

PERSON FOLLOWER ROBOT

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Abstract— In this paper we describe the design to build a robot capable of locating and following a human target moving in a domestic environment as well as industrial area. A person follower robot is an autonomous robot which is able to follow the color by using android camera of size 8MP and continuously capture the image of resolution 2448*3264 by using image processing technology. Android device will take decision according to the captured image and send it to the AVR atmega32 controller through HC05 Bluetooth module and another technology is using HC-SR04 ultrasonic sensor .Ultrasonic sensor emits the sound wave to measure the distance between person and robot. Also robot follows the person at particular [100cm] distance. If any obstacle comes in between the person and robot, it will stop the robot immediately. This project aims to implement and control the movement of the robot by proper tuning of the control parameters and thus achieve better performance.

Keywords – robot, person follower, ultrasonic sensor.

I. INTRODUCTION

The aim of this project is to detect and follow the person. we have seen in our day to day life, there will be a difficulties to carry items in many places so we have to implement or designed the robot in both automatic and manual mode system. In automatic system we used external android camera that will capture an image of that object and by using color detection of that object the robot will move. In manual system the ultrasonic sensors are used, by using distance measurement the robot will follow the person. If the distance in between 15-30cm, the robot will follow the person, otherwise it will detect as obstacle.

A robots that can help us carry items, accompany us at shopping malls, or during a jogging session at the park. A robot that can help nurses at hospital, or bringing the medical supplies during war to injured soldiers. There are so many advantages of having

Such robot, that in the future, it will most likely be the trends.

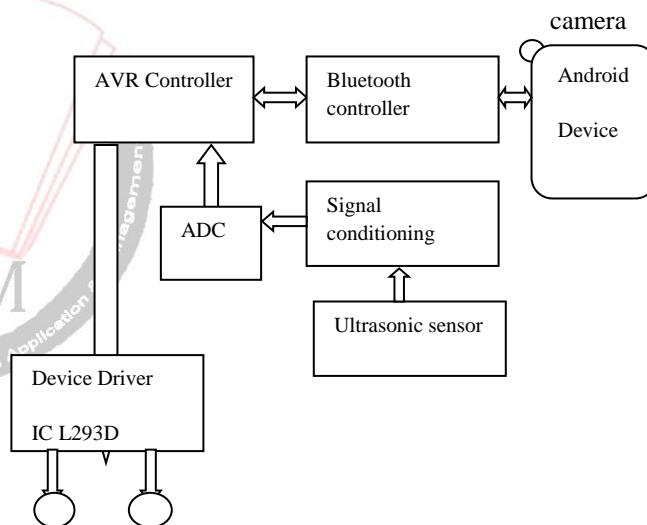


Fig.1 System Architecture

In this system architecture two modes are used:

Automatic Mode: By using android camera Capturing images of the person and after that it performs several image processing algorithms like RGB separation, Gray scale, Edge detection Boundary detection, HSV etc.

Manual Mode: By using ultrasonic sensor Ultrasonic sensor emits the sound wave to measure the distance between person and robot.

II. LITERATURE SURVEY

AVR CONTROLLER

The AVR microcontroller will perform the operation on the received command from android device through Bluetooth module HC-05. The DC motor driver IC-L293D is connected to port C of AVR microcontroller, which drives the DC motor as per command and controls the wheels of robot. The Port D of microcontroller are used for future use for wired communication by using MAX 232 IC for serial communication and Port B remaining pins are used for the ULN2803 IC for connected the in future the devices like Buzzer, LED etc.

ADC

In Microcontroller Atmega32 the Port A has 8-bit ADC are inbuilt. The ADC are used for to convert the signals from analog to digital form. These digital signals are used for further processing by the digital processor. ADC is operated on 5v power supply.

ULTRASONIC SENSOR

We used HC-SR04 three ultrasonic sensors, which transmit & receive signals by emitting sound waves.

Ultrasonic sensor has four pins Vcc, Echo, Trigger, Gnd three ultrasonic sensor are used to connect the right, left and front side of the robot for calculating the distance between person and robot. 5v supply are required for each ultrasonic sensor and common ground will be connected. The first and second Ultrasonic Sensor are connected to Port B B0,B1,B2,B3 pins and third Ultrasonic Sensor is connected to the Port A A0,A1 pins.

DEVICE DRIVERS

The AVR Microcontroller Port C, C0 to C3 pins are connected to the Driver IC L293D as a input and the four pins of Driver IC's two DC Motors are connected as a output of driver IC. It required 5V power supply. The 4.7k pull-up resistors connected between the microcontroller and Driver IC.

DC MOTOR

We have used two 60 rpm DC motors for forward and reverse direction according to the microcontroller instruction. For the DC Motors we have used directly supply from charging and discharging lead acidic battery 12V , 1.3A/hrs.

III. WORKING

This project working in two modes. First is automatic & second is manually, there is switch is given to operate those two modes. In our project we used 12V charge & discharge battery for the DC motors, and also used 5V power supply for the IC's. When switch is in automatic mode then at that time android camera will works, In this project we uses android camera which sense the image at 8MP and capture the image as per 35 frames per second. Initially when image will captured on that image the image recognition & image segmentation operation of image processing will be performed. Due to segmentation, android device will take decision as per the command given in the code and send to the AVR AT mega 32 microcontrollers, through HC-05 Bluetooth module. The AVR microcontroller will perform the operation on the received command from android device. The DC motor driver IC-L293D is connected to port C of AVR microcontroller, which drives the DC motor as per command and controls the wheels of robot.

When switch is in manual mode then at that time, ultrasonic sensors will works. We used HC-SR04 three ultrasonic sensors, which transmit & receive signals by emitting sound waves. By using distance calculation sensors will follow the person, these sensors connected to the right, left & front side of the robot. Also robot follows the person at particular [15-30cm] distance. If the distance between person and robot is below 15cm, it will detect as a obstacle and the robot will stop.

IV. FLOW FOR IMAGE PROCESSING

Automatic mode by using android camera following steps are including are as follows:-

First step initially image will be captured that is in image grabbing.



Second Step Channel Separation for the color image made from one of the primary colors (red, green, blue).



In Third step the Blurring and RGB to HSV Conversion will be takes place. In blurring stage, filtering operation will be carried out by using smoothing filter and an image with RGB primary colors converted into HSV (hue, saturation, value) for object selection purpose.



In Fourth step Object will be selected for to follow the selected object continuously.



In Fifth step the HSV thresholding is used to replace each pixel in an image into black and white pixel, depending on the intensity of an image.



In Sixth step the Blob detection method is used for detecting regions in an image.



In Seventh step the COG (Center Of Gravity) or center of mass which is used to obtain brighter pixels.



In this step Partition of a digital image will be done by using image segmentation.



In last step the direction detection, moving direction of the robot is given to microcontroller and according to the commands driver IC L293D will control the robot.

V. ADVANTAGES

Robot system is fit and forget that means when camera will capture an image then that image will be forget from camera after some time and the camera will capture the new image.

The robot is simple in construction there will be no difficulties in circuit because less components are used to design a robot. And due to simplicity in construction the cost of the system is medium.

The designed robot works with android camera and due to that the movement of robot is automatic.

VI. DISADVANTAGES

Robot always needs a path to run from the particular path. Robot has slow speed and instability on different line thickness or hard angles.

VII. APPLICATIONS

In Industrial application: a robot can help us carry heavy items for long distance.

In Hospital: a robot that can help nurses at hospital, or bringing the medical supplies during war to injured soldiers.

Guidance system for industrial robots moving on shop floor etc.

In Military application: in that robot can handle the heavy equipment like missiles etc. from one place to others.

VIII. CONCLUSION

Designed human follower robot using both automatically and manually operating methods with the help of AVR atmega32 microcontroller, android camera and ultrasonic sensors. It can follow a human whenever the person moves in that direction. The robot should also be able to exhibit an effective obstacle avoidance with target following and exploration behaviors. The human follower robot can help us in domestic environment as well as in an industrial area.

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