

DEVELOPMENT OF TRAVEL CARRIAGE WITH AN AUTO-ROUTING SYSTEM

T.C BelcittaCharles¹, Akhil Mathew Jacob², Joemol G. J³, Nishanth M⁴
Mar Ephraem College of Engineering and Technology, Marthandam, Elavuvilai.
akhiljacob12.c@gmail.com

Abstract-All the robotic inventions are to reduce manual effort upon mechanical work and to ease human life. Human following robots are one of the latest technologies in electronics and by utilizing its advantages and applications in day to day life .The aim of this paper is to create a suitcase which follows its owner. Several techniques are introduced to follow a human by the robots .The aim of this paper is to design and develop a travel carriage with auto-routing system for airports, railway stations etc, that will become a helping aid for the passengers to carry their luggages. The ultrasonic sensors technology plays a key role in this project.

I. INTRODUCTION

The human following robots are the latest technology in robotics area. It has many applications in day to day life .There are many sources used to follow the humans using IR sensors, laser range finders, charge coupled devices, voice recognition systems, PIR sensors, camera and image processing method.

This human following device has a target tracking system, an obstacle sensing system. Here the system uses ultrasonic sensor for target tracking and RF sensor for obstacle tracking. The robot should follow the target in busy airports and other places so that the robot needs to know the position and direction of the user and must determine its own path to follow the target

This is a passenger friendly porter robot which will carry the luggage, performs the luggage checking operation and accompanies the passenger in his travel on a levelled surface mainly in airports and railway stations.

The proposed system is developed for replacing the man power required to move the luggage by automatic systems. This robot will reduce the time delay and human efforts in luggage management. A hand held device in the size of a keychain with manual controls is used by the user to control the suitcase. The microcontroller is the brain of the robot which calculates the distance from the user by the inputs from

the sensors and produces required output to the motors to follow the target.

II. PROJECT CONCEPT

The auto routing luggage carrier system is a suitcase that will follow the user throughout any flat surface without the need of the user to use force to drag it. No effort will be applied by the user in order to carry different loads upto 30kg.the product comes in standard size of the existing suitcase the main function is to follow the user wirelessly.

III. LITERATURE SURVEY

[1]This paper introduces a vision based object tracking robot which is driven by wheels and controlled by a computer along with software. The design of a robot which is automatically controlled by computer to track and follow a coloured object. Image acquisition by the robot is achieved by ANDROID based camera, and then it is sent to image processing software for further processing. It describes a visual sensor system used in the field of robotics for identification and tracking of the object

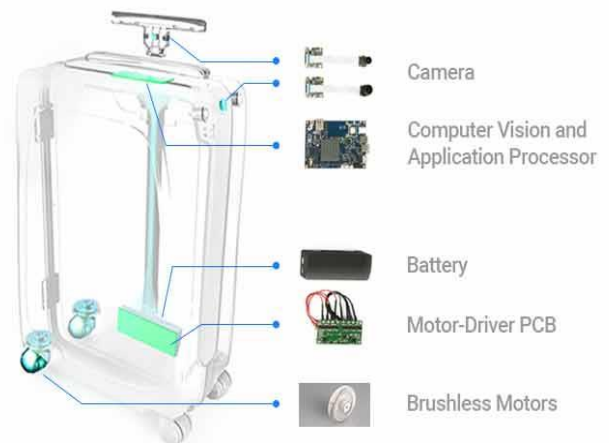
[2]Smart theft is a serious problem to the society. One of the solutions of the problem is the development of smart hand bag system using Radio frequency signal and location tracker as the main component. This project is implemented using an arduino microcontroller, RF transmitter and receiver module, SIM900 global system for mobile communications and global positioning system module and 9dB buzzer. This smart hand bag produces a loud sound to attract people surrounding whenever a snatch crime happens. The system is also able to track the location of the hand bag by using GPS. The location tracked by the GPS module will be send to the victim by using short messaging service. The transmitter unit will control the siren from a distance using RF signal. The user will bring along the transmitter unit as a key chain or to be put in the user's pocket.

[3]This study involves a circuit which is made in order to prevent traffic accidents caused by tiredness of the driver and

sleepiness. Infrared light emitting diode and infrared photo transmitter are used to track driver's body values during vehicle driving. The pulse value which can be increase or decrease directly proportional to the heart rate can be controlled with the help of infrared light emitting diode and infrared photo transistor. The blood pressure was transformed to an electronic signal with infrared receiver and infrared transmitter by checking the heart beats. The pulse rate of the driver is continuously measured, and these values are shown on a small display permanently. It is installed on a portable steering wheel which can be used in automotive industry. The process of waking the driver up can be made by raising the voice of music and with the vibration of the seat

IV. METHODOLOGY

The system consists of a microcontroller, radio frequency sensors, ultrasound sensors, alarm and DC motors. Power supply for all these devices are provided by using a 12V-7Ah rechargeable dry cell battery. The suitcase has multiple ultrasonic receiving sensors which tracks the signals transmitted from the transmitter. The transmitter produces 40 kHz ultrasonic signal that can be received by the receiving system. There are two circuits one is for the transmitting signal and the other circuit is used for receiving signal. The microcontroller receives the signal from the receiver sensors and the microcontroller calculates the distance and direction from the target to be followed.



V. BLOCK DIAGRAM AND WORKING

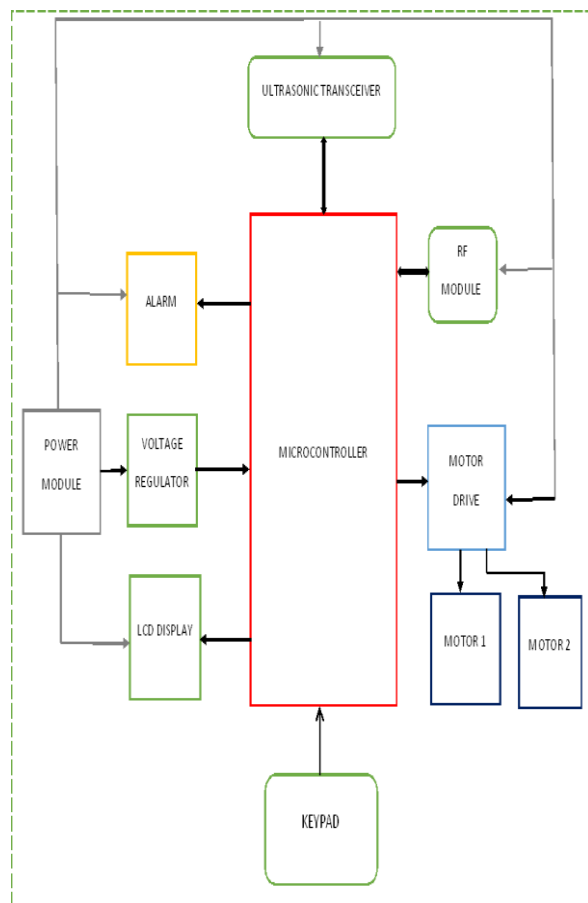


Fig1. Block diagram of suitcase circuit

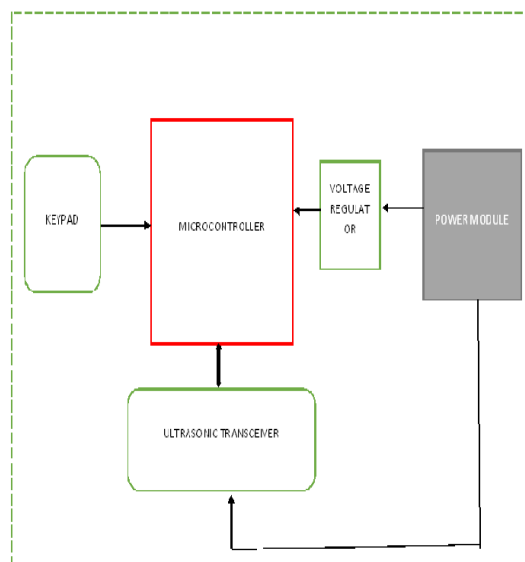


Fig.2. Block Diagram of user handheld circuit

A. Target Detection

The ultrasonic sensor module is the key element in target detection. The ultrasonic module consisting of a transmitter and receiver sections will detect the target. The robot will move forward, right or left in accordance with the detected human target. The basic principle behind the operation is that the ultrasonic transmitters emitted an ultrasonic wave in one direction, and start the timing when it is launched.

Ultrasonic is spread in the air, and would return immediately when it encounters obstacles on the way. At last, the ultrasonic receiver would stop timing when it received. . There are two main parts in the sensor, a transmitter to transmit the sound waves and receiver to receive the echo. Transmitter converts electrical energy into sound energy and receiver part receives the echo and turn the received sound waves into electrical energy. Ultrasonic sensors measure the distance to the target from transmitter by measuring the time between the emission and reception. As Ultrasonic spread velocity is 340m/s in the air, based on the timer record t , we can calculate the distance (s) between the obstacle and transmitter, namely: $s = 340t / 2$.

B. Obstacle Detection

The obstacle detection is done in the system by providing an infrared eye on it. The infrared eye is the IR transceiver circuit through which the robot detects the obstacles and controls itself either by changing direction for stationary obstacles or by stopping itself, waiting for the obstacle to move away. The basic optoelectronic components required are the LED at the transmitter and the photo detector at the receiver. The sensitivity of the photo detector is a function of the wavelength of the incident light. To maximize efficiency, the LED should be chosen so that its peak emission wavelength lies near the peak sensitivity of the photodiode. The suitcase follows the target with a 30cm distance and if anyone tries to theft our luggage the alarm fixed in it starts to alarm when the target and suitcase distance exceeds 1m. So that the speciality is our luggage is safe and secure.

The control circuitry can be made around a microcontroller that can handle ultrasonic sensors, RF sensors, motors at the same time. Usually an 8 bit controller will be sufficient for the purpose. The control circuitry includes robot section and the hand held module each requires separate controllers. A keypad is provided for the user to input information and required messages are shown on the LCD module. The robot moves on motors that are interfaced to the microcontroller through motor shield. The target detection component which is an ultrasonic sensor will provide necessary control signals for driving the motor. Obstacle detection can be done through

the RF module system. The power module has the ability to recharge the battery and also produce output of 5V and 12V, since the microcontroller ,lcd display ,HC SR04and alarm circuit works at 5V and DC motors work at 12V.

VI. IMPLEMENTATION

The circuit diagram is designed and the main components used in our project is described as follows

Arduino UNO-2,HC- SRO4-3,DC Geared motor-2,LN2938-1, Motorshield-1,Buzzer-1,Alarm Circuit-1,4*4 Keypad-2,16*2LCD Display-1,Suitcase-1, Freewheeling wheel-1, Chasis-1

MICROCONTROLLER

The microcontroller used here is ArduinoUNO which is similar to Atmega328. The ArduinoUNO has 14 digital input and output pin. The UNO can be powered using a USB connection with an external power supply. The operating voltage of UNO is 5v. The Arduino has 6 analoginput, a16MHzceramic resonator, USB connection, a power jack, an ICSP header and reset button, the pin 3,4,5,6,9,10 and 11 provided 8 bit PWM output



ULTRASONIC SENSOR

The sensor used in this project is HC- SR04 ultra sonic sensor. It uses Sonar for measuring the distance. It provides accurate measurements. The operating voltage of this ultrasonic sensor is 5v.



RELAY

These are switches used for controlling both the AC and DC appliances. Relay are used when we want to control high current AC/DC using sensor output or in the driver circuit. Here we are using a 5v Or 6v sugar cube relay



LIQUID CRYSTAL DISPLAY (LCD)

LCD is used in this project because it consumes only less power than the light emitting diode and glass display. The LCD can be either passive matrix or active matrix .at each pixel intersection of the active matrix a transistor is located and it is also known as thin film transistor display. The active matrix has an improved screen refreshing time. They align into block when the electric charge is applied and light enter through them.



MOTOR DRIVE

Motor drive act as interface between the microcontroller and motor of robot. The commonly used IC is L293D. It is a 16 pin IC

VII. RESULT DISCUSSION

The proposed idea was implemented and the final result was taken in which the suitcase is following the target that is the human by the output measured from the ultrasonic sensor which measure the distance between the suitcase and the target.

The measured distance was displayed in the lcd screen and the lcd display of user displays the real-time status of the model the ultrasonic sends the signal at 43.2 mhz and it is identified by another device at user hand and when it is crossing 40cm the microcontroller sends signal to motor shield and the motor runs behind the target.

VIII. CONCLUSIONS

Smart bag is an innovative carry on suitcase that makes life easier and smoother. Carrying luggage is the main difficulty faced by each and every passenger. Here we try to solve the dragging of luggage difficulty and also providing better security and intelligent features that suitable for modern era. In this project we developed a new low cost human following technology to assist low cost consumer product implementation, so that the overall production cost of a automatic user following bag will be less

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