International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 02 | Feb -2017 www.irjet.net p-ISSN: 2395-0072

RASPBERRY Pi BASED OBSTACLE AVOIDING ROBOT

Amruta Nikam[1], Akshata Doddamani[2], Divya Deshpande[3], Shrinivas Manjramkar[4]

[1] *Amruta Nikam, Asst. Professor, E&TC, DYPIEMR-Akurdi, Pune*
[2] *Akshata Doddamani, Student, B.E. (E&TC), DYPIEMR-Akurdi, Pune*
[3] *Divya Deshpande, Student, B.E. (E&TC), DYPIEMR-Akurdi, Pune*
[4] *Shrinivas Manjramkar, Student, B.E.(E&TC), DYPIEMR-Akurdi, Pune*

Abstract – *The project aims to build an autonomous robot using raspberry pi as a processing chip. An HD camera is used to provide and detect the obstacle from the real world to the robot. The robot is capable of avoiding the obstacle occurring in its path using an obstacle detection algorithm and move in an obstacle free path. The pi camera module will detect the obstacle in real time basis and using image processing algorithm it will detect the obstacle and feedback to the raspberry pi wherein it will change the path of the robot and divert it to obstacle free path.*

Key Words: Raspberry pi, Obstacle detection, Pi camera module.

1. INTRODUCTION

Robotics is the branch of technology which deals with the construction, design, operation and application of robots. Obstacle avoidance refers to the ability of a robot to detect obstacles in its way if there are any and thus make its own obstacle free path. It makes use of pi camera module for detecting the obstacle in its path and also raspberry pi.

We can develop the robot with a very good intelligence which is capable of easily sensing the obstacle through camera module. We proposed a model of a robot based on raspberry pi. Requirements of the project include raspberry pi, pi camera module, l293 motor drivers, DC motors. Raspberry PI is small kit means it is a small computer. This small computer performs a number of tasks. The Raspberry Pi is a series of credit card-sized single-board computer.

2. HARDWARE DESIGN

2.1 List of hardware

- Raspberry Pi 3 model B
- Motor drivers(ICL293)
- Wi-Fi 802.11n dongle to connect remotely to pi.
- 8AAA batteries
- DC motors
- L shaped aluminum strip to support camera.
- Pi camera

2.2 Hardware and Software description

2.2.1 Raspberry pi

Raspberry Pi is credit card-sized single-board computer. There are currently five raspberry pi models in the market i.e. the model B+, model A+, model B, model A and the compute module. All models use the same SoC (system on chip – combined CPU and GPU). All models feature a Broadcom system on a chip (SoC), which includes an ARM compatible central processing unit (CPU) and an on chip graphics processing unit (General Processing Unit, a Video Core IV). Central processing unit speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. The operating systems are stored in secure digital (SD) and program memory in either the SDHC or Micro SDHC sizes. Most boards have one to four USB slots, HDMI and composite video output. Lower level output is provided by a number of General purposes input output pins which support common protocols like I^2C. The Pi 3 has on board Bluetooth and Wi-Fi 802.11n.

Fig-1: Raspberry pi 3 model B

2.2.2 Pi Camera:

The Raspberry Pi camera module can be used to capture photograph as well as take high-definition video. You can use the libraries with the camera to create effects. The camera module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and video modes. It connects via a 15cm ribbon cable to the CSI port on the Raspberry Pi. The camera works with all models of Raspberry Pi 1 as well as Pi2. It can be accessed through the MMAL (Multi-Media Abstraction Layer), Video for Linux Application Programming Interface and there are numerous third-party libraries built for it, such as the Pi camera Python library.

The camera module is widely used in home security applications, and in wildlife camera traps.

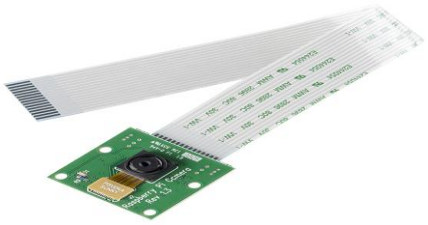

Fig-2: Pi camera module

2.2.3 Python

Python is widely used general purpose, high-level programming language. Its syntax allows the programmers to express concepts in fewer lines of a code when compared with other languages like C, C++ or java.

2.2.4 OpenCV

It (open source computer vision) is a library of programming functions, mainly aimed at real time vision. It has over 2500 optimized algorithms and the state of the art algorithms in a computer vision, which can be used for image processing, detection, face recognition, object identification, classification actions, traces and other functions. This library allows these features be implemented on computer with relative ease provide a simple computer vision. It is based on C++ but wrappers are available in python as well. In our project it is used to detect the obstacle and guide the robot on obstacle free path.

2.2.5 Motor driver IC(L293D)

L293D is a Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

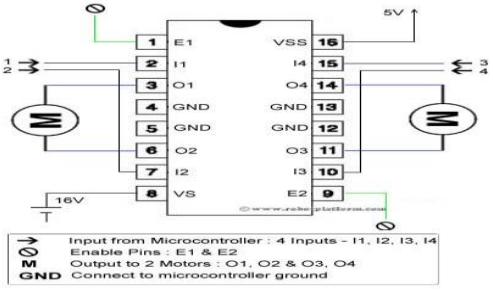

Fig-3: Motor Driver IC

3. WORKING

The raspberry pi based obstacle avoiding robot consist of three main module i.e. camera module, raspberry pi, motor drivers. The camera module gets the input image which are obtained are real time operation. The raspberry pi is a platform consisting of all necessary hardware module assembled on it. It receives the images from camera module. It carries out image processing and checks whether there are any obstacles in path of the robot and if any obstacle occurs then it will send the signal further to motor driver accordingly. The motor driver actually consists of two sub motors i.e. right and left motor. These motors receives the signal from raspberry pi in case of any appearance of the obstacle in its path the motors work accordingly to signal and moves in left or right direction with the help of left and right motor to avoid the obstacles .

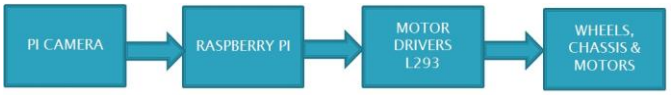

Fig -4: Block Diagram of raspberry pi obstacle avoiding robot

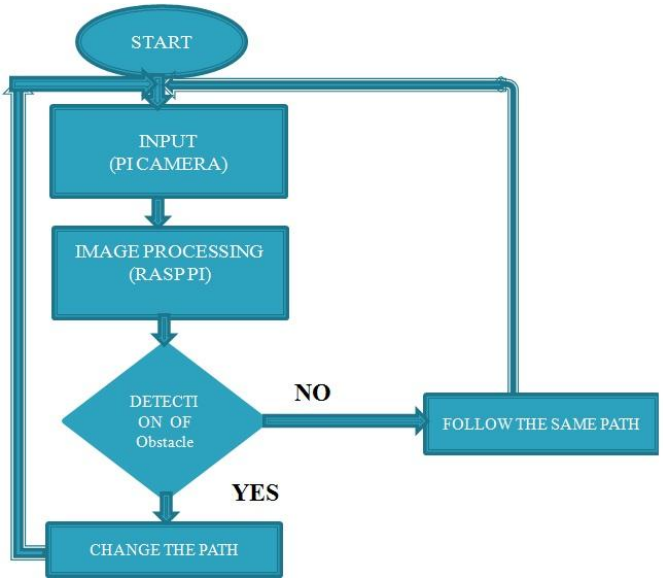

Fig-5: Flow Chart

3. CONCLUSIONS

The robot will be able to move as per the command given after detecting the obstacle through the camera module. When the video frame containing the obstacle is detected using the image processing algorithm the pi will command the motor as per the directions i.e. left or right and it will change its path accordingly.

REFERENCES

[1] Gurjashan Singh Pannu, Mohammad Dawud Ansari, Pritha Gupta. Design and Implementation of Autonomous Car using Raspberry Pi. International Journal of Computer Applications (0975 – 8887) Volume 113 – No. 9, March 2015.

[2] Ayush Wattal, Ashutosh Ojha, Manoj Kumar. Obstacle Detection for Visually Impaired Using Raspberry Pi and Ultrasonic Sensors. National Conference on Product Design (NCPD 2016), July 2016.

[3] Mr. T. P. Kausalya Nandan, , S. N. Anvesh Kumar, M. Bhargava, P. Chandrakanth, M. Sairani. Controlling Obstacle Avoiding And Live Streaming Robot Using Chronos Watch. International Journal of Engineering Innovation & Research Volume 5, Issue 2, ISSN: 2277 – 5668.

[4] Xiaodong Miao, Shunming Li & Huan Shen, On-Board lane detection system for intelligent vehicle based on monocular vision, International Journal on Smart Sensing and Intelligent Systems, vol. 5, no. 4, December 2012, pp. 957-972.

[5] A. Bar Hillel, R. Lerner, D. Levi, & G. Raz. Recent progress in road and lane detection: a survey. Machine Vision and Applications, Feb. 2012, pp. 727–745

[6] Narathip Thongpan, & Mahasak Ketcham, The State of the Art in Development a Lane Detection for Embedded Systems Design, Conference on Advanced Computational Technologies & Creative Media (ICACTCM'2014) Aug. 14-15, 2014

[7] Narayan Pandharinath Pawar & Minakshee M. Patil, Driver Assistance System based on Raspberry Pi, International Journal of Computer Applications (0975 – 8887) Volume 95– No.16, June 2014, pp. 36-39. [10] J.M.A. Alvarez, A.M. Lopez & R. Baldrich, IlluminantInvariant Model-Based Road Segmentation. Intelligent Transportation Systems, IEEE Transactions on, 12, 2008, pp 184–193.