

Raspberry PI Based Robotic Device for Women Safety

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Abstract - Women always feel unsafe to walk alone at night. We have seen many cases in newspapers now-a-days where many women irrespective of their age, are facing a lot of issues. These cases keep increasing every day and most of the women are afraid to step out of their home. Hence the main objective of our proposed work is to develop a device which will patrol the premises using its own predefined path or even a random path. The system uses IR based path following system for patrolling assigned area. It monitors each area to detect any problem using Night Vision camera . It has the ability to monitor sound in the premises. It then scans the area using its camera to detect if anything is going on. It captures and starts transmitting the images of the situation immediately to the IOT website. Here we use Flask Framework for receiving transmitted live video stream and displaying them to the administrator thus by embedding this IOT technology in the developed device we ensure providing safety for women.

INTRODUCTION

Ladies generally face social difficulties and are casualties of misuse and rough wrongdoings. This task centres around dealing with ladies' wellbeing utilizing innovation so ladies never feel alone and vulnerable.

Ladies generally feel dangerous to walk alone around evening time. There have been many cases in papers now-a-days where numerous ladies regardless of their age, are confronting a great deal of issues around evening time. These cases continue to build consistently and the majority of the ladies are reluctant to get out of their home. There have been numerous

developments done in innovation to cure what is going on and the greater part of them accompanies their own constraints.

It is seen in numerous situations where robots have supplanted dreary positions like exhausting night movements or distant area occupations with successes. Within the developing innovation we can fabricate and produce robots that are considerably more solid and reasonable. Accordingly, the designated premises will be under sufficient reconnaissance that the area will be shielded from undesirable guests.



Fig.1.1 A model of security robot

These security robots need to be used to patrol regularly because the more the area under surveillance the harder it will be for an intruder to commit illegal or criminal acts. It is important to patrol regularly because if the targeted area is patrolled once then it will be very easy for the the intruder to enter the building or the area. Hence, by doing the patrolling regularly we can ensure maximum safety.

1.1 Relevance of the project

To ensure that we provide maximum safety to women, we are using concepts of IOT to build a robotic device that will patrol the area.

The features of the security robot include:

- Weatherproof Enclosed Chassis for Outdoor Patrols.
- Wheeling and tracking system for Indoor/Outdoor use.
- Can be easily controlled by an Administrator.
- Live Video Streaming.

1.2 Problem definition

- Women are facing a lot of physical harassments.
- Lack of surveillance system to take care of safety of women.

1.3 Objective of the study

- Our device patrols the premises at defined path or a random path and follows different path if suspicious sound is detected.
- It detects human face in the place where the suspicious sound was detected, captures it and sends the live video stream using the Flask Framework.
- Once the images are transmitted it starts sending alert sounds and displays the images to the user's contacts.

1.4 Existing system

- VithU App:



Fig.1.2 VithU app

This is an emergency application where on clicking the power button of your mobile twice, it sends alert messages every two minutes to the contacts that was set in the application as guardians. The message says, “I am in danger. I need help. Please follow my location.”

- The stun gun:



Fig.1.3 Stun gun

This stun gun charges the electric shock to the attacker. It gives the victim a chance to escape the scene by weakening the reflexes of the attacker. This gun pumps about 700000 volts to attacker’s body when triggered. These guns run on Lithium batteries and can be carried in handbags.

- FightBack App:



Fig.1.4 FightBack app

This is similar to VithU app but has an additional feature. Along with sending SMS alerts and emails to the saved contacts, it also changes the Facebook status.

1.5 Limitations

- Issues with tracking location.
- Power consumption issues.
- Messages not getting delivered to Emergency numbers.
- Performance and Compatibility issues.

1.6 Proposed system

- The device uses camera and sensors mounted on the robotic device to secure the premises.
- This device is equipped with cameras and other sensors and it moves at particular path/random path. While patrolling, to follow the path, it uses its own predefined path/random path. It always stops at certain points and moves to next points if any suspicious path is detected.
- In this device, IR based patrolling system is used to patrol any premises. It monitors each area to detect any problem using Night Vision Camera.
- It monitors the premises. In the quite area, if the device picks up any activity it starts moving towards that area using its own predefined path. It then uses the cameras mounted on the device to scan the area and detect any suspicious activity.
- It then transmits the captured images of the situation to the IOT website. For this project we will be using Flask Framework for receiving transmitted images and displaying them to the administrator.

LITERATURE SURVEY

Reference paper 1

Title: Night Patrolling Device using IOT

Authors: Nishant Gadhawe, Bhushan Kohade, Sameer Dongre, Rahul Urkude, Rahul Tayde

Year of publication: 2021

Abstract: The fundamental thought of Nishant Gadhawe's late evening watching gadget is to thus recognize intruders inside the region like working environments, home, constructing so forward and report helpful board security control unit. The Night watching mechanical vehicle moves during an irregular way while watching or catching pictures through webcam. It utilizes Arduino, ESP32, IR sensors, DC Motors, ESP8266 camera module. The ESP8266 camera module is modified utilizing FTDI software engineer which is utilized to TTL converter. The essential objective of this task is to recognize the questionable activities inside the locales where human presence shouldn't be visible.

Techniques Used: Arduino, ESP32, IR sensors, DC Motors, ESP8266 camera module.

Reference Paper 2

Title: Smart Motion Detection Surveillance Rover with Night Patrolling for Women's Safety and Monitoring.

Authors: B.N. Divya, Bhargavi Hegde, B.R. Chaithanya, M.T. Moulya Raju, S. Shambhavi.

Year of publication: 2021

Abstract: Ladies security is the greatest worry in many regions of the planet. B.N. Divya portrays about a wellbeing electronic framework for ladies' security in the proposed framework. They utilize a surveillance camera with the night vision capacities utilizing raspberry pi and OpenCV. The profound learning method CNN is utilized for abnormality discovery. The picture is caught through the pi camera and it is shipped off raspberry pi for handling for face and human location with the assistance of OpenCV. Utilizing application programming connection point called Twilio the area of wrongdoing spot is shipped off the approved client. The framework precision of around 83%.

Techniques Used: Convolutional Neural Network (CNN), OpenCV, Raspberry Pi, Raspberry pi Camera, Twilio.

Reference paper 3

Title: Night Vision Patrolling Robot For Security Patrolling Using Raspberry PI.

Authors: Pavan Kitchagiri, Saitharun Vaddi, Shyamsundar Rao Rajanala, Bharathvenkataverma Manthena, Subbarayudu Sanepalli, Irfan Ahmad Pindoo

Year of publication: 2021

Abstract: Nowadays video surveillance huge to the extent that security. First in class cameras are required in business spaces, schools and focuses, stockrooms, and outside conditions. The mechanized vehicle moves at express ranges and outfits with night vision camera and sound sensors. It checks the region utilizing its camera to distinguish any human appearances perceived. It gets and begins imparting the photographs of circumstance quickly on sound or human face conspicuous evidence. The program language utilized is python and the library utilized is OpenCV for human recognition.

Techniques Used: OpenCV, Raspberry Pi, Night vision camera, sound sensor.

Reference paper 4

Title: Night vision Patrolling Navigation System for Women's Safety

Authors: Dr. Rohith S, Ms.Brunda R, Ms.Arbin Taj, Ms.Challa Nandini Reddy, Ms.Duttapati Greeshma

Year of publication: 2021

Abstract: Ladies and young ladies security is the one of the biggest gamble to India. This should be changed as quickly as time permits. An insurance watching mechanical utilizing raspberry pi permits us to diminish the worry around ladies wellbeing. This insurance instrument has been proposed principally founded on the watching robot by the use of raspberry pi. We can utilize evening time vision digicam for getting any

premises. for upgrading the exactness of the classifier, different frameworks are being utilized. Subsequently, we are planning the robot vehicle which moves at novel course and is outfitted with digicam and sound sensors. Robot can hear any little strong in the space then begins moving towards the sound on its predefined way. It then examines the region utilizing its camera to run over to identify any human face. It catches and begin sending the pictures to server. The modified server will furnish the client with ready sound. Consequently, the reason for watching is accomplished with this.

Techniques Used: Raspberry Pi, HD infrared camera with night vision, Sound sensor, Dc motor (robot module), Ultrasonic sensor, Liquid crystal display, Motor driver, IR Sensor.

Reference paper 5

Title: Night Vision Patrolling Rover Navigation System for Women's Safety Using Machine Learning

Authors: K. Gopalakrishnan, S. Thiruvengatasamy, E. Prabhakar and R. Aarthi

Year of publication: 2019

Abstract: Ladies security is most worried in India. There are various locales where women are not having a strong feeling that everything is good. Advancement changes how people are living. In this paper, we familiarize one more security framework with guard during bizarre activities. New security instrument has been proposed considering the watching robot using the Raspberry Pi. Here night vision camera can be used in any premises. To deal with the accuracy of the classifier, different Machine Learning models are utilized. Calculations like Boosting, Bagging, Stacking and Enhanced reweight part in Ensemble are utilized. Disarray lattice with individual classifier precision is considered for evaluating the outcomes. The results show that the proposed method execution contrasted and existing calculation.

Techniques Used: Raspberry Pi, Night Vision HD Camera, Sound Sensor, DC Motor (Robot module)

Reference paper 6

Title: Iot Based Night Patrolling Robot for Women Safety

Authors: A Raganna, Nithesh k, Neha B, Omchandra V Shrivastav, Praveen T Musaguppi

Year of publication: 2021

Abstract: We are living in a mechanically advanced world, wrongdoing rates against ladies are reliably rising. We arranged an introduced device considering Arduino and a GSM module with GPS to send an emergency message with region and produce a wariness to direct and ensure the security of ladies. This device exhorts the police control Center, and to the friends and family. Ladies in upsetting conditions may similarly include shock generators for self-assurance. In difficult circumstance, the system conveys a crisis call. The faroff association point is legitimate and can be set off by the loss basically by crushing a press button when they are misused.

Techniques Used: Arduino, Embedded System, GPS, GSM, Push Button, Raspberry Pi and Shock Generator.

Reference paper 7

Title: Raspberry pi Controlled Night Vision Patrolling Robot

Authors: Nagadeepa, Ganesh V N, Kavya, Aishwarya, Aswathi

Abstract: The automated vehicle has night vision cameras and sound sensors and goes at sporadic spans. It watches along a foreordained course utilizing a predetermined line. It stops at different areas, and assuming that sound is identified, it continues on toward the following area. The accompanying IR- based way framework is utilized to watch the allotted field. After the firm has shut, any sound starts to move towards the sound on its foreordained way. It then, at that point, utilizes its camera to check the region for any human faces it might find. It rapidly begins recording and transferring photos of the circumstance in the wake of identifying a sound or a human face. This is where we influence the Internet of Things Local Area Network (LAN) to get moved photographs and show them to the client alongside advance notice sounds.

Techniques Used: Night Vision, Sound sensor, IoT, Robot, Android.

Reference paper 8

Title: Women Safety Night Patrolling Robot

Authors: Komal Muraskar, Devendra Bire , Sakshi Dafare, Renuka Bhojar, Shital Parate, D. M. Khatri.

Year of publication: 2021

Abstract: Today in the continuous general abstract the inquiries in each young lady's brain, first and foremost, considering the at any point develop conditions on ladies' moles proportion in present time is for the most part about their wellbeing and security. This gadget is very versatile and can be set off by the casualty being attacked simply by tapping the button to catch the aggressor's picture through the Raspberry pi camera. Considering what is going on of the metro urban communities and other large urban areas, ladies' security has arisen as perhaps of the main prerequisite in our country. In this universe of trend setting innovation and brilliant hardware having a straightforward and financially savvy wellbeing device that helps the casualties during unanticipated dangers is required. This paper covers enlightening insights concerning the plan and execution of model for an electronic device which can possibly act as a wellbeing wear before long.

Techniques Used: Node MCU, Microprocessor

Reference paper 9

Title: Women Night Vision Patrolling Robot.

Authors: Poojari Manasa, K. Sri Harsha, Deepak D M, Karthik R, Naveen Nichal O.

Abstract: The automated vehicle traversed the predefined premises. It has night vision camera and sound sensors fitted to it. The camera utilized in this proposed framework has 360-degree turning highlight, which catches or screens everything. It examines the region utilizing the camera and it perceive the human face found. It records the video and the photos of the circumstance following recognizable proof of the sound or human face. IOT neighborhood (LAN) is utilized to get sent pictures and show them with advance notice sounds to the client.

Techniques Used: Night vision camera, Sound sensor, LAN, IR sensor, Arduino, Blynk Android program

Reference paper 10

Title: Women's safety system using Raspberry Pi.

Authors: Saravanan Perumal, R. Charulatha, M. Kavipriya, R. Kowsalya, J. Menaga Prithi.

Abstract: This task portrays about a savvy insightful security framework for ladies. Ladies all around the world are confronting a lot of untrustworthy actual badgering. This gains a high speed because of absence of a reasonable observation framework. Our undertaking is a dare to determine this issue. We are utilizing two items wrist band and displays that are utilized in everyday life. The framework looks like a band on

the wrist consolidated with pressure switch as an info which when initiates shows the outcome Screaming caution and poisonous gas instrument are forced for self-defensing reason and send area and messages to the crisis contacts and furthermore sort out the assailant utilizing live web based video. Nerve gas component and live real time video utilizing webcam is consolidated in the displays that go about as a weapon of the savvy innovation. We truly accept that this try will have an effect in the lady's life.

Techniques used: A portable device which resembles a band on wrist. It consists of Pressure switch, Raspberry pi 2, GSM modem, GPS receiver, Screaming alarm, Tear gas, and Live Steaming Video.

GENERAL DESCRIPTION OF THE SYSTEM

The proposed plan will manage a ton of basic issues looked by ladies during night and give security the utilization of cutting edge innovation. While the general public could conceivably significantly impact its mentality yet this gadget will most likely assistance to feel ladies free.

To foster a mechanical gadget which will utilize the best of the IOT elements to watch and get the premises and send live updates of any circumstance to the IOT server.

There are just barely any preventive estimations to diminish the likelihood of ladies' provocation. The most effective way to decrease the savagery against them is being an ethical help. So, the Women Safety Patrolling Robot will be an endeavor to guarantee ladies security. In existing frameworks, CCTV cameras are utilized

which just records the occasions and thus it won't be a preventive measure for ladies' wellbeing though the proposed watching robot will be watching in its relegated region and will check for unknown exercises. Subsequently the late evening watching robot will be of more prominent use to the lady's local area.

Technical Requirement of the System

Hardware Requirements

- Raspberry PI: 3B+ model
- Ultrasonic sensor
- DC Motor: 12 volts (4 motors)
- Resistors: 1K Ω , 2K Ω
- Breadboard
- Motor Drivers
- Raspberry PI CAM
- IR sensor
- Lithium battery: 1800 μ AH (4 batteries)
- Power bank: energy source for Raspberry Pi

Software Requirements

- Processor: i5 9th generation
 - RAM: 8GB
 - Raspberry Pi Configuration
1. RAM: 1GB
 2. Model: 3B+
 3. Processor speed: 1.4 GHz
 4. Number of cores: Quad Core

Language Python



Fig.3.1 Python Logo

Python is a high - level, deciphered, broadly useful programming language. Its plan reasoning underlines code intelligibility with the utilization of critical space.

Python is progressively composed and trash gathered. It upholds different programming standards, including organized (especially procedural), object- situated and practical programming. It is frequently portrayed as a "batteries included" language because of its extensive standard library.

OS

Raspbian OS

Raspbian is a Debian-based engineered especially for the Raspberry Pi and it is the perfect general-purpose OS for Raspberry users. It employs the Open box stacking window manager and the Pi Improved Xwindows Environment Lightweight coupled with a number of pre-installed software which includes Minecraft Pi, Java, Mathematica, and Chromium. Raspbian is the Raspberry foundation’s official supported OS and is capable of accomplishing any task you throw at it.

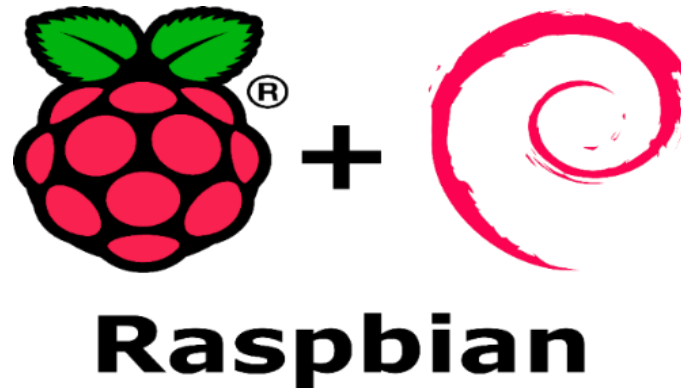


Fig.3.2. Raspbian OS Logo

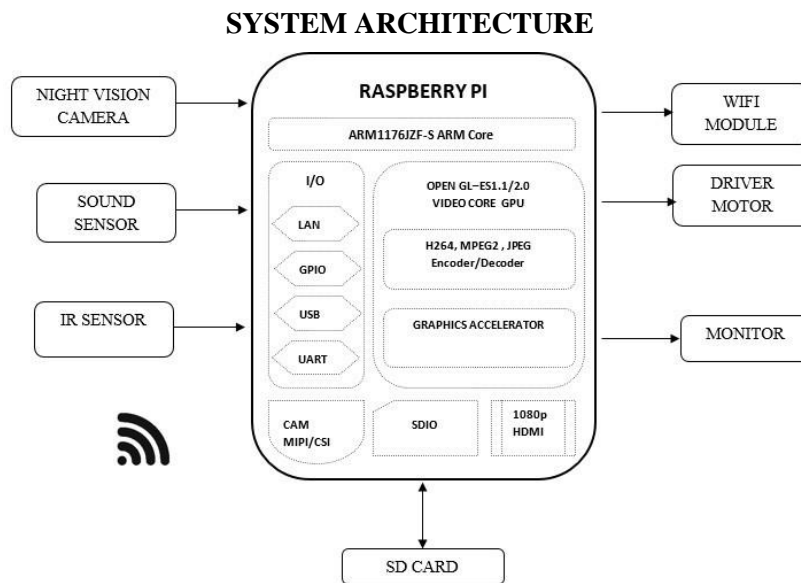


Fig.4.1. Block Diagram of the Proposed System

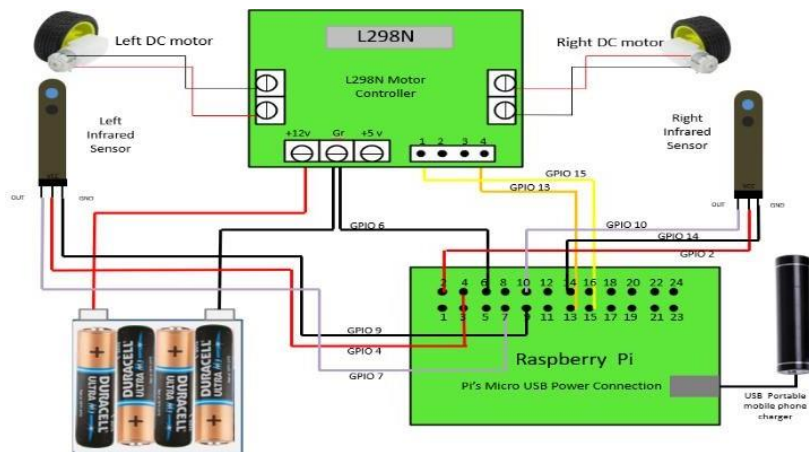


Fig.4.2.Raspberry Pi Line following Robot Car Wiring Connections

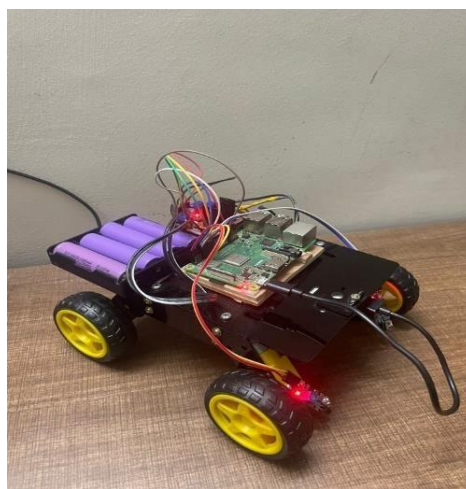


Fig.4.3 Real Hardware Implementation

Connection Details:

- Camera - Camera module
 - Motors connected to L298N
 - From L298N the input pins to control the driver is given to Raspberry Pi
 - EN1(to control speed of left motors) – 32
 - EN2(to control speed of right motors) – 31
 - IN1(left forward) - 12
 - IN2(left backward) – 11
 - IN3(right forward) – 15
 - IN4(right backward) – 13
 - Power Bank is battery source for raspberry pi
 - For L298N and Motors to run Seperate Battery Source Lithium ion 2000 mah (batteries)x4
- Rest of the connections are done as per the architecture.

COMPLETE PATROLLING ALGORITHM

- Step 1: Start
- Step 2: Follow Path Following Algorithm.
- Step 3: If Path is not given or assigned, the user has the privilege to control the robot
- Step 4: Start the patrolling on a path with all sensors such as Night Vision Camera, Ultrasonic Sensor, IR sensor switched on.
- Step 5 : The user can press right, left, forward, backward and stop buttons on the screen to control the robot.
- Step 6: Follow the path to check for any activity.
- Step 7: If any activity detected, start continuous video stream and send it to the server as alert.
- Step 8: Movements of the robot and visibility settings can be altered by the user if required.
- Step 9: Continue the patrolling process
- Step 10: Stop

User Driven Robot

- Step 1 : Import tkinter and RPi.GPIO
- Step 2 : Set pin mapping to BOARD
- Step 3 : Turn off channel warnings messages
- Step 4 : Set GPIO pins as output (pins 12,11,15,13)
- Step 5 : Set GPIO pins 38 and 40 as output pins
- Step 6 : Create object pin20 and pin21 for PWM on port 20 and 21 respectively at 100 hertz
- Step 7 : Start pin20 and pin21 on 0 percent duty cycle(off)
- Step 8 : Set pin20 and pin21 on ChangeDutyCycle(10)
- Step 9 : Set GPIO pins 7 and 10 as inputs
- Step 10 : Check all motors by turning them on and off (GPIO pins 12,11,15,13)
- Step 11 : Make sure all the pins are set to off
- Step 12 : Call mainloop() function

Path Following Algorithm

- Step 1: Import all the required libraries
- Step 2: Set pin mapping to board
- Step 3: Turn of channel warning messages
- Step 4: Set GPIO pins(12,11,15,13) as outputs
- Step 5: Set GPIO pins(7,10) as inputs
- Step 6: Turn on left motor
- Step 7: Turn off left motor
- Step 8: Turn on right motor
- Step 9: Turn off right motor
- Step 10: Turn off all the motors
- Step 11: While true:
- Step 12: if right and left sensors are off stop both motors

- Step 13: if both sensors are on then turn on both motors
- Step 14: if left sensor is on then turn right motor off
- Step 15: if right sensor is on then turn left motor off

OUTCOMES OF THE PROPOSED PROJECT

The Final Raspberry Pi Robot built using all the required components is shown below:



Fig.6.1.Raspberry Pi Robot with Camera

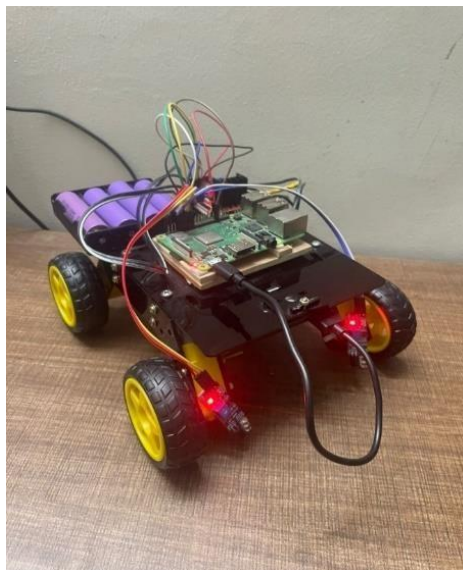


Fig.6.2.Raspberry Pi Robot Without Camera

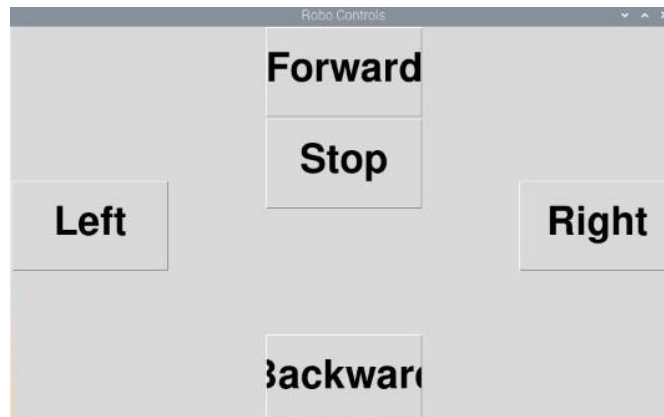


Fig.6.3.Control Buttons of the Robot

The overall control buttons made available for the robot are :

- Right movement Button
- Left movement Button
- Forward movement Button
- Backward movement Button
- Stop Button

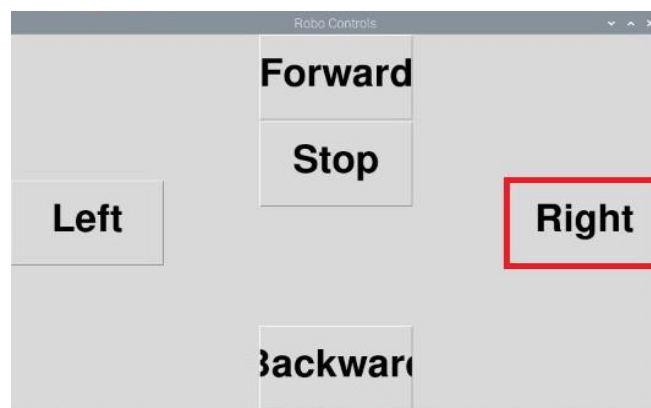


Fig.6.4.Right Button

The Right button upon pressing by the user will cause the robot to take a **Right** turn.

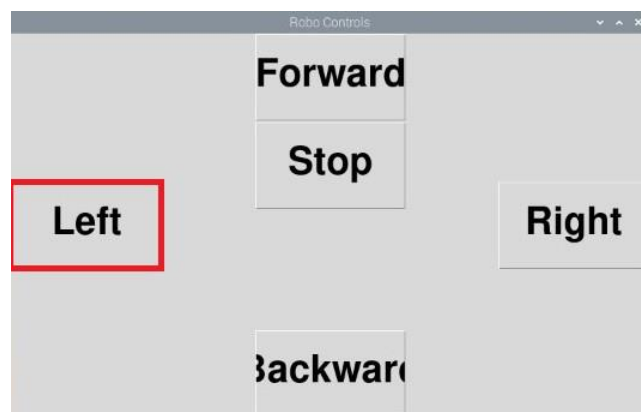


Fig.6.5.Left Button

The Left button upon pressing by the user will cause the robot to take a **Left** turn.

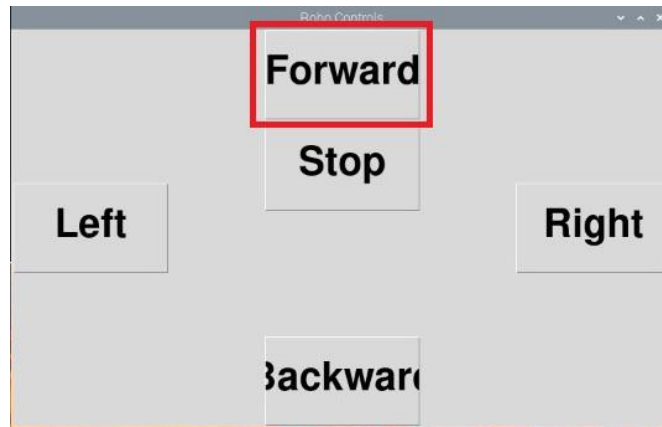


Fig.6.6.Forward Button

The Forward button upon pressing by the user will cause the robot to take a **Forward** movement.

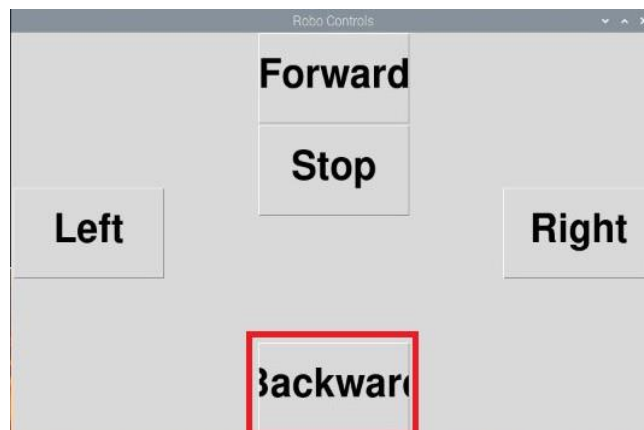


Fig.6.7.Backward Button

The Backward button upon pressing by the user will cause the robot to take a **Backward** movement.

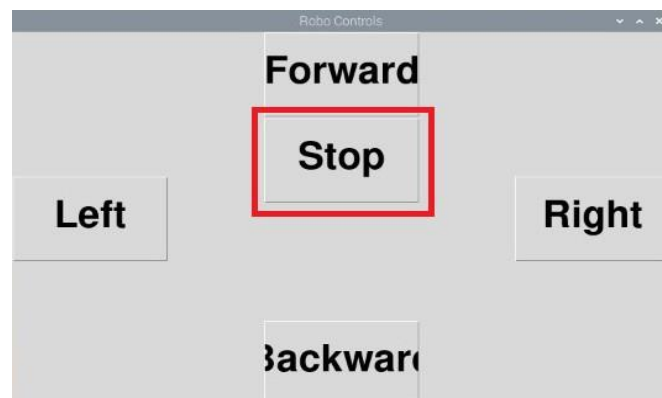


Fig.6.8.Stop Button

The Stop button upon pressing by the user will cause the robot to Stop.



Fig.6.9.Video Stream

Explanation:

By using the robot, the administrator can :

- Give instructions to the Robot.
- Patrol the area as per his/her wish since all the controls are given to the user in the form of buttons.
- Enter into territories where human access is impossible by taking the size advantage.
- Send constant updates in the form of live video stream to the administrator.
- Secretly monitor and secure the premises without even getting noticed.
- Take suitable actions if any activity is detected.

CONCLUSION

This gadget is an independent brilliant way for night vision watching. It includes the development of a security robot that utilizes a night vision camera to guarantee the wellbeing of its environmental factors. Improvement would without a doubt bring about a critical expansion in security. The technique for making a robot for perception configuration is proposed in this paper. Utilizing the idea of IOT, it takes care of the issue of restricted degree perception. Thusly, this Robot is little in scale and moves into domains where human access is unthinkable. The Robot is hard to detect and mixes in with the surroundings. One of the main progressions in the devices area is distant innovation. This advancement is being utilized to help our organization as a vital piece of observation. This outcomes in a profoundly productive and practical robot that diminishes human work while as yet performing persuading really looking at undertakings.

Future Enhancement

- The system can be further improved into a full-fledged security robot to reduce human work.
- The system can be provided having 360° coverage along with high end components with higher extend its operation and to increase its efficiency.
- The system can be provided with additional microphones facing more directions for better detection of direction of source of the sound.

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