

# Autonomous Stroller using Arduino

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**ABSTRACT:** In this article, we described to build a robotic stroller which is able to track and follow the target in unstructured environments. In today's world, Robotic industry is evolved so much and is used to perform certain task. The robotics applications are more involved in industrial applications. Generally, robotics is used in manufacturing products where the required production rate is very high. Nowadays, robotics is also used for day to day applications and the use of robotics is increasing rapidly. This paper is our attempt in reducing the human efforts in domestic and industrial applications. A person following robot is desired in many applications. A follower robot can be more helpful in medical and military purpose where every human effort is precious and can cost us to a great extent. A stroller robot is implemented using various sensors like ultrasonic sensors, cameras. Here, we introduce a new approach towards a stroller robot. More specifically, our approach is to design a control system which can carry luggage as well as follow the target person. In this paper, stroller robotic cart is proposed by interfacing the microcontroller with ultrasonic sensor. Ultrasonic sensors are used to identify and follow the target person. The system is designed to provide a contactless transport along with the target person. The cart is equipped with ultrasonic sensors at the front and baggage on the top. The distance between the person and the robot is measured and the movement of the robot is decided by the inputs given to microcontroller by ultrasonic sensor.

**KEYWORDS:** Ultrasonic, Embedded, Distance Measure, Smart Stroller.

## I. INTRODUCTION

In today's era, robots play a very important role. Robots are used to perform various task which are dangerous for human beings in certain cases. Robot assistance is proved to be always helpful for us. A robot that can carry our stuff and accompany us in shopping malls, home, golf courses. There are many advantages of having such kind of robots[1]. It can also be used in civil and industrial applications. It is desired in many applications that the robot be able to track and follow the person. The robot should be able to track the movements of the person and follow him. This type of robot is implemented using sensors, cameras. The method of following the target person involves constant analysis of distance between the target person and the robot. These systems have many drawbacks as the stroller robot implemented using cameras involves a problem in background/foreground separation. This results in slow operation of the robot and the systems are slow in analyzing complex situations and the sensors detect the path and follow it. Line follower robot requires a predefined path and thus it cannot be used in day to day life and these systems are unable to avoid the obstacles. To overcome this problem, we decided to implement the system using ultrasonic sensor. Ultrasonic sensors are fast and are widely used for distance measurement applications. Data received from ultrasonic sensor is processed by microcontroller and thus the movement of the cart is decided.

## II. MATERIALS AND METHODS

The designed system operation is simple as compared to the other systems available in the market. The design of the system is feasible to use. The ultrasonic sensors lock the target as soon as the system is turned on. The Sensors measures the distance between the user and cart. It maintains adequate distance as specified by the designer. The distance specified in our project is 20cm. As the system is a miniature model of the cart, the

assigned parameters are less. The values vary as the capacity and size of the cart changes. The basic hardware of the system is same for all sizes and capacity.

There is need to change the motors and body of the cart as per of typical stroller, robotic cart is as shown in the figure above the requirement of the area where it is used. The basic system there is needed to change the motors and body of the cart as per the requirement of the area where it is used. The basic system of typical stroller robotic cart is as shown in the figure above

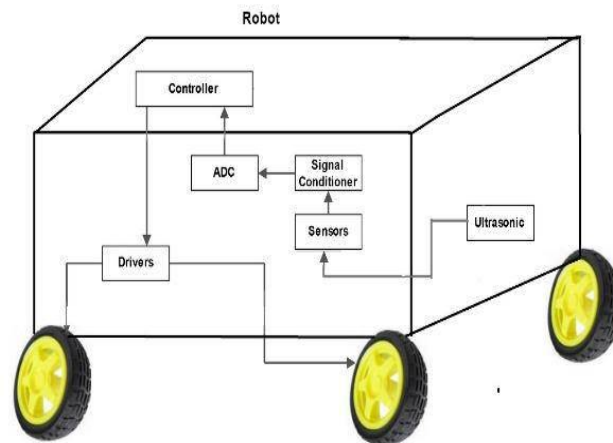


Figure.1. Basic system design

### A. Block Diagram Overview

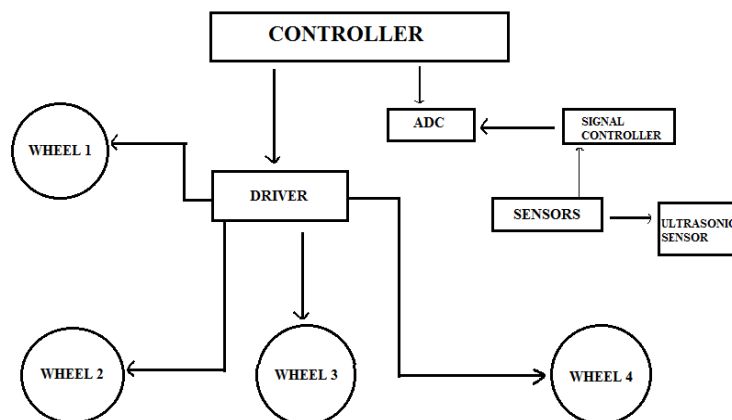
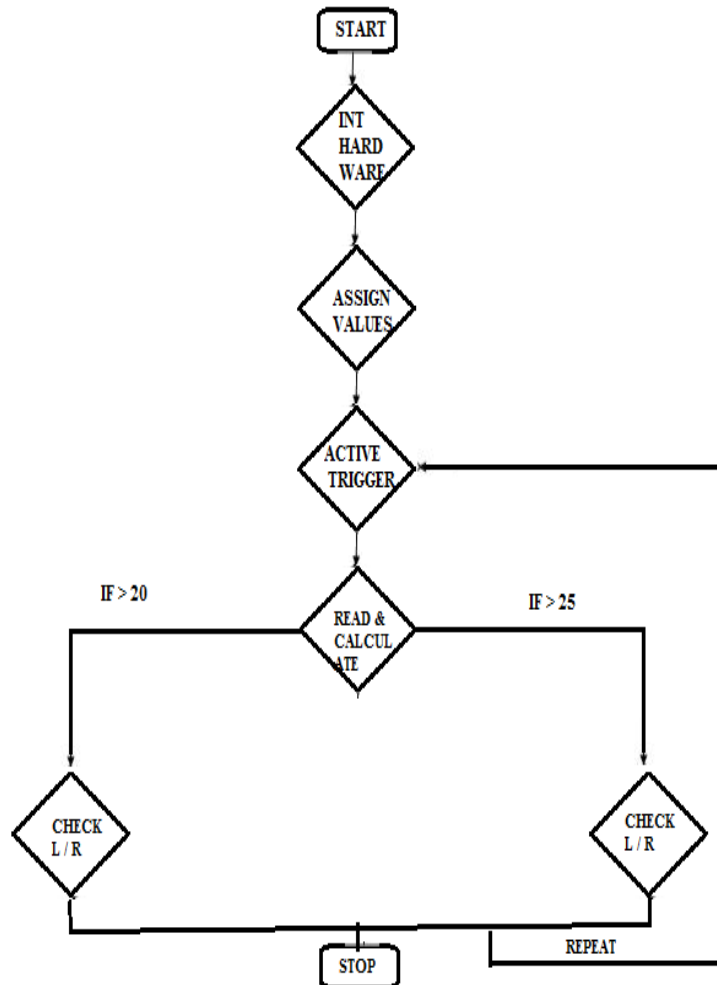


Figure.2: Block Diagram of Follower Robotic Cart Using Ultrasonic Sensor

The aim of our project is to implement the design model of the system for person tracking and following using ultrasonic sensor. The ultrasonic sensors are low voltage and current devices. Ultrasonic sensors do not require a transmitter and receiver for transmission and reception of the signal. As the ultrasonic sensor works on the principle of reflection. The ultrasonic sensors are placed at the front of the cart. Three ultrasonic sensors are used in this system. One sensor is placed in the middle whereas 1 -1 sensor are placed at the right at left side of the cart. The ultrasonic sensors are connected to the ADC. The ADC converts the data into digital form and gives it to microcontroller. Microcontroller compares the data from the 3 sensors and decides the movement of the cart. The smallest value obtained after comparisons from the outputs of the ultrasonic sensor is considered. If the value of sensor 1 is minimum then the cart will move in the forward direction. If the value from sensor 2 is minimum it will turn into right direction[3]. Similarly, the movement of the cart in the left direction is calculated. The distance of the cart and the user is maintained. This system is more feasible to use as it is fast and more accurate than any other system. The wheels of the cart are connected to the motor drivers. The motor drivers are controlled by the microcontroller.

## **B. SENSOR PLATFORM**

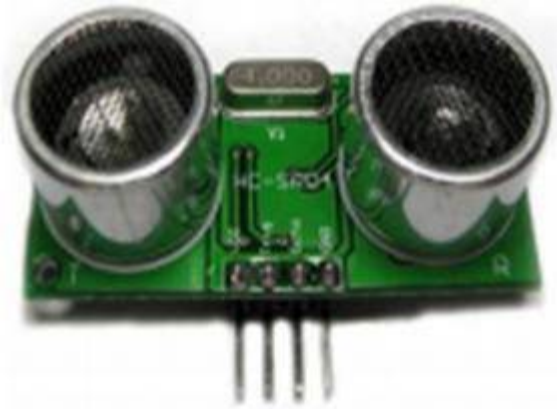
The Flowchart of the overall system operation is as given above. As soon as the system starts, initialize the hardware. Initialization is a process of assigning the variables to the registers and ports. After initialization assign echo and trigger pins for ultrasonic sensor. Activate the trigger for at least 20 milliseconds for all three sensors[4]. Read Echo pin using timer and increment the counter value. Calculate or convert the obtained value in centimeter. If value is greater than 20 centimeters then move buggy forward. If the value is not greater than 20 centimeters then stop and check for left sensor and right sensor. Now, if the left sensor value is greater than 25 centimeters then move buggy left or else if right sensor value is greater than 25 centimeters move buggy in right direction. If none of this condition satisfies then stop or hold the position of the buggy. This cycle is repeated in a loop for complete operation of follower robotic cart using ultrasonic sensor. The loop mentioned above will not stop unless and until the user turns off the switch of the cart.



**Figure. 3. Flowchart representing system operation**

Arduino software is used for programming the microcontroller. The code is generated on the software and dumped into the microcontroller by serial communication. For serial communication MAX232 is used. The port is controlled by an IC. The IC dumps the code into the microcontroller. The registers and ports are assigned to the microcontroller.

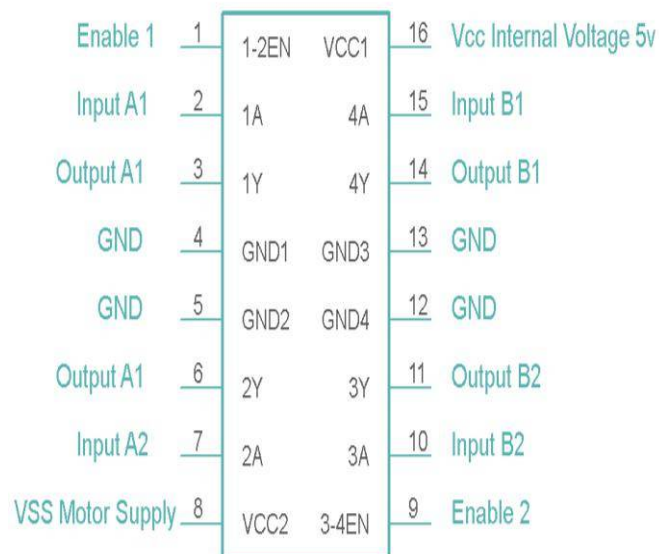
**C. ULTRASONIC S SENSOR**



**Figure. 4. Ultrasonic Sensor (HCSR04)**

HCSR04 is used as ultrasonic ranging module. It has ranging distance of 2cm to 500cm. Its quiescent current is less than 2mA and its operates on 5V DC. Its effective angle is 15 degree. Ultrasonic sensor works on the principle of reflection. A short ultrasonic pulse is transmitted at one time pulse. The sensor receives the signal reflected by the object. The next pulse is not transmitted until the echo of previous pulse fades away. The cycle is less than 50ms. It is mainly used for distance measurement. The resolution of the ultrasonic sensor is 0.3cm

**D. DC Motor Driver**



**Figure. 5. Motor Driver (L293D)**

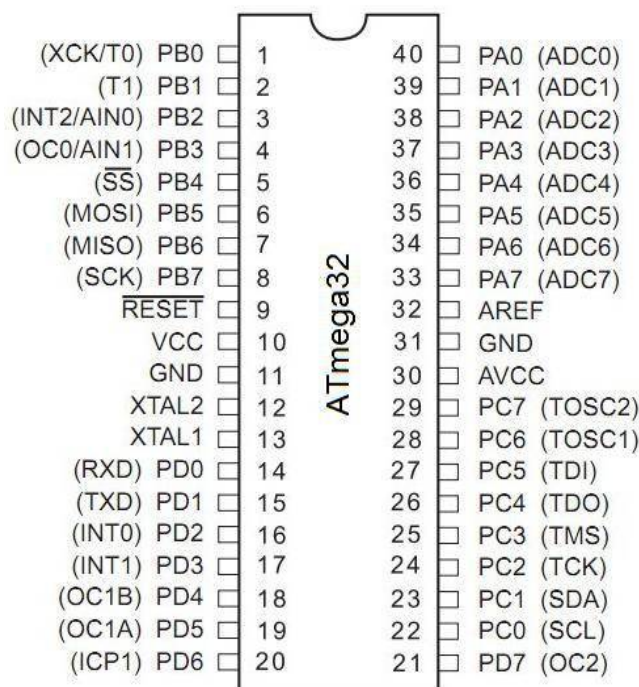
L293D is a motor driver integrated circuit (IC) and it acts as current amplifiers. They accept a low current control signal from the controller and provides higher current signal as output. This higher current signal is used to drive the motors.

A	B	Description
0	0	Motor Stop
0	1	Motor Runs Clockwise
1	0	Motor Runs Anti-Clockwise
1	1	Motor Stop

**Table. 1. L293D Drive Motor Truth Table**

The inputs are given to pin 2,7,10 and 15 whereas the outputs are obtained at 3,6,11 and 14 pins. Two DC motors can be driven simultaneously in forward and reverse direction. The motor operation is controlled by logic inputs. Logic 01 and 10 will rotate the motor in clockwise and anticlockwise directions. The L293D basically drives two DC motors which are responsible for the movement of the cart in forward and reverse direction. The left and right direction movement is achieved by changing the speed of one motor. The cart turns in right direction if left motor speed is greater than right motor. Similarly, the cart turns in left direction if the right motor speed is greater than left motor.

### E. Atmega Microcontroller



Atmega microcontroller is used for interfacing the sensors and the motor drivers as they are power efficient and provides an ideal platform for high performance applications. It is based on advanced Risc architecture[6]. It has 32Kb of In -system Programmable Flash, 1024 bytes of EEPROM, 2Kb of SRAM. ARM controller is high end while the 8051 is outdated. So Atmega microcontroller is preferred for our application. The code complexity of the AVR is simple as compared to the ARM controllers. At mega controllers are mostly used in robotics applications. It has 10 bit ADC which is essential to accept inputs from the sensors. As sensors provide the data in analog form. The data is converted into digital form using ADC. The operating frequency is high and the power consumption is less.

### III. RESULT

The objective of the stroller robot is to track and follow the person which is obtained for which it uses ultrasonic sensors which detects the target as well as measures the distance and sends to the microcontroller which controls the movement of the cart.

### IV. DISSCUSSION

The field of robotics has a great scope in near future. The applications of robotics are increasing day by day. There are several fields where robotic industry is yet to be entered. The follower robot is yet another example of robotics. Robotics industry is helping mankind for its greater good. Follower Robot can be equipped with several more features like interfacing the cart with the user mobile. Thus, both the cart and the user can track each other. The cart can be upgraded with safety and security features as it carries items along with it. Follower cart can be helpful in military applications. As at the time of warfare, it can be used to supply necessary commodities. instrument. It will follow wherever it goes and provide the necessary materials to the doctor and the patient.

### V. CONCLUSION

The major aim of this system was to design and construct a stroller robotic cart using ultrasonic sensor which can track and follow the target person in unstructured environments. The follower robotic cart is achieved using ultrasonic sensor, motor drivers and microcontroller. The system provides a new approach in the field of robotics. This cart would be helpful in reducing work while performing certain task. The stroller robotic cart has better scope in the near future.

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