Smart Car Crash Detection System

Project Progress Report

Under the Supervision of: Lecturer Priyashantha Thennakoon

Abstract

Car crashes are a major cause of injuries and fatalities worldwide. A rapid emergency response can significantly improve survival outcomes. This project aims to develop a Smart Car Crash Detection System that instantly detects collisions and notifies emergency contacts through a mobile application. Utilizing onboard sensors and wireless communication, the system ensures timely intervention without human input during emergencies.

Objectives

- Detect vehicular crashes using sensor-based data.
- Instantly alert emergency contacts and services with location information.
- Provide visual and audible indicators for system status.

Problem Statement

In many accidents, delayed emergency response due to lack of real-time information leads to preventable loss of life. Existing systems are often expensive and not easily retrofit into existing vehicles. A cost-effective, portable, and intelligent system is needed.

System Overview & Specifications

The system uses an ESP32-S3-WROOM microcontroller as the core. An MPU6050 sensor detects sudden acceleration changes to identify crashes. LED indicators communicate device status:

- Blue (blinking): Awaiting Bluetooth connection.
- Green: Connected to mobile app.
- White (blinking): Hardware fault detected.
- Yellow (blinking for 5s): Crash detected; cancel via push button.
- Red: Crash confirmed.

A piezo buzzer sounds an alarm upon crash detection. The connected mobile app uses its GPS to send crash location to Firebase, which then distributes alerts to

emergency contacts.

Implementation Plan

- Design and testing of schematic and perfboard prototype ✅
- PCB finalized and ordered ✅
- Crash detection algorithm implemented ✅
- Mobile app integration with Bluetooth and Firebase ✅

Expected Outcomes

- A reliable, low-cost crash detection device.
- A mobile app capable of alerting contacts with location data.
- Improved emergency response time for road accidents.

Hardware Progress & Testing

Currently, real-world testing of the system is underway, involving simulated crash scenarios to fine-tune the crash detection logic and ensure reliable alerts.

Supervisor

Lecturer Priyashantha Thennakoon

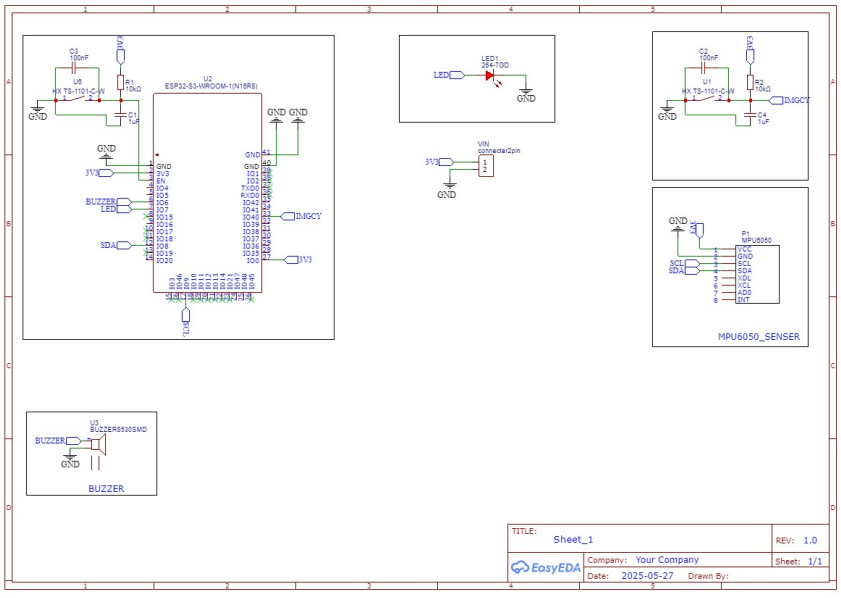

Figure 1: Schematic Circuit Design

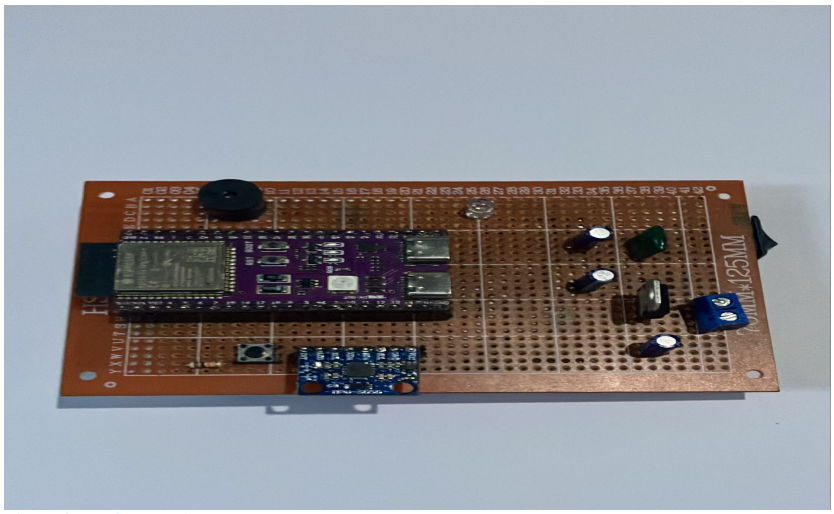

Figure 2: Pref-board Assembled Prototype

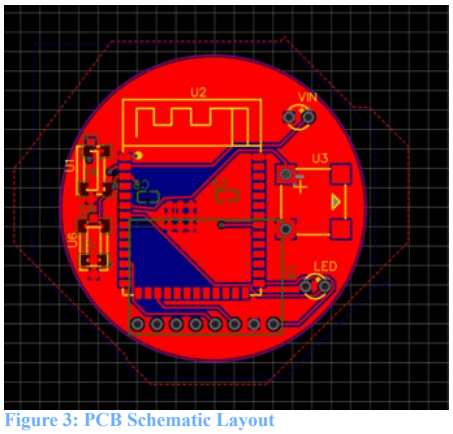

Figure 3: PCB Schematic Layout

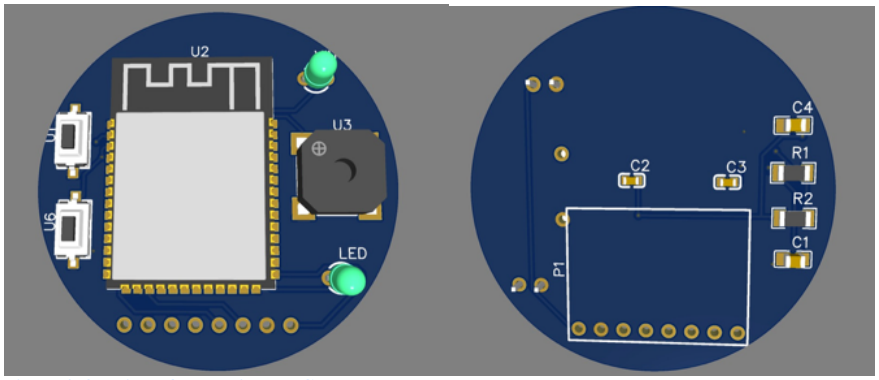

Figure 4: 3D View of the Designed PCB