ABSTRACT

Autonomous robotic systems require advanced obstacle detection and navigation mechanisms to operate efficiently in dynamic environments. Traditional navigation methods using fixed ultrasonic sensors often result in limited detection range and inaccurate path selection. This project proposes an omnidirectional navigation system that integrates an ultrasonic sensor, a servo motor, and an L293D motor driver to optimize robotic movement. The ultrasonic sensor is mounted on a servo motor, allowing it to scan a 180-degree area and improve obstacle detection accuracy. The L293D motor driver controls the movement of the robotic vehicle, ensuring smooth navigation based on real-time sensor data. The system employs a mean-based algorithm to minimize false positives in obstacle detection and optimize pathfinding. This approach significantly improves robotic efficiency, making it suitable for applications such as industrial automation, search-and-rescue operations, and autonomous vehicles.

Keywords – L293D, Ultrasonic Sensor, 16×2 LCD, Servo Motor

CHAPTER – 1

EMBEDDED SYTEMS

* 1. Introduction:

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, “embedded system” is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be load and peripherals to be connected.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system’s memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are

* 1. CHARACTERISTIC OF EMBEDDED SYSTEM
* Speed (bytes/sec): Should be high speed
* Power (watts): Low power dissipation
* Size and weight: As far as possible small in size and low weight
* Accuracy (%error): Must be very accurate
* Adaptability: High adaptability and accessibility
* Reliability: Must be reliable over a long period of time
  1. APPLICATIONS OF EMBEDDED SYSTEM

We are living in the Embedded World. You are surrounded with many embedded products and your daily life largely depends on the proper functioning of these gadgets. Television, Radio, CD player of your living room, Washing Machine or Microwave Oven in your kitchen, Card readers, Access Controllers, Palm devices of your work space enable you to do many of your tasks very effectively. Apart from all these, many controllers embedded in your car take care of car operations between the bumpers and most of the times you tend to ignore all these controllers.

* **Robotics:** industrial robots, machine tools, [Robocop](http://en.wikipedia.org/wiki/Robocup) soccer robots
* **Automotive:** cars, trucks, trains
* **Aviation:** airplanes, helicopters
* [Home and Building Automation](http://en.wikibooks.org/wiki/Embedded_Control_Systems_Design/Home_and_Building_Automation)
* **Aerospace:** rockets, satellites
* **Energy systems:** windmills, nuclear plants
* **Medical systems:** prostheses, revalidation machine.