how the connection is made using the raspberry pi with the existing components. In the later section we will discuss about how each and every component works

PI CAMERA :

The one and only purpose of the PI camera is to capture the videos and motions of the intruder in front of it and this is placed on the top of the system and it can be move by itself or manually around to capture the videos in different sections and then it

sends those recordings to the screen with the user that is controlling it immediately.

RASPBERRY PI :

It act as an interface module between the software and hardware and there is an inbuilt wireless controller and also a Bluetooth controller unit is also there which supports the PI camera and connects all the required sensors with it.

System Hardware



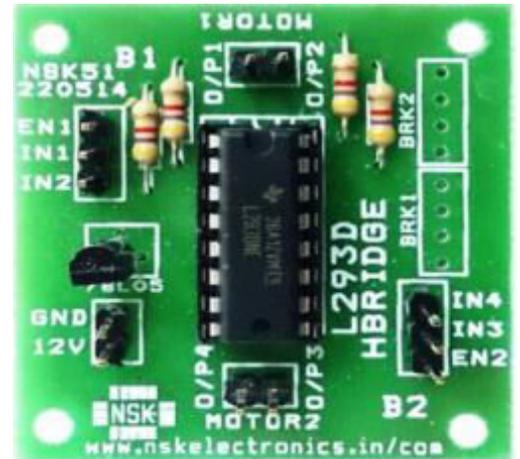
The Raspberry Pi 3 :

It is the latest and most powerful, innovative third generation Raspberry Pi. This is the most powerful single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. It now comes with a more powerful processor, 10 times faster and are much more efficient and well optimized than the first generation Raspberry Pi board. It also now adds wireless LAN & Bluetooth connectivity making it the most available solution for building a compact powerful designs. There is option for an in-built wireless connectivity. The new Raspberry Pi is also a low-cost , innovative devices that are available now a days. The new addition of a 2.5 amps power source reflects that it will power up more complex USB devices available around without the requirement for a second power cable.

Motor :

It is a 500rpm 12V DC motor which has high quality and low cost DC motor. It is consisting of steel gears and pinions to assure a long period of working. The gears present are fixed on steel spindles. The output shaft which is rotating inside a plastic bushing. Inside a plastic ring whole part is covered. The gearbox is tightly sealed and well lubricated and does not require any maintenance. Inside the gear box the motor is screwed. Although motor generates 500 rpm at 12V but between 4V to 12V, it gives wide range of RPM, and torque.

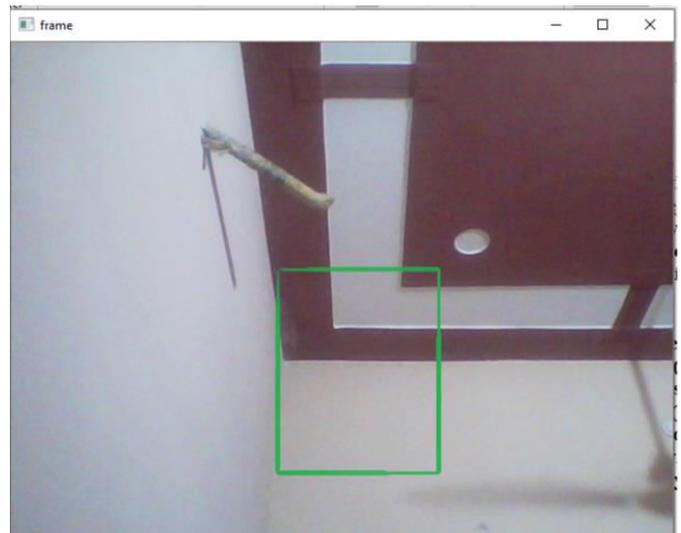
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Output

Motor Driver:

It is also known as L293D Motor Driver IC which helps DC motor to move in the direction that is instructed to do. As it is having a 16-pin IC so it can control a set of two DC motors side by side.. It works based on the concept of H-bridge. It is a circuit where it allows the voltage to be flown in any desired direction. As we are aware that voltage need to change its direction so that it can rotate the motor in either clockwise or anticlockwise direction, So they are ideal for driving a DC motor. To enable rotation of two dc motor independently, two h-Bridge circuit is there inside the single IC. Due its compact size and less-cost it is very much popular in different robotic application for controlling DC motors. Pin 1 and 9 are the two enable pin, and should be high to run the motor. It is consisting of steel gears and pinions to assure a long



Working code

```
import numpy as np
import cv2

# initialize the HOG descriptor/person detector
hog = cv2.HOGDescriptor()
hog.setSVMDetector(cv2.HOGDescriptor_getDefaultPeopleDetector())

cv2.startWindowThread()

# open webcam video stream
cap = cv2.VideoCapture(0)

# the output will be written to output.avi
out = cv2.VideoWriter(
    'output.avi',
    cv2.VideoWriter_fourcc(*'MJPG'),
    15.,
    (640,480))

while(True):
    # Capture frame-by-frame
    ret, frame = cap.read()

    # resizing for faster detection
    frame = cv2.resize(frame, (640, 480))
    # using a greyscale picture, also for faster
    detection
    gray = cv2.cvtColor(frame,
cv2.COLOR_RGB2GRAY)

    # detect people in the image
    # returns the bounding boxes for the detected
    objects
    boxes, weights = hog.detectMultiScale(frame,
winStride=(8,8) )

    boxes = np.array([[x, y, x + w, y + h] for (x, y,
w, h) in boxes])

    for (xA, yA, xB, yB) in boxes:
        # display the detected boxes in the colour picture
        cv2.rectangle(frame, (xA, yA), (xB, yB),
(0, 255, 0), 2)

    # Write the output video
    out.write(frame.astype('uint8'))
    # Display the resulting frame
    cv2.imshow('frame', frame)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

# When everything done, release the capture
cap.release()
# and release the output
out.release()
# finally, close the window
cv2.destroyAllWindows()
cv2.waitKey(1)
```

Conclusion

This paper draws an outline of the design, implementation, testing, and performance of an robotic surveillance vehicle controlled wirelessly by a user. It is developed for the purpose of directing the movement and detection of intruder. Since these robots will patrol at the border region or in the forest region so they should be designed in such a way that they should be water proof and can run on odd surfaces. As they are being used instead of humans, it is important that the robot will have some defensive algorithm. To make the robot self-defense additionally a laser gun can be added. Few more defensive algorithms along with equipment's can be added to modify it in the near future.

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