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Raspberry pi Based Self Alignment Chair

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Abstract-*We are in a world which is blessed by modern technologies and smart structures that help us in our everyday life by making us familiarized with the invention in computing systems, computerization, artificial intelligence and so on. The world has seen an outbreak of smart systems in the last decade. To keep a significant contribution to the modern technological use, our proposed system enhances the growing need of smart systems. In this paper, a design of self-position aligning chair combined with the features of self-parking independent robot has been proposed. It diminishes both human efforts and time consumption in the process of furnishing and beautifying a conference room. Experimental results showed that the proposed model is more economical and affordable than the systems available till date. This work improves our lifestyles by reducing human efforts, saving time and also by maintaining more attractive working places.*

Keywords*—**Arduino Uno; smart raspberry Pi board, meeting room; self-position aligning chair; object recognition; obstacle finding and escaping; image processing; automation and robotics.*

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I. Introduction

Today's world is now highly dependent on smart systems. Smart devices and equipment have made our lifestyles so comfortable that people all around the world are using these in their lives more than enough. Augmented reality in education, automation in transportation, development of artificial intelligent robots, evolution of IoT , data science and so on have noteworthy influence by introducing ourselves with an unproblematic way of life. The self-alignment wheel chair is used to eliminate the problem occurred in class room or auditorium getting messed up. In this system controlling of chair is depend upon detecting of particular object stored in it's code. The camera fixed on wheel chair capturing the image of eye and track the position of user, motor will be move in the required direction such as left, right and forward. Also the Ultrasonic sensor is mounted in front of wheel chair for safety to detect stagnant or mobile barriers. It will stop the wheel chair movements automatically. A raspberry Pi board is used to control whole system. This is cost effective and independent wheel chair system.

II. Literature Survey

One of the major problems of lining up of chairs after office gatherings is now have a solution provided by a notable Automakers. The Japanese firm has invented self-fueled office chairs which are able to arrange themselves over their stopping position with the sound sensor. This Japanese organization utilized four movement cameras toward the edge so far and utilized them to track general office chairs on their wheels. This innovation I is otherwise called picture handling. The Wi-Fi ordered cameras find each chair's area and it gets back to its beginning position. The room structure is pre-modified into the framework, with singular seats

allocated their own position attestable. These have been tailored to react to the sound sensor, with each seat consequently back tracks to its original position. We were really taking a glance at office seats as a theme and seek there is a need after this in some organization, in their meeting room."Nissan's definitive objective is self-aligning, and the self-stopping chair. Instead of considering them just furniture, we can trust them as a me a n s by which our improvement can be brought into the consideration of different articles. Few of us wished to see it in our own places like examination room, dining table, what is called as an "Intelligent Parking Chair."It is possible to have a turn of 360 degrees with the Intelligent Parking Chair and finds an objects position with the help off our cameras, that "produce a best view to remotely transmit the seat's position and its passage to goal. It is centered around finishing just a single task by coordination of sensors and motors controlled by microcontroller programming/coding. There are three sorts of stopping designs: parallel, front/back-in reverse, and with an angle of 45 degrees. Making our ventures Wireless reliably makes it to look simple and furthermore widens the range in which it can be controlled. Starting from using an ordinary infrared LED for small separation remote control till an ESP8266 for over all HTTP control, there are number of approaches to control something distantly. In this we can calculate how we can assemble remote activities using a 433 MHz RF module. These modules are effectively accessible. They can be used independently as a Transmitter and Receiver or be combined with a Microcontroller. Here we will take in the rudiments of RF module and how to use it as an independent RF Transmitter and Receiver. Here we have explained the RF Transmitter and Receiver Circuit by controlling the LEDs remotely utilizing RF. 8051 Microcontroller is a programmable device which is used for controlling. 89c51 is 8-bit microcontroller suggeststhatitcando8-bitoperation.It has 4 input/output ports which are utilized as information as per your need. The microcontroller 89c51 have peripherals like Timer, Serial Port interface and Interrupt controlling can be utilized as per your need. One of the Purpose of shared parking garage management integrate checking the quantity of stopped vehicles, and distinguishing the accessible area. The work presented in this paper proposes an other framework for giving stopping statistics and direction utilizing picture preparing. The proposed framework incorporates checking the quantity of stopped vehicles, and recognizing the slows down accessible. The paper work recognizes vehicles through pictures as opposed to employing electronic sensors fixed on the floor. A camera is introduced for the purpose of the parking garage. It will click pictures. Using picture of a vehicles as reference picture, the caught pictures are consecutively coordinated using picture coordination. The edge detection can be done using Prewitt edge identification.

III. Existing system

Microcontroller Based Autonomous Chair :

In order to park the chair itself, press the switch which is fitted at the particular place or at the side of the existing door, this switch working on the principle of radio frequency modules which uses 433MHz of frequency for sending parking command signal to the main or controller system. At the controller side the RF receiver circuit is connected to decode this command signal and starts the programming implementation. first activating the ultrasonic sensor. The chair will move forward and detects any obstacle if it is wall. After its found both motors will rotate in opposite direction and change the direction of chair. IR sensors use to detect the wall and it maintain the distance between wall and system. Magnet is fitted at below of the table, if magnet is found by the miniature magnetic sensor which is fitted at the system, then it will stops the system. LCD is connected to the controller for monitoring the distance at every time.

RFID Based Autonomous Chair

The "Intelligent Chair parking" is a exclusive chair that automatically moves to a desired position. The chair is having a wheel so that it can move automatically 360 degrees position. Four cameras installed on the room's ceiling produce a bird's-eye view to wirelessly transmit the chair's position and its route to destination. With this innovation in office technology, Japanese businessmen are now free from the wearisome task of managing chairs. The most common image of disability is of the handicap people who use the wheelchair. Wheelchairs are used by people who find themselves unfitted to move without external assistance. The physically challenged person or individual have “Special Needs” and often require some help to perform their daily routine. The physically challenged people, who use a normal wheelchair, usually require an external person to move around. The requirement of an automated home navigation system, which consists of a wheelchair, can be used by the elderly and the physically challenged people without the help of an external person display, transducers etc. In this way, as an alternative to personnel275 controlled traditional parking operations, an unmanned, atomized chair control and identification system has been developed. Thus RFID based automatic parking seat is self-sufficient. The employment of RFID technology is innovative and might improves the existing automation system. RFID is one of the most basic technologies that enable wireless data transmission.

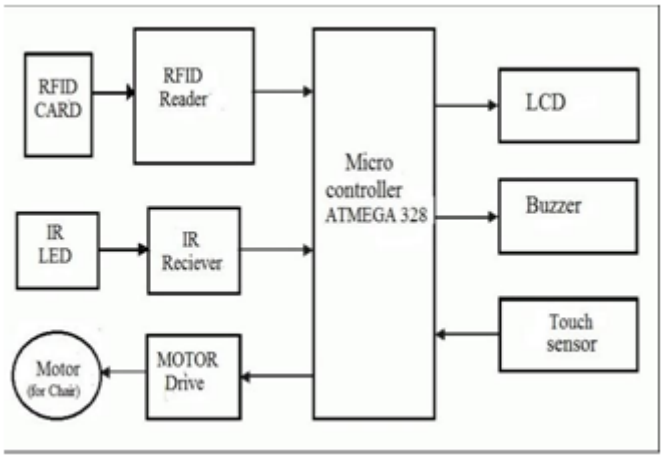


Fig 1: RFID Based Autonomous Chair

***ARDUINO Based Autonomous Chair*:**

The embedded system of the smart parking chair has been classified into input segment and output segment as in Fig.1. The input module consists of the localization device, the obstacle recognition sensors, and the user input device. Both these modules or segments are interfaced using an embedded microcontroller that serves as the fundamental command module, and delivers information regarding the current location. Localization is performed using a anisotropic magneto-resistive sensor system [4], and obstacle prevention navigation is performed using ultrasonic range finders [7]. Rest of the hardware is enclosed inside the circular frame stuck to the bottom of the chair. Once the target coordinates are feed to the system through the clap sensor, the microcontroller will initiate its routine. At the similar time, the magnetometer communicates with the microcontroller to read primary and closing co-ordinates . When it governs that the robot is present at a point of interest, it will send suitable signal to the microcontroller. Consequently, microcontroller will start the motor to move the chair in predetermined direction . The ultrasonic sensor integrated to the input ports of the Arduino Uno AT mega328 microcontroller, which constantly sends appropriate signals when an obstacle is recognized. These signals are then examined to identify the location of an obstacle, and in accordance with this the obstacle avoidance routine initialize.

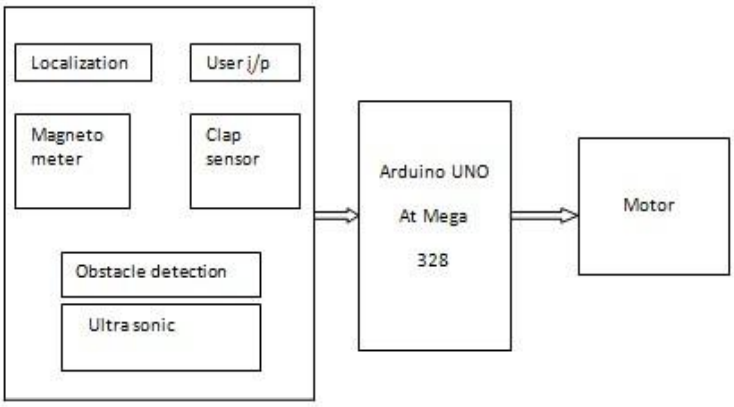


Fig 2. Arduino Based Autonomous Chair

Proposed System

The paper is focused on accomplish in gasing let ask i.e. automatic parking of chairs by combination of sensors and actuators controlled by microcontroller and tactic planning/coding, therefore the vehicle platform is not built from the parts but from modifying aRCtoycarinstead for saving the time.Thereare generally three kinds of parking patterns: parallel, forth/back-in perpendicular, and rotating with an angle(usually45 degrees), and this project is just focused on the parallel parking. The modified toycaris expected to do the following tasks in a complete automatic parking process:

1. Once the length of a parking space larger than the length of the chair plus a buffering distance is detected, the chair will stop automatically.

2 Perform a smooth and efficient parking behavior according to the relative positions of the car and the parking space.

The automatic chair parking system has the following major components:
-Raspberry Pi
-Arduino nano
-Ultrasonic Sensor
-USB Camera
-Relay
-12v DC Motor
-Battery
-L293D Motor Driver IC

IV. Methodology

System Block Diagram

The purpose of this self-alignment wheelchair is to eliminate the problems occurred in classroom or auditorium getting messed up. In this system controlling of chair is depend detection of particular object stored in its code. Camera is mounted on wheelchair, for capture the image of eye and tracks the position object position of user, motor will be move in required direction such as left, right and forward. Ultrasonic sensor is mounted in front of wheelchair for safety to detect static or mobile barriers and stop the wheelchair movement automatically. A raspberry pi board is used to control whole system. Index Terms Central switch, Image processing, open computer vision image library, Python, Raspberry pi, Wheelchair.

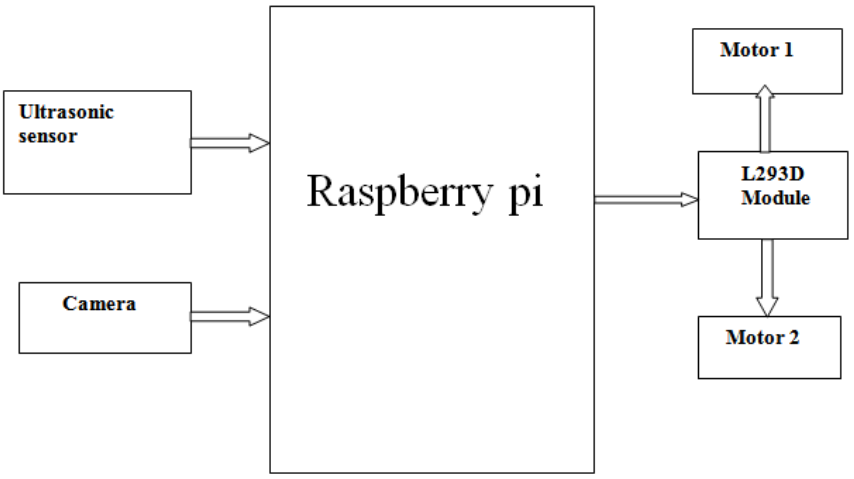


Fig 3 System Block Diagram

- ✧ Raspberry pi board is soul of the system, which control the complete system operation.
- ✧ Camera is directly connected with raspberry pi board and continuously captures the images, distance between object / image and camera device is fixed. It may be 5 to 10 meters.
- ✧ Image processing based data signal sent to the raspberry pi, raspberry pi received the data and analyze it and send the control signal to motor driving circuit, based on the location of object or image.
- ✧ This will decide that motor run either in clockwise or anticlockwise direction or stop. Two individual motors are fixed on each wheel.

V. Working

A system consists of different parts first input capturing part second Processing Unit, 3rd Driving part Hindi system when and we are using chair in a conference room it goes study but when you left the chair system start processing and find its path find its input logo CMOS camera used to you capture image from input window and for Processing Unit by using Raspberry Pi 3 when in input window a particular logo which is already predefined in a programming is detected by Raspberry pi system works Starts and end make origin and greed in in window Windows 4 part x axis- x y - y If logo comes in a window of of aphid from the origin then system rotates motor in a forward direction if from the origin system rotates motor in a right side direction Simile for the left and for the bottom now if during motion of chair if any obstacle comes then system stops until object do not removed and When obstacle remove in front of chair system again got triggered from the sensor which is Ultrasonic sensor and start working towards logo.

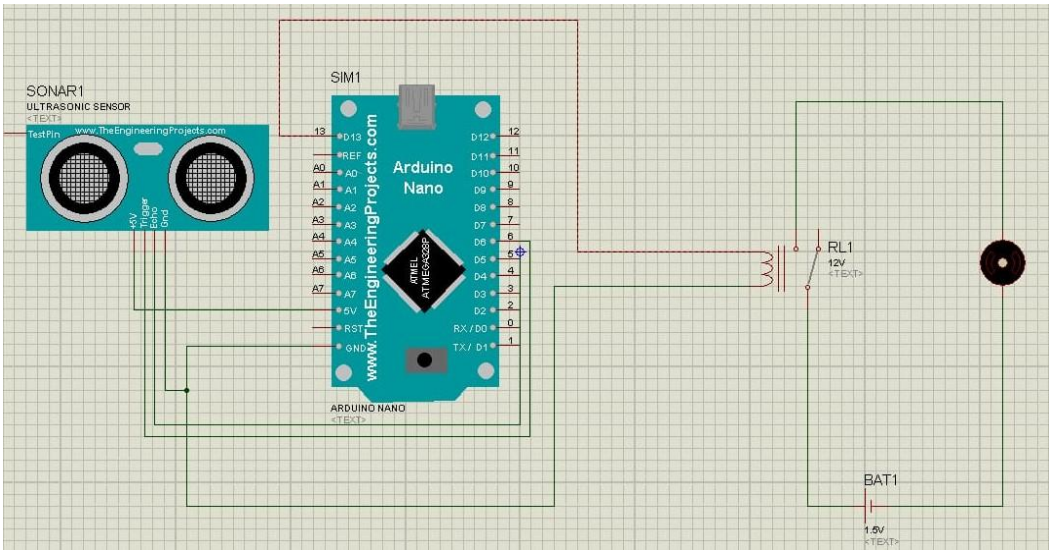


Fig.4: Circuit Diagram of Object Detection Using Ultrasonic Sensor

Arduino Nano :

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package.

It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source.

Technical Specification:

- **Microcontroller:** Atmel ATmega168 or ATmega328
- **Operating Voltage(logic level):** 5 V
- **Input Voltage(recommended):** 7-12 V
- **Input Voltage(limits):** 6-20 V
- **Digital I/O Pins:** 14 (of which 6 provide PWM output)
- **Analog Input Pins:** 8
- **DC Current per I/O Pin:** 40 mA
- **Flash Memory:** 16 KB (ATmega168) or 32 KB (ATmega328) of which 2 KB used by boot loader
- **SRAM:** 1 KB (ATmega168) or 2 KB (ATmega328)
- **EEPROM:** 512 bytes (ATmega168) or 1 KB (ATmega328)
- **Clock Speed:** 16 MHz

Role of Arduino Nano in Self Alignment Chair:

The role of Arduino Nano in Self Alignment Chair is to recognize an object in front of the chair through Ultrasonic sensor. When some object is arrived in front of the chair then ultrasonic sensor receives the signal from transmitter and send the signal to Arduino. We use Arduino to store the separate Code (program) of Ultrasonic sensor Activity.

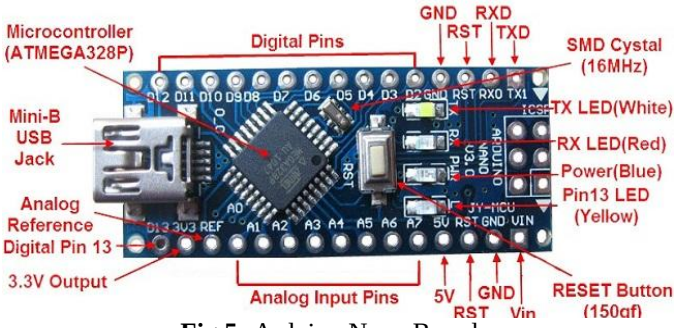


Fig 5: Arduino Nano Board

L293D motor driver:

Fig.6 shows L293D motor driver. L293D is a double H- connect engine driver coordinated circuit (IC). Engine drivers go about as momentum intensifiers since they take a low-flow control flag and give a higher-ebb and flow flag. This higher current flag is utilized to drive the engines. L293DcontainstwoinbuiltH-connectdrivercircuits.Inits basic method of task, two DC engines can be driven at the same time, both in forward and invert heading. The engine activities of two engines can be controlled by input rationale at pins 2 and 7 and 10 and 15. Information 00 or 11 will stop the comparing engine. Rationale 01 and 10will turn it in clockwise and anticlockwise bearings, individually. Empower pins 1 and 9 (comparing to the two engines) must be high for engines to begin working. At the point when an empower input is high, the related driver gets empowered.

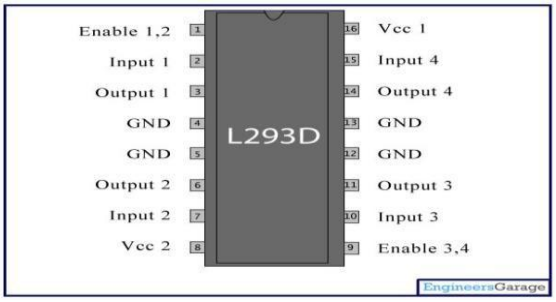


Fig.6: shows L293D motor driver

Ultrasonic sensor:

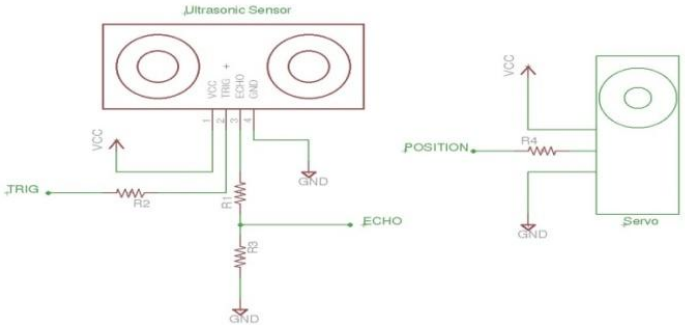


Fig 7: Ultrasonic sensor module

Ultrasonic ranging module HC - SR04 provides 2cm - 700cm non-contact measurement function, the ranging accuracy can reach to 3mm.Ensured stable signal within 5m, gradually faded signal outside 5m till disappearing at 7m position.

The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work.

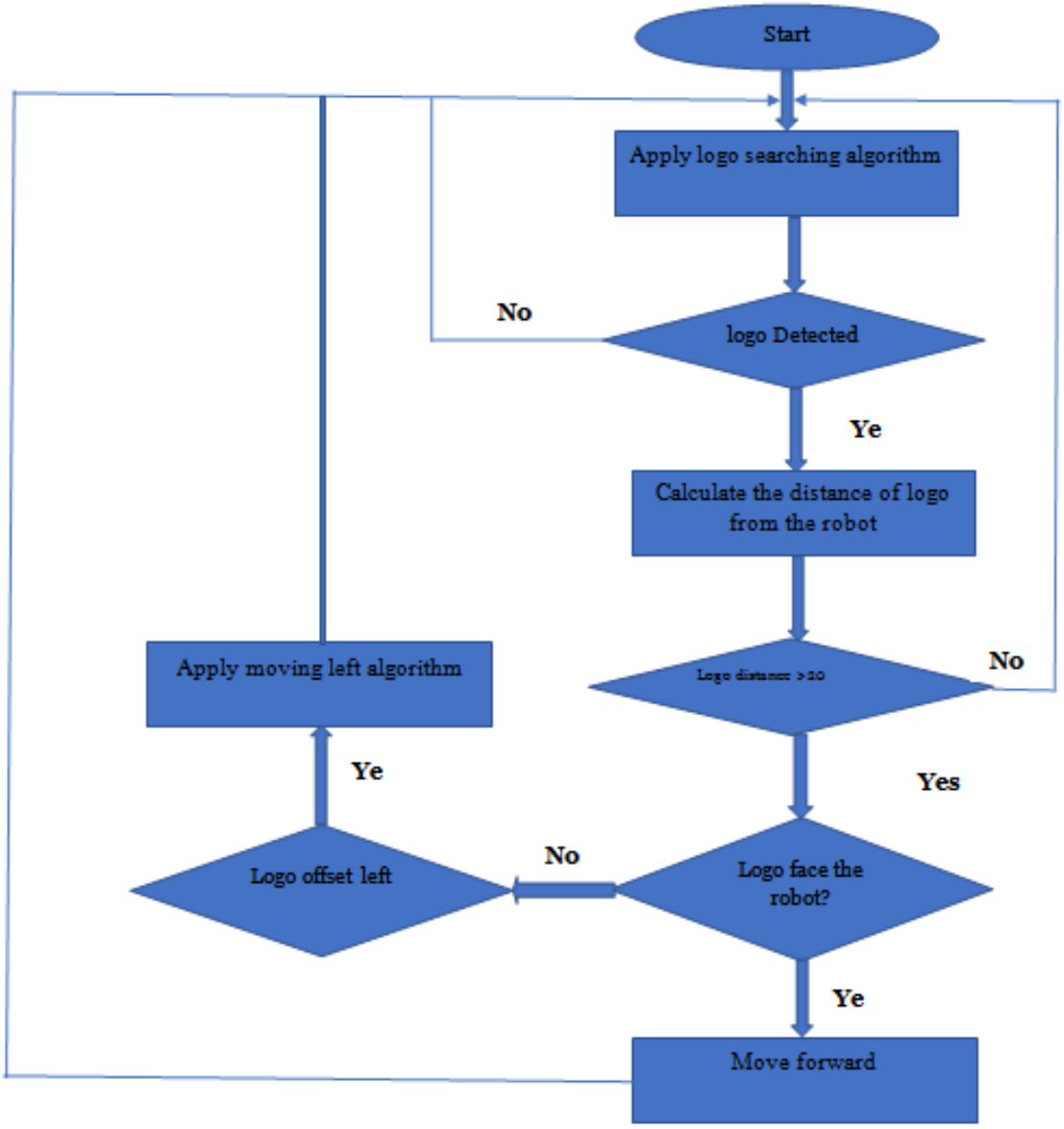
Fig 8 Image Ultrasonic Sensor Module

(1) Using IO trigger for at least 10us high level signal；
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time × velocity of sound (340M/S) / 2.
TRIG: Trigger Pulse Input
ECHO: Echo Pulse Output
GND: Ground
VCC: 5V Supply

VI. Detecting a proper image for parking space :

When we start our system, Raspberry Pi is On, in which camera is connected to USB port which detects the particular symbol or image. When we left the chair system start processing and find it's path from it's input logo, CMOS camera is used to capture image from input window and from processing unit by Raspberry Pi 3. When in input window a particular logo which is already predefined in programming is detected by raspberry pi, system starts working.

VII. Flowchart



VIII. Future Scope

i. In corporate companies like board room after completion of meeting the employees moves away without arranging the chairs thus, this system automatically arrange the shuffled chairs to their respective position. It may used in schools and colleges like in the practical labs the students moves away without arranging the shuffled chairs hence, by giving the interrupt to the systematically arrange the chairs in their original destination.

ii. In conference halls the people goes away after completion of conference without arranging the displaced chairs. This system helps in arranging the displaced chairs in their located position.

IX. Conclusion

Using this system, we can reduce the human effort. It is a self- parking system because of this there is no manual operation required. Due to this we can easily arrange the chairs in their respective places just by giving the interrupt to the chair.

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