

Real-Time Obstacle Sensing and Detection using Ultrasonic Sensor

ABSTRACT:

Our project, “Real-Time Obstacle Sensing and Detection using Ultrasonic Sensors,” aims to increase robotic systems' efficiency by detecting obstacles within a preset range. We are using the LPC1768 microcontroller, ultrasonic sensors, LEDs, and a buzzer to accurately detect obstacles within a particular range and inform the user. The distance between the obstacle and the sensor will also be displayed. The system is highly efficient in dynamic environments, making it efficient for various fields such as autonomous vehicles, robotics, parking systems, etc.

INTRODUCTION:

This project aims to implement a system which can be able to sense and detect nearby objects with efficiency. The project uses LPC1768 microcontroller along with other components like LEDs, servo motor and a buzzer.

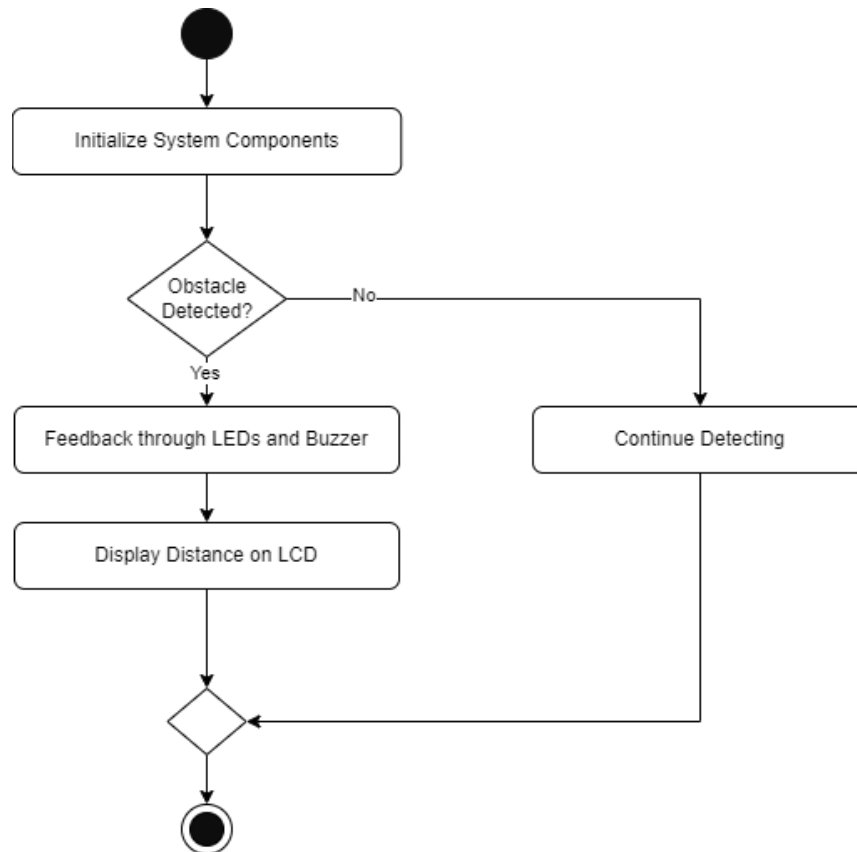
A primary aim of the system proposed is to provide obstacle detection within a defined area. It releases sound waves through the ultrasonic sensor and the returning echoes are used to find obstacles. The main goal of the system being designed is sensing and detection of the obstacle. This is achieved by analysing the information processes from ultrasonic sensors and detecting it with the help of buzzers and LEDs. This enhances the system potential to operate within dynamic areas.

PROJECT DESCRIPTION:

The autonomous navigation and obstacle avoidance system utilizes the LPC1768 microcontroller to process inputs from the ultrasonic sensor. The Ultrasonic sensor is connected strategically to the kit. A threshold value for minimum distance is set. When an obstacle crosses the specific range, the system calculates the distance and sends the information to the microcontroller which triggers an immediate response. The integrated buzzer serves as an alert mechanism, sounding off when the sensor is brought closer to any obstacle, also glowing the LEDs, thus providing a warning that the obstacle is detected. The distance calculated by the system will be displayed in the Liquid Crystal Display available in the LPC1768 microcontroller kit.

This project integrates both hardware and software elements, highlighting the versatility of embedded systems in robotics. On the hardware side, components such as ultrasonic sensors, buzzers, LEDs and LCD are interfaced with the LPC1768 microcontroller to achieve obstacle

detection and movement control. The software is programmed in embedded C using Keil μ Vision, a development environment specifically designed for ARM-based microcontrollers.



EXPECTED OUTPUT:

Certain major outcomes are anticipated from the “Real - Time Obstacle Sensing and Detection using Ultrasonic Sensors” in relation to its capability to detect obstacles in dynamic environments. The system will be capable of identifying obstacles as they come up in real time using ultrasonic sensors. The system will also offer users feedback in real time via LEDs and a buzzer once an obstacle has been encountered.

COMPONENTS REQUIRED:

- **LPC1768 Microcontroller:** The system’s core is the 32-bit ARM Cortex-M3-based LPC1768, which operates at 100Mhz and provides a robust platform with its 32 KB RAM and 512 KB flash memory. It allows faster and accurate processing, making it suitable for real-time obstacle detection.

- **Ultrasonic Sensors:** The HC-SR04 ultrasonic sensor is used for unambiguous distance measurement by emitting sound waves and reflecting signals when they hit an object. This method ensures that the obstacle is detected without collision.
- **Buzzers and LEDs:** The system triggers immediate feedback mechanisms upon obstacle detection, such as a buzzer to alert users and LEDs to provide visual signals.
- **Jumper Wires and Cables:** Used to make the necessary electrical connections between the microcontroller and sensor.

SOFTWARE REQUIREMENTS:

- Keil μ Vision IDE
- FlashMagic

REFERENCES:

[1] [interfacing hcsr04 ultrasonic sensor with lpc1768 - Keil forum - Support forums - Arm Community](#)

[2] LPC1768 reference manual

[3] Obstacle Detection with Ultrasonic Sensors and Signal Analysis Metrics, Transportation Research Procedia [Volume 28](#), 2017, Pages 173-182, Elsevier.

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