

Obstacle Avoiding Intelligent Robot

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Abstract: -- Avoidance of Obstacle is one of the most significant aspects of autonomous mobile robots. This task is composed by two phases. First, the robot must detect obstacles in the environment with its sensors. After that , it must select an appropriate movement to go through the environment without colliding. In this work, ultrasonic sensors are adopted to implement a real-time obstacle avoidance system for robots with wheels, so that the robot can constantly detect surroundings, avoid obstacles, and move toward the target area. Secondly, three ultrasonic sensors installed on the wheeled robot were used to detect large sized obstacles and to obtain distance information between the robot and the obstacle.

Index Terms — Wheeled mobile robot, Ultrasonic sensors, Android application, AVR, GSM

I. INTRODUCTION

Robot is nothing but an automatic machine which is guided by computer programmer to move from one place to another using different mechanism and makes human work simpler and effective .Obstacle avoidance is a primary requirement of any autonomous mobile robot. Obstacle avoidance Robot is design to allow robot to navigate in unknown environment by avoiding collisions. Obstacle avoiding robot senses obstacles in the path, avoid it and resumes its running. There are some very famous methods for robot navigation like wall-following, edge detection, line following. The sensor-based system is utilized an unknown or changing environment, to perform real-time obstacle avoidance and real-time path planning functions. The sensing elements that are most commonly found in the literature include ultrasonic sensors and GSM. The ultrasonic sensors are easily obtained and inexpensive, and they are effective in distance measurement, obstacle avoidance, or even on-street parking applications. Ultrasonic sensors have for a long time been major components of devices for detecting obstacles and exploration the unknown environment. It utilized three ultrasonic sensors to capture relative information about of robot and to identify an obstacle.

II. LITERATURE SURVEY

Autonomous ground vehicles and mobile robots have been developed with different configurations and sensing capabilities since approximately the 1970s. One of the earliest wheeled robots was the SHAKEY[1]. The SHAKEY was based on a combination of on-board computers and a radio link to larger computers elsewhere.

SHAKEY's primary sensor was a scanning camera. Around the early 1980's, the CMU Rover represented the state of the art in field of robotic mobility. It also had multiple general purpose processors on-board and had arrangement for connecting to a large remote computer. While the robots described had sensing and planning capabilities, others which lacked elaborate planning capabilities were also simultaneously developed.

Many different sensors and instruments have been used on mobile robots. These include ultrasonic sensors, infrared sensors, vision sensors, tactile sensors, and encoders. Ultrasonic sensors have been one of the simplest and widely used sensors for measuring distance to the nearest obstacle from a mobile robot. Design and development of circuits for distance measurement between a transmitter and receiver ultrasonic transducer have been extensively researched[6]. Approaches to correct various types of errors during distance measurement have also been developed. Use of multiple receivers (along with one transmitter) has also been studied. The exact point attaining minimum distance cannot be easily obtained using an ultrasonic sensor. This, however, is not a severe limitation for many applications in robotics.

Ultrasonic sensors have a range of 3 metres and form the primary sensor on the mobile robot developed as a part of this book. While sensors based on the ultrasonic, pulse-echo technique described in the previous paragraph have been the main stay for collision avoidance systems in mobile robots, other alternatives that are not based on sound have also been examined by researchers[6]. In particular, where it is difficult to provide a medium for propagation of sound waves, light-based sensors have been explored. Some of these sensors are based on time-of-flight and triangulation techniques.

Robot navigation problems can be generally classified as global or local, depending upon the environment

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surrounding the robot. In global navigation system, the environment which surrounds the robot is known and a path which avoids the obstacles is selected. In one example of the global navigation techniques, graphical maps which contain information about the obstacles are used to determine a desirable path. The environment in local navigation surrounding the robot is unknown, or only partially known, and sensors must detect the obstacles and a collision avoidance system must be merged into the robot to avoid the obstacles. The artificial potential field approach is one of the well-known techniques which has been developed for this purpose.[15]

Android is a very familiar word in the world today. Millions of devices are running the Google Android OS and millions are being developed daily. Android development platform has been made by Google open to everyone around the world, so there are millions of developers. Although some developers just focus on building the games or apps for the android devices, there are various prospects as well.[15]

III. SYSTEM HARDWARE DEVICES AND DESIGN

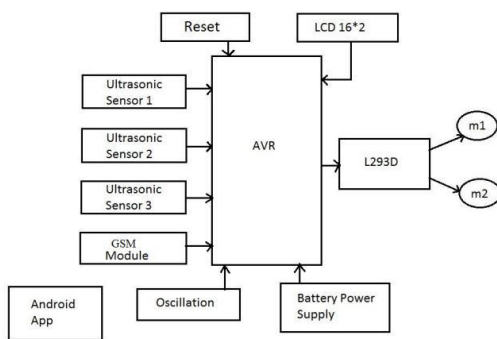


Fig 1 : Block diagram of proposed system
1.AVR

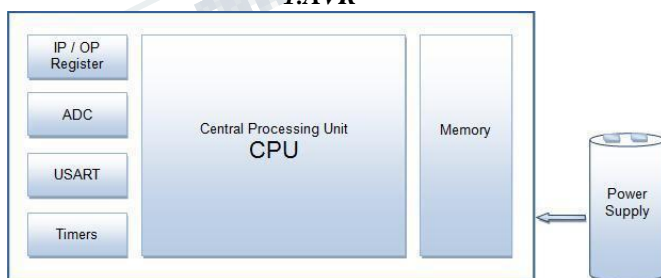


Fig 2 : Architecture of AVR Microcontroller

In our days, there have been various progression in the field of Electronics and many bleeding edge innovations are being produced each day, but at the same time 8 bit microcontrollers have its own particular part in the advanced gadgets advertise overwhelmed by 16-32 and 64 bit computerized gadgets. Albeit effective microcontrollers with higher handling capacities exist in the market, 8bit microcontrollers still hold its esteem due to their straightforward operation, particularly high prevalence, capacity to disentangle an advanced circuit, minimal effort contrasted with components offered, expansion of numerous new elements in a solitary IC and enthusiasm of makers and shoppers.

Modern microcontrollers are entirely different from what it were in the primary stage, and the quantity of producers are a great deal more in tally than it was 10 years or two back. At present a portion of the real producers are Microchip (production: PIC microcontrollers), Atmel (distribution: AVR microcontrollers), Hitachi, Phillips, Maxim, NXP, Intel and so on. Our advantage is upon ATmega32. It has a place with Atmel's AVR arrangement smaller scale controller family.

2.LCD Display:

LCD Display by and large used to show the messages about neighbourhood obstacle. It is a 16X2 characters show. [5]

3. Ultrasonic sensors:

Because of its low cost ,being achieved simply and mature technology ,ultrasonic sensors has been used commonly to avoid obstacle. Robot detects the location of obstacle by ultrasonic distance. Ultrasonic distance uses time difference, that is to say, ultrasonic transmitters launch a wave to some direction. while to count time of the beginning time, ultrasonic propagates in the air ,will return immediately when encounters obstacles, the timekeeper will not work as soon as that the ultrasonic receivers receive the reflected waves. According to the spread of ultrasound in air speed and the timer records the time, we can calculate the distance of obstacles launch dot pitch. As the speed of ultrasound in the air and the air temperature and humidity, in more precise measurement, you can change the temperature and other factors into accounting This mobile robot uses ultrasonic obstacle avoidance system for multiple ultrasonic sensors to avoid obstacles objects detection and location.[14]

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Motor Drivers (L293D IC):

Motor drivers take a low current control signal but provide a higher current signal, thus acting as a current amplifier. The higher current signal drives the motors. L293D is a motor driver that allows direct current (DC) motor to drive on either direction. It contains two inbuilt H-bridge driver circuits [2]. To rotate the motor in clockwise or anticlockwise direction, voltage needs to change its direction.

H-bridge is a circuit that allows voltage to be flown in either direction. Hence H-bridge IC are ideal for driving a DC motor [3]. While operating in its common mode, it can drive two DC motors simultaneously, in forward as well as reverse direction. The motor operations can be controlled by input logic at pins [2, 7] and [10, 15]. Input logic signal 00 or 11 will stop the motor. Logic 01 will rotate it in clockwise direction and 10 in anticlockwise directions

Technologies Used

Android Studio:

Is the official integrated development environment (IDE) for Android platform development. It was announced on May 16, 2013 at the Google I/O conference. Android Studio is freely available under the Apache License 2.0. Android Studio was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0. Based on JetBrains' IntelliJ IDEA software, Android Studio is designed specifically for Android development. It is available for download on Windows, Mac OS X and Linux, and replaced Eclipse Android Development Tools (ADT) as Google's primary IDE for native Android application development.

GSMs

The GSM framework is a recurrence and time division framework in which each physical channel is described by a transporter recurrence and a schedule vacancy number. GSM framework frequencies incorporate two groups at 900MHz and 1800MHz generally alluded to as GSM-900 DCS-1800 frameworks. [8]

GSM Architecture: The GSM specialized particulars characterize the distinctive components inside the GSM arrange design. It characterizes the distinctive components and the courses in which they associate to empower the general system operation to be kept up. The design of GSM is appeared in figure 4. The GSM organize engineering is presently settled and with the other later cell frameworks now

settled and other new ones being sent, the fundamental GSM arrange design has been redesigned to interface to the system components required by these frameworks. In spite of the advancements of the more up to date frameworks, the essential GSM organize design has been kept up, and the components depicted beneath play out an indistinguishable capacities from they did when the first GSM framework was propelled in the mid 1990s.

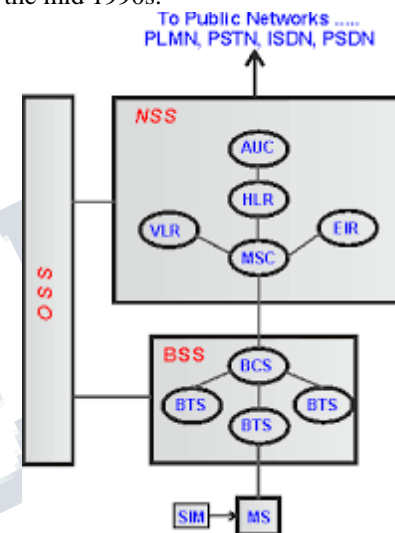


Fig4:GSM Architecture

GSM organize engineering components: The GSM arrange design as characterized in the GSM determinations can be assembled into four fundamental ranges, Mobile station (MS), , Network and Switching Subsystem (NSS), Base-station subsystem (BSS)Operation and Support Subsystem (OSS) Mobile station: Mobile stations (MS), portable gear (ME) or as they are most broadly known, cell or cell phones are the segment of a GSM cell arrange that the client sees and works. As of late their size has fallen drastically while the level of usefulness has enormously expanded. A further preferred standpoint is that the time between charges has essentially expanded. There are various components to the PDA, in spite of the fact that the two principle components are the primary equipment and the SIM. The equipment itself contains the primary components of the cell phone including the show, case, battery, and the gadgets used to create the flag, and process the information recipient and to be transmitted. It likewise contains a number known as the International Mobile Equipment Identity (IMEI). This is introduced in the telephone at make and "can't" be changed. It is gotten to by the system amid

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enlistment to check whether the hardware has been accounted for as stolen.

IV. CONCLUSION

Enormous amount of work has been done on wireless controlling of robots. In this project, various methodologies have been analyzed and reviewed with their merits and demerits under various operational and functional approaches. Hence, it can be inferred that features like user friendly interface, light weight and portability of android OS based smart phone has overtaken the sophistication of technologies such as static cameras, programmable glove etc., making them obsolete. Although recent researches in this area have made wireless controlling a ubiquitous phenomenon, it needs to acquire more attention in relevant areas of applications like table top screens, home appliances, wheelchairs, artificial nurses etc. in a collaborative manner.

