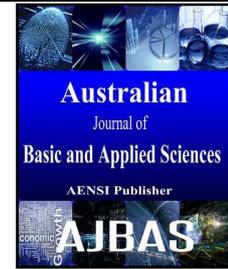




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PLC Based Sensor Operated Obstacle Detection Mobile Robots

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ABSTRACT

In the present day obstacle avoidance robots are designed with microcontrollers, digital cameras, laser scanners, sonar etc., Limited number of shots of scene at a given time and processing enormous amount of data makes obstacle detection quite slow for real time applications. Rapid actions, accurate rapid response, and flexibility in system modifications are present day need of industries. Programmable Logic Controller (PLC) is gaining its presence in industrial applications. In the present work an attempt has been made to develop a sensor operated obstacle detection mobile robot. by the sensors and robot path are controlled and modified accordingly by means of program logic. Use of sensors, and PLCs, provide a greater control over modifications and ease of implementation. Ultrasonic sensors are used to detect the obstacles and are interfaced with the PLC controller. The positions of the obstacles are identified.

INTRODUCTION

Today's mobile robots operate in different environments viz. industries, commercial, military environments. These robots have to interact with humans during decision making process. The working environment is highly unstructured and often unknown. Hence the robots must be able to process a large amount of information, in order to make planning and navigation decisions quickly. In order to autonomously act, mobile robots needs to find its way to the target area where the job is to be carried out. A basic feature of any autonomous navigation system is an obstacle detection and avoidance mechanism. For that purpose the environment has to be perceived using ultrasonic sensors. The obstacle detection task is usually one of many important tasks that these robots must accomplish.

Obstacle detection (Luksch, 2005) is defined as "the determination of whether the given space is free of obstacles for safe travel by a mobile robot." Obstacle detection is one of the most renowned problems within the subfield of industries, obstacle detection is crucial in order to perform many basic operations for mobile robot such as avoidance and navigation. Very sophisticated sensors and processors used to perform obstacle detection so far have been able to accommodate navigation at speeds of only a few meters per second.

II. Programmable Logic Controllers:

A Programmable logic controller is a solid state user programmable control system with functions to control logic, sequencing, timing, arithmetic data manipulation and counting capabilities. (Brooks, Rodney, 1986) It can be viewed as an industrial computer that has a central processing unit, memory, input and output interface and a programming device. The central processing unit provides the intelligence of the controller. It accepts data, status information from various sensing devices like limit switches, proximity switches, executes the user control program store in the memory and gives appropriate output commands to devices like solenoid valves, switches etc.,

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In this project, sensors and PLC system is interfaced with the obstacle detection robot for achieving the automation.

III. Methodology:

The objective of the system is to detect obstacles in order to gradually stop the robot to avoid collision. The path planning and guidance system depends on the function of the robot. While an Automated Vehicle employed in a factory needs simple path and robust guidance (Hartwell, Ian).

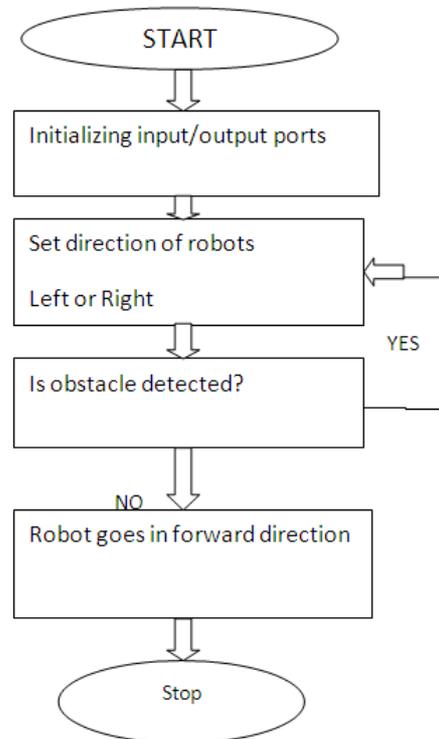


Fig. 1: Flow Diagram.

V. Design Of The Robot:

Design of which, Robot carries and drive a load
 Total load it carries is approximately 6 Kg TO 7 Kg on its plat
 DC Motor of power 0.1 KW =100 watts and 30 rpm is used.
 Torque induced in the robot is 32.8 N-m

VI. Sensors:

A sensor is a device that measures a particular characteristic of an object or system. Some sensors are purely mechanical, but most sensors are electronic, returning a voltage signal that can be converted into a useful engineering unit.

Ultrasonic sensors transmit ultrasonic waves from its sensor head again receive the ultrasonic waves reflected from an object. By measuring the length of time from the transmission to reception of the sonic wave, it detects the position of the object. The three ultrasonic range finders mounted on the vehicle to detect obstacles and provide information to the PLC. The obstacle detection mechanism is managed by a ultrasonic waves to find the presence of a obstacle in its path.

A. Plc Kit And Ladder Diagram:

The Indra control L20 is a modular and scalable control. It combines the benefits of a compact small control with a standardized I/O system on the basis of terminal technology. It has hardware platform that can be used for PLC applications. (Vaughan, R.N., 1998) It provides onboard interfaces, e. g. high-speed inputs and outputs (8 each) and communication interfaces, such as Ethernet, PROFIBUS and RS 232. The locally available I/O units can be extended by the Rexroth Inline I/O system; just by simply mounting the components side by side. (5) Application programs, including runtime, are completely stored to an easily accessible standardized Compact Flash medium. Operating elements and interfaces are arranged on the front.

The eight-digit display with four operator keys, the reset button with light emitting diode, the RS232 interface, and the receptacle for the Compact flash card are provided to the left of the unit. Further interfaces (Ethernet, PROFIBUS DP) are located in the central section of the unit. The terminals for digital inputs and outputs (eight each) and the voltage supply connectors are arranged to the right of the unit.



Fig. 2: Indra control unit L20 (Model).

Conclusion:

In this paper a method of controlling the mobile robot through obstacle detection is discussed. The system is operational and capable to avoid obstacle and enables autonomous functions like collision avoidance and position hold change. By using the PLC the good control of robot is achieved.

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