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RESEARCH ARTICLE

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DESIGN OF SURVEILLANCE ROBOT WITH OBSTACLE SENSING AND MOVEMENT CONTROL USING ARM CONTROLLER

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ABSTRACT

The Proposed system focuses on the design and construction to make a design the robotic as in the base of Surveillance application. At the same all the things are done by human begins manually. The proposed system in case of low power consumption by ARM microcontroller. The proposed system in to two sections which is Robotic section and monitoring section respectively In the robotic section ultrasonic sensor is used for the obstacle detection .So the robotics keep its path for detects obstacles in the Rural region or Urban region. If the obstacle is detected it's deviated from its path. The camera which attached to the robot captures the image and transfer through wireless. So in the Monitoring they watch those things happen in the real terminal unit. In this proposed having the two modes of operation which is mode1 and mode2, in mode1 all time camera will be ON and mode2 is whenever an obstacle sensing that time only the camera will be ON otherwise will be OFF condition. So selected mode of operation based on application.

Index Terms-CCTV camera, ultrasonic sensor, robotic vehicle, relay, ARM controller

INTRODUCTION

Nowadays technologies updated from day to day. At the same time everything changes in to Machine instead of human beings. In this growth of technologies, robotics occupies a specific place in the growth. Robots are used in extreme condition, where man cannot go and do work. Embedded system highly contributes to robotic control. ARM controller is an advanced controller to operate a robot at various operations. Different types of robots are there such as Fixed Sequence Robot, Variable Sequence Robot, Playback Robot, Numerical Control Robot, and Intelligent Robot. Proposed system we are using the intelligent robot of surveillance robot. A Robots can be applied in many applications including exploration and mapping, surveillance and reconnaissance, patrol and monitoring, victim identification in hazardous environments. Wheeled mobile robot (WMR) has been applied to commercial applications for years. As the cost of robots goes down and as robots become more compact the number of military and industrial applications of surveillance robot systems increases. Primary importance in the design of surveillance robot systems is motion planning through obstacles. These are an extension of the potential field's methods which have been previously used for robot path-planning. Robotics is a growing field. This has caused many universities to offer classes and programs in the field of robotics that combine elements of electrical engineering, mechanical engineering and computer science. Additionally, project-based learning is an important part of learning an engineering discipline. For that reason, many of these schools uses educational robots as experimental platforms. These robots are built to perform basic functions such as line following and obstacle avoidance. Students can then program them to perform tasks such as collecting small balls or travelling from one area to another.

2. OVERVIEW OF ROBOTICS

Robotics is an emerging field. Robots are used in extreme condition where humans cannot go and work. Robots in recent days have been used in army for surveillance purpose. In industrial robots are used to work in extreme temperature conditions and work in accurate precision. The main idea of this project is to design a robot than does not require any human assistance at any time for surveillance purpose. For controlling purpose, we are using embedded controller. For surveillance purpose, we propose to use CCTV camera. We use ultra sonic sensor for sensing and avoiding the obstacles. To design a robot for exploring in various land terrain and to sense the obstacle and avoid it. To control the movement of the robot using the ARM controller. To capture/record the activities in its locality and transfer the image in wireless medium to remote server, in this proposed having the two modes of operation which is mode1 and mode2, in mode1 all time camera will be ON and mode2 is whenever an obstacle sensing that time only the camera will be ON otherwise will be OFF condition. So selected mode of operation based on application.

The concepts behind a robot that carries radioactive fuel rods and one that carries red Ping- Pong balls are very similar. Embedded Technology is now in its prime and the wealth of knowledge available is mind blowing. However, most embedded systems engineers have a common complaint. There are no comprehensive resources available over the internet which deals with the various design and implementation issues of this technology. Intellectual property regulations of many corporations are partly to blame for this and also the tendency to keep the technical know-how within a restricted group of researchers.

Mobile robots have been widely applied in many modern applications. The newly developed robots can complete very complicated tasks by improving the adaptive ability of the robot system. This kind of robots is currently an important research topic. The basic feature of mobile robots is to possess the obstacle avoidance capability, which is inherently one of the most difficult tasks in path planning. Obstacle avoidance control can be classified into motion control and dynamic control, according to whether its controller considers dynamic properties of the robot. Many avoidance algorithms were developed by the model of mobile robot kinematics,

while ignoring its dynamic behavior. Meanwhile, utilizing insufficient position control only to deal with dynamic interactions obstacles, a control algorithm has been introduced to describe the dynamic relationship between the mobile robot and moving objects.

Robotics is the science and technology of robot, their design, manufacture, and application robotics require a working knowledge of electronics, mechanics and software, and are usually accompanied by a large working knowledge of many subjects. It robots are to working effectively in homes and other non-industrial environments, the way they are instructed to perform their jobs, and especially how they will be told to stop will be of critical importance.

3. BLOCK DIAGRAM

In this system the rover moves from one location to another in an un-scaled path. While moving, if the rover is obstructed by an object. It halts for a moment and observes the object and then the rover moves again. While, moving it turns the surveillance camera to offline mode to save energy. The movement here is controlled by a single ARM controller. The controller is a low power controller a small power is needed for controlling its operation. The equipment uses an ultrasonic sensor for analyzing its path it analyzes the area for obstacle and stores its distortion the control methodology here is a low power methodology.

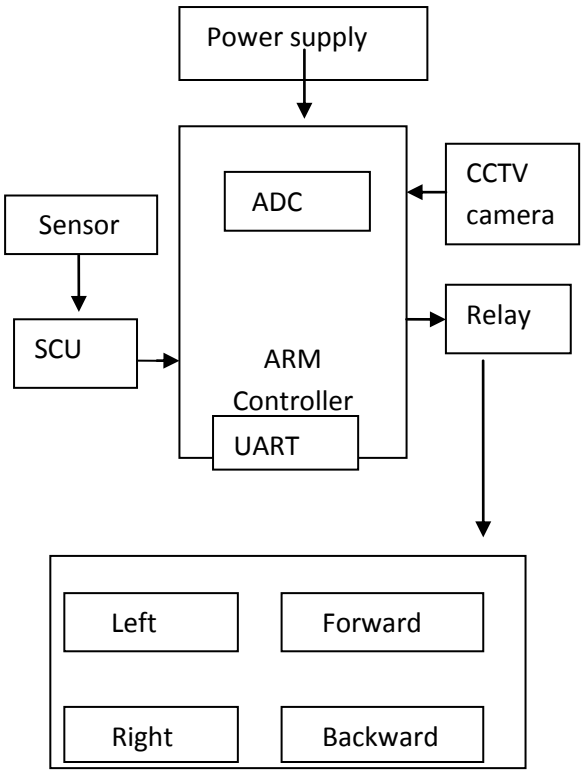

Fig.1.Blockdaigram

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4. MOVEMENT CONTROL

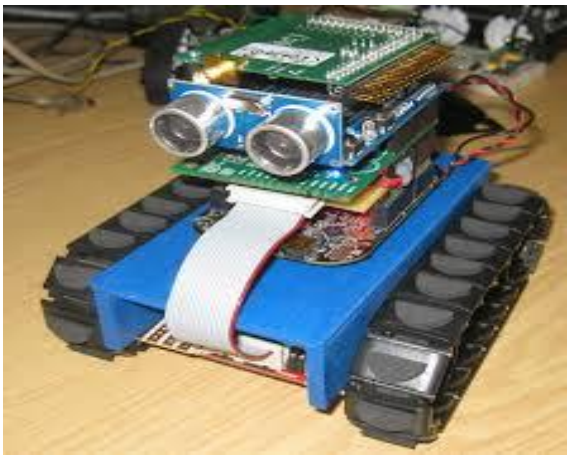

Fig.2. Movement Control System Using Ultrasonic Sensor

The robot is automatically changing the direction of robot vehicles as required whenever any obstacle comes in its way. Here an ultrasonic sensor is used which detects the presence of any obstacle and send the signal to the controller which change the direction of the robot. Ultrasonic sensor works on a principle similar to radar or sonar, ultrasonic sensor generate the high frequency sound wave and evaluate echo which is received back by the sensor.

5. SIMULATION OUTPUT

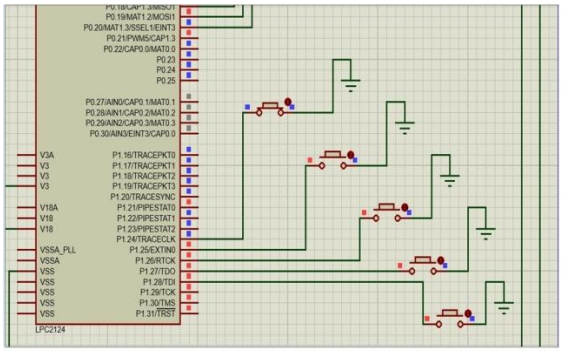

Fig.3.Sensors Output

In Fig.3 showing the output of the sensors, we are considering the each switch as sensors. This five sensor doing five different functions of movement of robot wheels. Robot two wheels are rotated on forward when first sensor is detected, two wheels are rotated backward when second sensor is detected, one wheel are forward another wheel are stopped when third sensor is detected, when the fourth sensor detected the opposite of the last condition , two wheels are stopped when detected the fifth sensor.

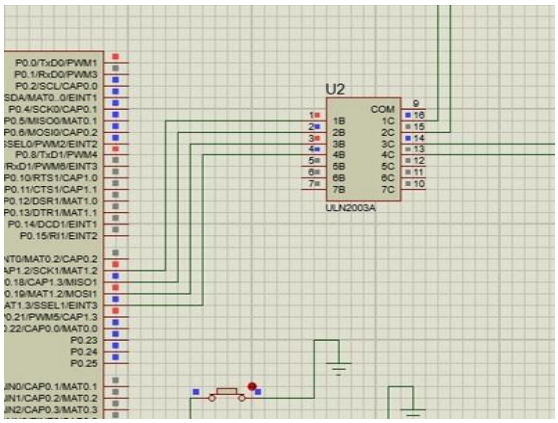

Fig.4. Relay Driver Fig.

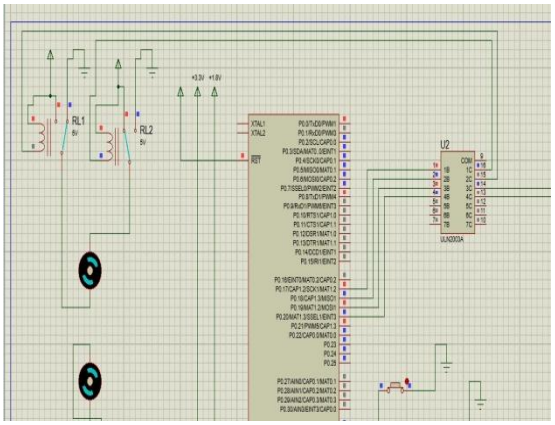

Fig. 5.Relay and Motor Output

In Fig.4 showing the function of relay driver (ULN2003A), whenever sense the sensor, the control signal of 0 and 1 getting from the ARM controller, this control signal get input of relay driver if input of driver 1 means the corresponding pin of output get 0, if input 0 means corresponding output pin disable condition. This output of driver signal connected relay coil. In Fig.5 showing the relay and motor output. Two relay are connected in one motor, this connection is shown in fig.3, whenever make the closed loop in relay together while the motor will be run otherwise the motor will be stopped.

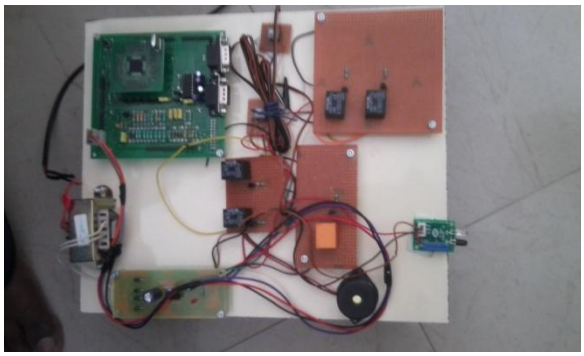

Fig.6. Hardware Implementation

I have implemented the proposed hardware in 50% of the project, this hardware shown in Fig.6.

6. CONCLUSION AND FUTURE SCOPE

Proposed robot not only surveys the land terrain, but also change its driving co ordination according to the land terrain. Driving co ordination is already programmed into ARM processor, CCTV surveys 24/7 and communicates a remote server via the wireless medium, and driving co-ordination is selected to make the robot go in forward, backward according to the ultrasonic sensor input. DC motors drive the robot wheels, we choose a DC motor for this robot because, and DC motor is simple to control in terms of their speed and in direction. Battery with long amp hour is used, the main idea to design this robot is, and the robot should entire think on its own and should not depend on human input for direction or speed or for power supply. The proposed system will be modified such that the surveillance robot will transmit the obstacle data to the remote computer using wireless medium. .In this proposed having the two modes of operation which is mode1 and mode2, in mode1 all time camera will be ON and mode2 is whenever obstacle sensing that time only camera will be ON otherwise will be OFF condition. So selected mode of operation based on application.

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