Design and Development of Human Following Trolley

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Abstract:- This paper represents the human following trolley using a raspberry pi. A trolley automatically avoids an obstacle, and to interact and communicate with the person trolley should follow that particular person. To achieve this target the goal of our work is to design and fabricate a robot that not only tracks the target but also move towards by avoiding obstacles while tracking. To make things simpler, a unique tag is placed on the person that should be followed by trolley. A small pi camera continuously captures the images of the unique tag and continuously compares it to the original captured image. If it is matched, then trolley moves further also it makes its way to proceed further by avoiding obstacles by using ultrasonic sensors. Tag plays essential role as per as uniqueness is a concern and makes the task easy. The trolley is mechanically designed, and electrical components are also used. All processing is carried out using a raspberry pi.

Keywords:- Raspberry Pi, Unique Handmade Tag, Ultrasonic Sensor, Pi Camera.

I. INTRODUCTION

Robotic technology plays vital role in this moving world in a couple of past years. In this robotic world, it is necessary to make trolley such as "Human following trolley which interacts and co-exists with them. To perform this task accurately, trolley needs to avoid obstacles and also it must be intelligent enough to follow a person in a crowded area, rich environment and indoor and outdoor places.

➢ *Advantages:*
- It provides the best possible result by maintaining accuracy.
- It reduces human efforts.
- It is easy to handle.

Here raspberry pi is a credit-card-sized single board which is developed by UK based raspberry pi foundation. The raspberry pi has GPIO pins. Using the L293D motor driver board, the robot is controlled by GPIO pins. Here a pi-camera is connected to a raspberry pi.

DC motors are being used for movement of robotic wheels, i.e. to move right-left, forward or backward direction.

Raspberry Pi uses ARM11 architecture and a Linux-based system. Also, it has 8 GPIO, 1 UART, 1 I2C and 1 SPI, basically to meet the control requirement. The wheels of the trolley are controlled by DC motors which are dependent on driving motor.

II. LITERATURE SURVEY

In [1] robot can be controlled by using the android app. It gives commands to the robot to move upward, backward, left, right. As per signal generated by the android app, raspberry pi is given to the raspberry pi, and controlling process is done. [1]

In [2] robotic ARM, android application, raspberry pi is used. In this robotic arm performs the same like human hand works. Application is built in android platform, the indication is given to raspberry pi for further process. In this technique, the delay and server problems are reduced as the Wi-Fi is used.

In [3] robot can be implemented wirelessly as it uses Integrated circuit, Parallel port, Atmega 168 Microcontroller, Arduino, X-bee, Zigbee. The Robot could be guided with absolute freedom and autonomy without using wires.

In [4] robotic cart is implemented to track and follow the target in the unstructured environment. Here microcontroller and ultrasonic sensor are used to identify and follow a targeted person.

In [5] a robot automatically follows the particular person as a unique tag is placed on the person that should be followed by a robot.

In [6] a trolley follows with carrying good with it also the bar code reader is placed in a trolley to save the time of billing.

In [7] Intelligent Space for the achievement of the human-centred robotic system was developed. The positions of targeted objects in the iSpace is measured with multiple DINDs installed in a wide area.

III. WORKING METHODOLOGY

Trolley consists of a robotic vehicle having two wheels and one freewheel mounted along with different sensors and modules, i.e. ultrasonic sensor and camera. The camera is vertically adjusted and is initially mounted at the height of 4ft from the ground to enhance the visual capability and

effectiveness. The user controls the trolley as it follows a particular person by a unique identification tag.
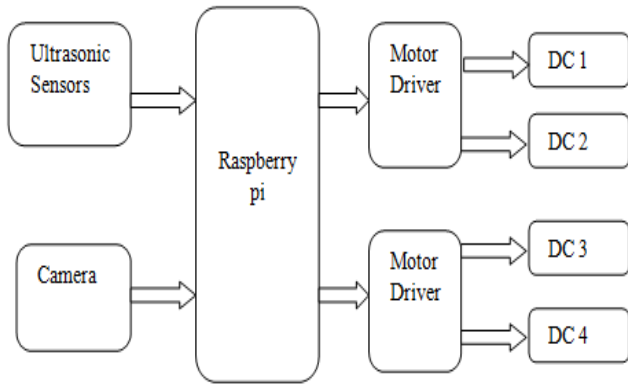

Fig 2:- Block diagram of the system

The Pi camera captures the image continuously and compares it with the original. If it is matched, then it follows that person. Also, it checks for the obstacles and avoids them by using a ultrasonic sensor. There are several features of the project such as design of circuit, tag identification, obstacles avoidance and human detection system.
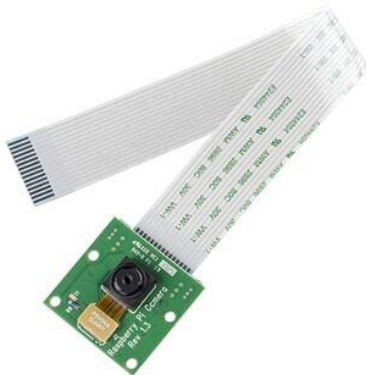

Fig 3:- Pi camera

Continuously image capturing is done for identifying the unique tag. We have used computer vision camera for recognising the tag at the back of the person and an OpenCV python platform to develop this algorithm.
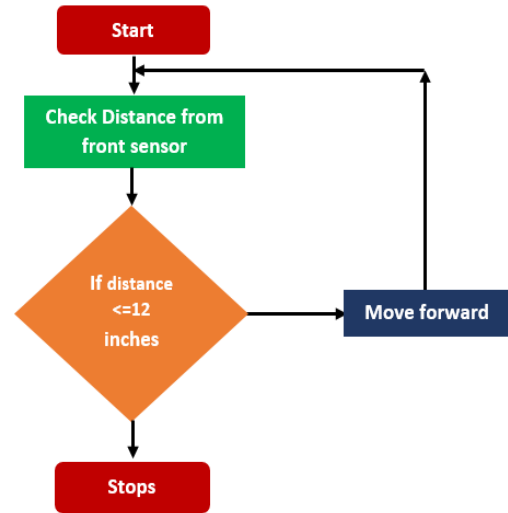

Fig 4: Ultrasonic Sensor

Fig 5:- Flow Chart of Ultrasonic Sensor

Ultrasonic sensors transmit sound waves at a frequency which is too high for humans to hear. Then they wait for the sound to be reflected back and calculate the distance based on the time required. This is similar to the radar measures time it takes a radio wave to return after hitting the object.
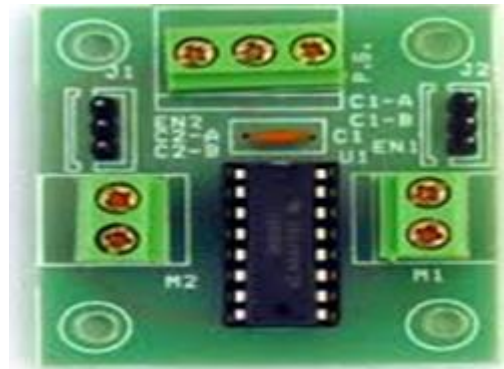

Fig 6: Motor driver IC

L293D is a motor driver IC which we have used to drive the DC motors in both the directions. L239D is a 16 pin IC who can control set of two DC motors simultaneously.

IV. RESULTS

The objective of the follower robot is to track and follow the person who is obtained. It is achieved by using ultrasonic sensor and pi-camera which detects and follows the person and avoids obstacles also and according to that raspberry pi executes further controlling actions.
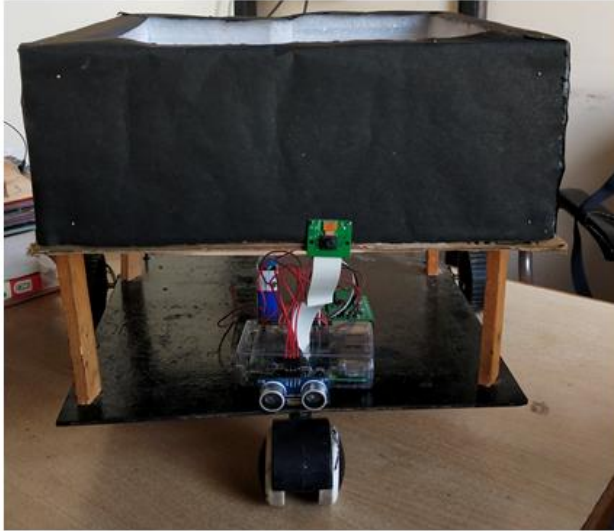
Fig 7: Physical implementation of the trolley

V. CONCLUSION

This paper is effectively experimented & implemented for the human following trolley, which captures the tag using pi-camera and follows the particular human. So this device is cost-effective, and it reduces human efforts. Also, this device is utilised for various places like malls, hospitals, railway platforms etc.

FUTURE SCOPE

There are many interesting applications in the vast robotic world in different fields like military or medical. Wireless communication functionality can be added in the robot to make it more versatile and control from a large distance. This capability of the robot could be used for the military by mounting real-time video recorder. Also, we can interface GPS to that trolley to track its location.

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