Fall Detection with Airbag System: A Revolution in Safety

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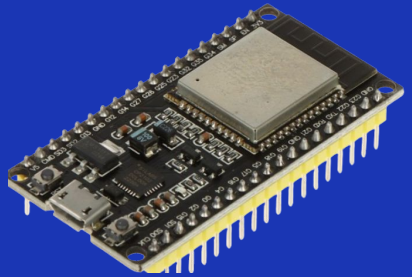
Introduction

This project aims to recognize falls in elderly people using an MPU6050 accelerometer and gyroscope sensor. This is attached to a portable vest. Once a fall is recognized, the ESP32 microcontroller sends a warning message to the telegram, and the airbag will bloom to prevent injuries.

Key Features :



1.Fall Detection:
The MPU6050 accelerometer & gyroscope continuously monitors movement and detects sudden free falls.
The ESP32 microcontroller processes this data using a predefined threshold.

2.Triggering the Airbag System:
When a fall is detected, the ESP32 sends a signal to activate the airbag inflation system.
A servo motor or solenoid valve releases KI into the H_2O_2 chamber.

3.Rapid Airbag Inflation via Chemical Reaction:
Potassium iodide (KI) catalyzes the decomposition of hydrogen peroxide (H_2O_2), producing oxygen gas:
$2H2O2 \rightarrow 2H2O + O2$ (Gas)2H 2O 2 →2H 2O+O 2(Gas)
The generated oxygen gas inflates the airbag within seconds, cushioning the fall.

4.User Notification:
The ESP32 sends an alert to a Telegram bot to notify caregivers about the fall.
It shares fall status and location data via WiFi.

Hardware Components:

1.ESP32: The brain of the system, handling data processing and communication.

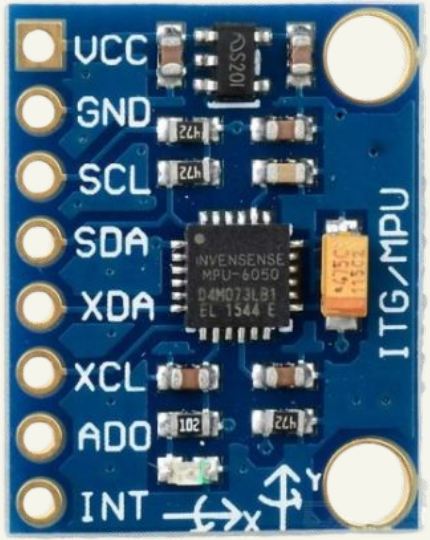
2.MPU6050: Accelerometer and gyroscope sensor to detect sudden free falls.

3.Servo Motor/Solenoid Valve: Releases KI into the H_2O_2 solution to trigger inflation.

4.Battery-Powered Vest: Houses the electronics and airbag system.

5.Hydrogen Peroxide (H_2O_2) + Potassium Iodide (KI): Reactants for oxygen gas generation.

6.Airbag Pouch: Made from lightweight, durable material for protection.



Software Components:

1.MPU6050 Reads Acceleration & Angular Velocity – Determines sudden falls.

2.ESP32 Analyzes Sensor Data – Decides if an airbag should be deployed.

3.Relay/Servo Activation – Triggers the release of KI for chemical reaction-based inflation.

4.Telegram Notification – Alerts caregivers with real-time updates.

What we Do !!!

"Our project aims to revolutionize wearable fall protection systems by integrating IoT and chemistry. Instead of conventional CO_2-based inflation, we employ a hydrogen peroxide & potassium iodide reaction, which rapidly generates oxygen gas to inflate airbags upon fall detection. The system is powered by an ESP32 microcontroller that continuously monitors movement via an MPU6050 sensor. If a fall is detected, the ESP32 triggers the airbag system and sends an alert via Telegram. This safe, cost-effective, and eco-friendly approach enhances safety for the elderly and individuals with mobility issues."

Conclusion:

Our Fall Detection & Airbag Deployment System is an innovative blend of IoT, sensor technology, and chemical engineering, designed to provide real-time fall protection for elderly individuals and those at risk of injuries. By integrating an MPU6050 motion sensor with an ESP32, the system accurately detects falls and instantly deploys an airbag using a hydrogen peroxide and potassium iodide reaction.