AUTONOMOUS ROBOT FOR CAMPUS NAVIGATION USING EMBEDDED SYSTEM FOR GUIDING STRANGERS

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Abstract– In this **article we are dealing with the design and implementation of an autonomous navigation system, which allow the robots to operate autonomously in campus environment for guiding strangers to a specific location. The navigation system consists of four modules input module, obstacle detection, path planning and communication. The input module gets data from the user and process it according to the direction. It consists of an obstacle avoidance using an ultrasonic sensor in addition to, a path planner using the predefined data. The obstacle avoidance modules detects the obstacle in their path and avoid the obstacles on its way and reaches the destination. The module is able to detect the obstacles quickly and accurate to the millimeter. Distance mapping method is used for path planning such that the based on the campus path the algorithm is developed. This design of navigation robot makes the robots to operate autonomously in a known campus environment for guiding the strangers. The robot itself knows its current location. The current location of the robot is display at theentrance.**

Keywords— Robot, obstacle detection, communication using RF Transmitter and Receiver.

I. INTRODUCTION

In this project we are using an autonomous robot which means the robot is driving independently without help of human operators. In our project navigation is the most important requirements. Here navigation done by path planning is done based on distance mapping. A predefined path is already available and the robot moves depending upon the algorithm. Robot is present in the current state and

when the key is pressed that is the destination state to reach, so depending upon the destination state the robot follows the predefined path to reach the destination. For mapping there are various methods for robot navigation like edge detection, line following etc. One of the commercial systems uses wall following method on a floor cleaning robot for long Hall ways but we are using distance and delay as a requirement of mapping. Obstacle avoidance is a basic requirement of any autonomous moving robot. Obstacle Avoidance Robot is designed to allow robot to navigate in unknown environment by avoiding obstacle in their path and resumes its running. Mostly for obstacle avoidance edge detection methods are commonly used. A disadvantage with obstacle avoidance based on edge detecting is the need of making the robot stop running in order to get accurate measurements. All mobile robots have some kind of primitive algorithms that detect an obstacle and stop the robot in order to avoid a collision. The other algorithms are more complex, since they involve detection of an obstacle as well as some kind of quantitative measurements concerning the obstacle's dimensions. Once these algorithm have been determined, then the obstacle avoidance algorithm needs to steer the robot around the obstacle and resume motion toward the original target. In this paper the steering algorithm ensures that the robot does not have to stop in front of an obstacle during its navigation. Hence the robots may overcome some of the problems while navigating, which are discussed above and it can navigate smoothly during its operation avoiding the collisions. We have presented a basic algorithm and design which can be further improved depending upon the required applications. Our robot used for predefined environment for any unknown area we are using another algorithm based on the environment.

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II. PROPOSEDSYSTEM

The project proposes an autonomous robotic vehicle, in which there is no need of using remote for controlling the robot actions. It detects obstacles present on its paththroughthe ultrasonic sensors, avoid it and take decision on the basis of which department it needs toreach.

- BLOCKDIAGRAM
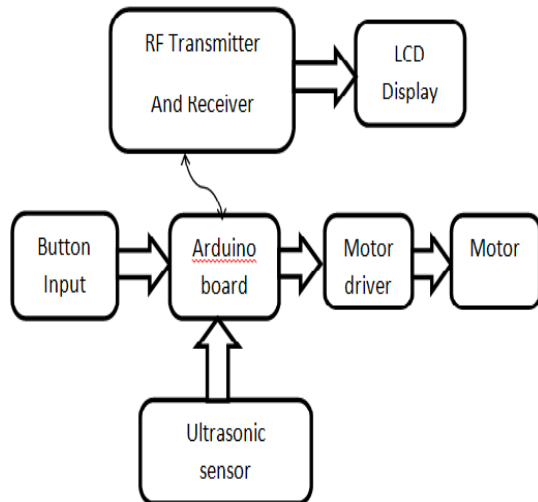
- PUSH-BUTTON

Push buttons are used for giving input depending upon the button pressed the robot moves towards the respective location.

- ULTRASONICSENSORS

This sensor is used to find the obstacles present in the location. It will generate the ultrasonic waves whenever the robot moves near to the obstacle the waves will be reflected back and the ultrasonic receiver will detect it and interrupts the controller depending upon the coding the robot either takes a different direction or halt for some seconds and still the obstacle remains for a long time means buzzer starts ringing. In this we are using HC-SR04 sensor it consists of 4 pins. The 4 pins are echo pin, trigger pin, vcc, gnd. vcc is given direct supply 5v and gnd pin is grounded trigger pin is used for transmitting the signal and echo pin is used for receiving thesignal.

- MOTORDRIVER

For our robot chassis to drive the motor we are using motor driver L293D. It has 7 pins. The 7 pins are 12v,GND

EN1,C1-A,C1-B,C2-A,C2-B.12v pin is directly given supply of 12v,GND pin is directly connected to ground.EN1 is enable pin and it is given 5v supply to enable the motors,C1-A and C1-B are inputs for one motor C2-A and C2-B are inputs for another motor. It has 2 H-Bridge Circuit inside the module which allows two motors to operate independently. H-Bridge is a circuit which allows the voltage to flow in either direction. Voltage need to change its direction for allowing the motor to either rotate in clockwise or anticlockwisedirection.

- MOTOR

In this project we are using DC motor. It converts direct current electric power to mechanical power. Principle of DC motor is based on Fleming's left hand rule.

- RF TRANSMITTER ANDRECEIVER

RF can travel through larger distance and hence it is suitable for long range applications.RF signals can travel even when there is obstruction between transmitter and receiver. RF transmission is more reliable when compared to IR transmission. It operates at frequency of 433MHZ.The transmission occurs at rate of 1kbps-10kbps.RF module is mostly used along with a pair of encoder/decoder. Encoder is used for encoding parallel data for transmission feed while reception is decoded bydecoder.

- LCDDISPLAY

LCD is a flat-panel display that uses light modulating properties liquid crystals. They do not emit light directly, instead they use a backlight or reflector to produce image in color. LCD consumes much less power than LED and gas-display because they work on the principle of blocking light rather than emitting light.

III. FLOW CHART FOR OBSTACLEAVOIDANCE

When robot is moving if any obstacle occurs its way robot analyze the obstacle based on the ultrasonic sensor. If obstacle is present in all the direction the robot halts and if obstacle is present for long time buzzer will start ringing. If obstacle is present in the front and right of the sensor robot takes the left turn and goes towards the destination. If obstacle present in the front and left of the robot sensor robot takes right turn and goes towards destination.

Our robot is placed at entrance default and if the entrance key itself is pressed the robot doesn't move. If some other department key is pressed the robot moves towards the department, on the way if any obstacle is detected in all direction the robot stops for some second still obstacle doesn't move in any direction buzzer starts ringing, if any one direction is free robot takes that direction without deviating it reaches the location.

IV. ALGORITHM FORMAPPING

This table shows the algorithm based on which the robot moves. Current state is the state in which the robot is present. Destination state is the state in which the robot has to move.

Current states

Destination states	ENTRANCE	CIVIL	ECE	EEE	IT	MECH	BIO-TECH
	x	✓	✓	✓	✓	✓	✓
	✓	x	✓	✓	✓	✓	✓
	✓	✓	x	✓	✓	✓	✓
	✓	✓	✓	x	✓	✓	✓
	✓	✓	✓	✓	x	✓	✓
	✓	✓	✓	✓	✓	x	✓
	✓	✓	✓	✓	✓	✓	x

According to this algorithm if current states and destination states are same the robot doesn't move or it is in halt. If current state and destination states are different the robot moves depending upon its current state and destination state. When the key is pressed depending upon the key pressed current state and destination states are checked if they are same then the robot doesn't move if they are different the robot moves from the current state to the destinationstate.

V. CONCLUSION

The main goal of our project is to create an autonomous robot to reduce the inconvenience caused to a stranger when entering the campus. Our robot intelligently detects the obstacles on its way and depending upon it the robot moves and guide the strangers in the campus by helping them find theirway.
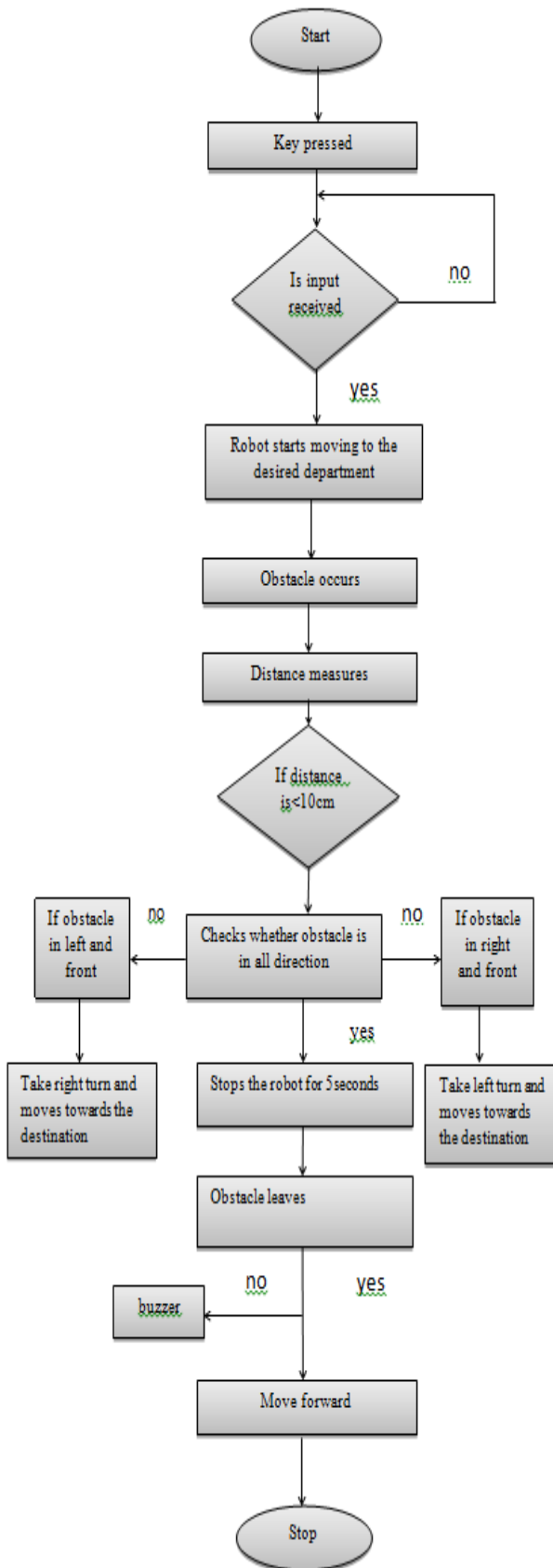
VI. REFERENCES

[1] M. Sarcinelli-Filho, H. A. Schneebeli, E. M. O. Caldeira, C. M.Soria „Optical Flow-based Obstacle Detection and Avoidance in Mobile Robot Navigation". *Mediterranean Conference on Controland Automation – MED 2012*, Lisbon, Potrugal, July 9-12, 2012.

[2]IEEE paper for Obstacle avoidance robot using ultrasonic sensors: *http://www.personal.umich.edu/~ykoren/uploads/Obstacle_avoidance_w_ultrasonic_sensors_IEEE.pdf/*

[3] T. Dunlay, "Obstacle avoidance perception processing for the autonomous land vehicle," in *Proc. IEEE Robotics and Automation Conf.*,vol. 2, 2008, pp. 912–917.

[4] Eiji Hayashi, Keisuke Ikeda, Development of asystem for self-driving by an autonomous robot,Proceeding of 10th international symposium onartificial life and robotics, Vol.10th, pp.4 inCD-ROM, Japan,2010.

[5]Obstacle avoidance robotic vehicle using ultrasonic sensors for obstacle detection :*http://www.elprocus.com/obstacle-avoidancerobotic-vehicle/*

[6]How to make an obstacle avoiding robot: *http://www.instructables.com/id/How-To-Make-anObstacle-Avoiding-Arduino-Robot/*

[6] Tick J, "Business Process-based Initial Modeling at Software Development" In: Szakal A (eds.), IEEE *11th International Symposium on Applied Machine Intelligence and Informatics*,Herlany, Slovakia, IEEE Communications Society, 2013.

[7]NorhashimMohdArshad, Noorfadzli Abdul Razak , "Vision-based Detection Technique For Effective Line-tracking Autonomous Vehicle," in *IEEE 8th International Colloquium on Signal Processing and its Applications*, 2012.

[8] A. Bouguerra, H. Andreasson, A. J. Lilienthal, B. Astrand, T.Rognvaldsson, "An autonomous robotic system for load transportation", in *IEEE Conference on Emerging Technologies & Factory Automation*, Sept 2009, pp. 1-4.

[9] M. Rahman, M. H. R. Rahman, A. L. Haque, and M. T. Islam, "Architecture of the vision system of a line following mobile robotoperating is static environment", in *9th IEEE International MultitopicConference*, 2013, pp. 1-8.

[10] L. Zhang, X. Zhuan, X. Gao, "Design and implementation of a vision based 4-wheeled line track robot", in *2010 WASE InternationalConference on Information Engineering*, 2010, pp. 3-6.

[11] Pakdaman. M.; Sanaatiyan. M.M. (2009), "Design and Implementation of Line Follower Robot," Computer and Electrical Engineering, 2009.ICCEE'09. Second International Conference on , vol.2, no., pp.585-590,28-30 Dec.2009.

[12]PriyankPatil (2010), "AVR Line Following Robot," Department of Infonnation Technology K. 1.SomaiyaCollege of Engineering Mumbai, India.Retrieved Mar 5, 2010.

[13] J. Kramer and M. Scheutz, "Development environments for autonomous mobile robots: A survey," Autonomous Robots, vol.22.

[14]PrashantAgrawal, Krishna, Nand Gupta, 'Line Follower Robot'.

[15] Sz. Sergyán, "Useful and effective feature descriptors in content based Image retrieval of thermal images",*IEEE10th Jubilee International Symposium on Intelligent Systems and Informatics*, SISY 2012, Subotica, 2012,September20-12,PP.55-58.(ISBN:978-1-4673-4749-8)