



DESIGN AND CONTROL SYSTEM FOR THE UNMANNED VEHICLE

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Abstract

Presently a day's transportation of merchandise from a segment to another has turned into a urgent part. The point of the work is to diminish the human exertion in lifting and exchanging the heaps. Since history, man utilized different techniques from creature to present day hardware for transportation of burdens, an endeavour has been made for creating vehicle which is independent to transport merchandise inside a territory (railroads, organizations, enterprises and so on) and diminishes man exertion and builds exactness which isn't so supreme in current strategies because it still needs lots human effort. This calls for a better solution which will reduce the human effort in a large scale. The unmanned vehicle will move from an initial to target location in an obstacle free environment in 2D workspace while taking the shortest route to the destination. Scientific demonstrating for the vehicle has likewise been done with a specific end goal to discover the flow of the vehicle. The last outline and the procedure to achieve the last plan, prototyping, testing and check and approval of the yield will be displayed.

Key words: Transportation, Human effort, unmanned vehicle.

I INTRODUCTION

Innovation is regularly advancing in this day and age. This is apparent from the robotization in relatively every field in given assembling industry, restorative, security powers to transportation. This undertaking is firmly connected with the computerization of transportation industry [1]. It covers the idea of

a driverless vehicle or a self-ruling vehicle. This is essentially a vehicle which doesn't require any physical human push to be utilized as a part of transportation and development of the specific vehicle starting with one area then onto the next. The transportation business has advanced from being mechanically determined autos to physically transmission autos to programmed transmission autos to semi-independent autos to completely self-ruling autos [1, 2].

This auto show works by getting criticisms as contribution from the numerous sensors to have the capacity to work as required. The significant criticism gadget which is utilized comprehensively regarding deciding the area of the auto is the Global Positioning System (GPS). A GPS is likewise helpful in deciding the course to be taken by the vehicle to go from one position to the next. The computerization of the auto business has surprised the world and has overwhelmed the market one of a kind plans and attributes to meet the predetermined requests of clients. This venture is a model of the self-sufficient vehicle where the ULTRASONIC sensors are utilized to go about as criticism gadgets to offer contribution to the controller of the position of the auto. The ULTRASONIC sensors are utilized rather than GPS because of exceptionally poor determination of GPS sensor in INDIA.

The GPS sensor gives high blunder for this little 2D workspace. The two ULTRASONIC sensors mounted on the sides gives the x and y arrange of the auto which will be nourished into the controller to decide the present position of the vehicle. The area to reach is entered utilizing a numeric keypad and the controller utilizing the Lypuanov hypothesis and Runge-Kutta

techniques set up an arrangement of directions which the auto will make a trip through keeping in mind the end goal to achieve its last goal. The vehicle from these sources of info head out starting with one area then onto the next through the assistance of this controller. In this manner, it can be seen that this demonstrating of the self-governingly transportable vehicle is an unmistakable delineation of the real model which will utilize the GPS and Navigation Maps to have the capacity to movement out and about [3]. These independent autos are without mishap as it will have deterrent evasion sensors found surrounding it and will utilize cameras and picture preparing methods to have the capacity to work. This model has numerous applications, for example, in agrarian segments where there are tremendous fields which should be cared for and the course is rehashed therefore making it difficult for people to work so this self-sufficient vehicle will be best appropriate there. This gadget when actualized in reality, this gadget can be useful in the transportation of the handicapped and physically debilitated and the under matured when they have to transport their wiped out guardians to doctor's facility in the event that as crisis happens.

II DESIGN AND ASSEMBLE OF VEHICLE:

The model of the auto like as appeared in Figure 1 has an Arduino Uno microcontroller mounted into it. The vehicle utilizes the ultrasonic sensors to decide the area of the vehicle. After couple of analyses and testing it was chosen not to utilize the GPS on the grounds that the model is little and GPS sensor determination gives heaps of blunders in identifying the area. There are four ultrasonic sensors utilized and these are settled on the four sides of the vehicle which measures the x and y facilitates in the 2D space. A keypad is utilized to enter the objective directions. Lyapunov calculation at that point encourages the way arranging and bolsters constant directions to the Runge– Kutta strategy. The Runge– Kutta technique discretizes the way and sustains the directions to the engines of the vehicle for course and direction.

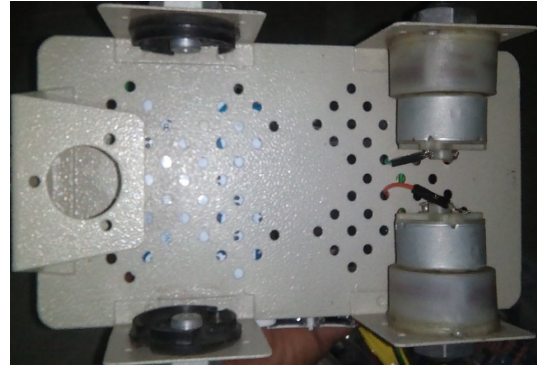


Figure 1, vehicle used for experiments

III VEHICLE MODEL AND CONTROL SYSTEM:

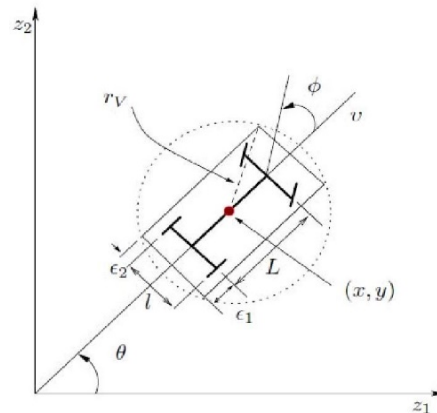


Figure 2, rear wheel power with front wheel steering

To outline a crash free way of our auto like versatile robot, we utilize the Lyapunov based control conspires. The rear wheel driven car-like vehicle model is adopted from [4]. Referring to Fig. 3, (x,y) denotes the center of mass of the car, θ gives the car's orientation with respect to Z1- axis, ϕ gives the steering wheel's angle with respect to car's longitudinal axis. The configuration of the car is given by $(x,y,\theta,\phi) \in \mathbb{R}^4$, and its position is give as the point $(x,y) \in \mathbb{R}^2$. If L is the distance between the two axles and l the length of each axle, then the kinodynamic model of the car-like vehicle which was derived by Sharma in [4,12] is given by

$$X1 = v1 \cos \theta1 - (L1 / 2) \omega1 \sin \theta1$$

$$Y1 = v1 \sin \theta1 + (L1 / 2) \omega1 \cos \theta1$$

IV HARDWARE TESTING AND VALIDATION:

After much push to execute, test and confirm the finding framework, we approved the way of the auto like vehicle by contrasting the PC reenactment comes about with that of the exploratory information from the equipment model. As appeared in Fig. 4 Arduino Uno microcontroller is utilized for interfacing all the information, yields and way arranging. The sources of info are the three ultrasonic sensors for obstruction shirking and area recognition x and y , these are set in the front and on each side of the vehicle. The ultrasonic Sensors (HCSR04) figure the area of the vehicle to bolster to the Lyapunov controller. The yields are the two stepper engines situated at each back wheel with the engine driver circuits for the development of the vehicle. The driver circuits take a low-momentum control motion from Arduino Uno and afterward transform it into a higher flow flag that can drive the engines. It additionally obstructs the back electromotive power (emf) which can harm the microcontroller.

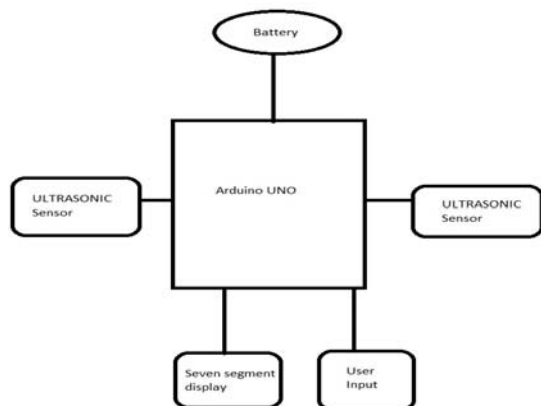


Figure 3, Block Diagram

Once the x and y facilitates are nourished to the microcontroller by the Ultrasonic sensors, the x and y organizes are sustained to the Lyapunov work. The Lyapunov work gives the common differential conditions (ODEs) with a given beginning worth which can't be straightforwardly bolstered to the engine driver for course, subsequently Runge– Kutta (Fourth Order) technique is utilized to computationally unravel the differential conditions ODE's and discover the way of the vehicle until the point when target is come to. This tackled way is the discrete way where the interims of x and y can be controlled as required. Re-underlining the

means, to course the vehicle to target area utilizing the framework:

- Client is asked to and y arranges on keypad enter the area of target. Client enters x .
- Utilizing the Lyapunov work and the RK4 technique the way of the vehicle to its last position is produced.
- While the vehicle moves to its goal, the ultrasonic sensors give as input the present area of the vehicle.
- Once the vehicle will achieve the area of the entered organizes it would stop and show on the SSD the message "R".
- The program at that point sits tight for the following directions to be entered.
- On the off chance that there are any hindrances in the way of the vehicle, the ultrasonic sensor set before the vehicle would distinguish it and stop the vehicle when the obstruction is inside 10cm of closeness.

Keeping in mind the end goal to accomplish the experiment facilitates which were utilized to test the equipment model were additionally utilized for the reenactment in the product. Once the three experiments were additionally kept running on programming and the yield got they were then contrasted against with contrast mimicked results and equipment comes about. In the wake of contrasting the mimicked comes about and the outcomes acquired by equipment comes about one might say that the outcomes which were gotten were like the reproduced comes about with just a slight level of blunder. Because of the way that there would be mistakes while working engines, for example, now and then the engine would miss a stage or even make a stride additional then the coveted turns, this would prompt blunders in the position the vehicle needed to go. Consequently, a few trials were made to adjust the way the engine performed. The Lyapunov work is asymptotic which is it won't touch base at the objective yet come near the objective

CONCLUSION

All in all, the general thought of the unmanned vehicle has been set up, reenacted and the usage of the vehicle in equipment has been finished. Utilizing the Lyapunov hypothesis together with Runge– Kutta technique to discretize the Lyapunov calculation and give out the directions to the vehicle for way and target area. The self-sufficient vehicle effectively found and

achieved the objective in an obstruction free condition while taking the most limited course.

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