**Title of the project**

**Synopsis**

**Project -1**

*Submitted in partial fulfillment for the award of degree*

*of*

**Bachelor in Technology**

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**Submitted by:**

Name (Roll No.)

**Submitted to Guide :**

Name with designation

Department of Electronics & Communication Engineering

Chandigarh Engineering College – CGC Landran, Mohali

**Affiliated to PTU, Jalandhar**

Session: 2018-22

**Department of ECE**

**Chandigarh Engineering College-CGCLandran, Mohali**

**SPECIFICATIONS FOR SYNOPSIS**

#### ****1. Hardware Specifications****

| Component | Specification |
| --- | --- |
| **Microcontroller** | Arduino Nano / ESP32 |
| **Motion Sensor** | MPU 6050 (Accelerometer & Gyroscope) |
| **Flex Sensor** | Bend angle detection for posture monitoring |
| **Heart Rate Sensor** | Optical-based heart rate monitoring |
| **GSM Module** | SIM800L for SOS alert messaging |
| **Piezo Buzzer** | 3V–5V audio alert system |
| **Responsive Airbag System** | Automatic deployment upon fall detection |
| **Battery** | 3.7V Li-ion rechargeable battery |
| **Connectivity** | Bluetooth / Wi-Fi (Optional) |

#### ****2. Software Specifications****

| Parameter | Specification |
| --- | --- |
| **Programming Language** | C/C++ (Arduino IDE) |
| **Algorithm** | Threshold-based fall detection |
| **Communication Protocols** | UART, I2C, SPI |
| **Alert Mechanism** | GSM-based SOS messaging |
| **Data Logging** | Future expansion with cloud-based storage |

#### ****3. Mechanical & Design Specifications****

| Parameter | Specification |
| --- | --- |
| **Jacket Type** | Lightweight, wearable fall prevention jacket |
| **Material** | Breathable, shock-absorbent fabric |
| **Weight** | Approx. 1.2kg–1.5kg |
| **Fit & Comfort** | Adjustable straps for customized fit |
| **Impact Resistance** | Reinforced padding for fall protection |
| **Water Resistance** | Water-repellent outer layer |

#### ****4. Power & Charging Specifications****

| Parameter | Specification |
| --- | --- |
| **Battery Type** | Lithium-ion |
| **Charging Method** | USB Type-C / Wireless Charging |
| **Power Consumption** | Low-power optimized circuit |
| **Battery Backup** | Up to 12 hours on a single charge |

 Format for B.Tech Project Synopsis

  1. **Introduction**

Falls are a major cause of injury among elderly individuals and individuals with mobility impairments. The SafeStep Smart Fall Prevention Jacket is designed to provide real-time fall detection and injury prevention using advanced motion sensors, a responsive airbag system, and emergency alert mechanisms. This wearable technology aims to reduce fall-related injuries by integrating a microcontroller-based system with IoT connectivity, ensuring rapid response in case of a fall.

2. **Technology Used:**

Microcontroller: Arduino Nano / ESP32

Sensors: MPU6050 (Accelerometer & Gyroscope), Flex Sensor, Heart Rate Sensor

Communication: GSM Module (SIM800L) for SOS alerts

Protection Mechanism: Responsive airbag system & Piezo buzzer

Power Supply: 3.7V Li-ion rechargeable battery

Software: Arduino IDE, Embedded C programming

**Field of Project:**

This project belongs to the domain of Wearable Assistive Technology, particularly focusing on elderly safety, healthcare, and mobility assistance.

**2. Feasibility Study**

**Need for the Project:**

According to WHO, falls are the second leading cause of accidental injury deaths worldwide.

Senior citizens and individuals with physical disabilities often suffer severe injuries due to falls.

Existing solutions like canes and walkers do not provide automated fall protection.

**Feasibility & Significance:**

Technical Feasibility: The hardware components are commercially available, and the system can be developed with embedded programming.

Economic Feasibility: The prototype is cost-effective, with an estimated production cost of ₹3500–₹5000 per unit.

Operational Feasibility: The jacket is designed to be lightweight, comfortable, and easy to use, ensuring accessibility for elderly users.

**3. Literature Survey**

Several studies have explored fall detection and prevention technologies:

Wearable Fall Detection Systems Using IoT

Research papers highlight the efficiency of MPU6050 sensors for motion analysis.

IoT-based alert systems have been integrated into fall prevention mechanisms.

**Role of Artificial Intelligence in Fall Prediction**

Machine learning models can analyze walking patterns and predict fall risk.

**Comparison of Fall Prevention Technologies**

Studies show that airbag systems reduce impact force by up to 90%, preventing fractures.

**Real-Time SOS Systems for Elderly Care**

GSM-based emergency response mechanisms significantly improve survival rates.

(References will be added in IEEE format)

**4. Proposed Methodology / Planning of Work**

**Flowchart of Working:**

Sensor Activation: MPU6050, Flex Sensor, and Heart Rate Sensor continuously monitor body movement.

**Fall Detection Algorithm:** Detects abnormal motion patterns and sudden falls.

**Airbag Trigger**: If a fall is detected, the airbag inflates within milliseconds.

**Emergency Alert System:** Sends an SOS message via GSM module.

**User Feedback Mechanism:** A buzzer alert informs the wearer.

**Data Logging & Future Enhancements:** AI-based prediction models for fall risk assessment.

**Development Phases:**

Phase Task Duration

1 Component Selection & Hardware Testing 2 Weeks

2 Algorithm Development & Sensor Integration 3 Weeks

3 Prototype Assembly & Testing 4 Weeks

4 Optimization & Final Testing 2 Weeks 2 week

5 Documentation & Report Preparation 1 Week

**5. Bibliography / References**

[1] WHO Report on Fall Injuries, 2023

[2] "IoT-Based Fall Detection Systems: A Review," IEEE Transactions, 2022

[3] "Wearable Technology for Elderly Safety," Journal of Medical Devices, 2021

[4] "Real-Time Motion Analysis Using Accelerometers," Springer, 2020

[5] "GSM-Based Emergency Response Systems," Elsevier, 2019

***Basic format for books:***

1. J. K. Author, “Title of chapter in the book,” in *Title of His Published Book, x*th ed. City / Country of Publisher, Abbrev. of Publisher, year, ch.*x*, sec. *x*, pp. *xxx–xxx.*

*Examples:*

1. G. O. Young, “Synthetic structure of industrial plastics,” in *Plastics,* 2nd ed., vol. 3, J. Peters, Ed. New York: McGraw-Hill,1964, pp.15–64.
2. W. K. Chen, *Linear Networks and Systems.* Belmont, CA:Wadsworth, 1993, pp. 123–135.

***Basic format for reports:***

1. J. K. Author, “Title of report,” Abbrev. Name of Co., City of Co., Abbrev. State, Rep. *xxx*, year.

*Examples:*

1. E. E. Reber, R. L. Michell, and C. J. Carter, “Oxygen absorption in the earth’s atmosphere,” Aerospace Corp., LosAngeles, CA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1988.
2. J. H. Davis and J. R. Cogdell, “Calibration program for the 16-foot antenna,” Elect. Eng. Res. Lab., Univ. Texas, Austin, Tech. Memo. NGL-006-69-3, Nov. 15, 1987.

***Basic format for conference proceedings (published):***

1. J. K. Author, “Title of paper,” in *Abbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), year, pp. *xxxxxx.*

*Example:*

1. D. B. Payne and J. R. Stern, “Wavelength-switched pas- sivelycoupledsingle-mode opticalnetwork,”in *Proc. IOOC-ECOC,*1985,pp.585–590.

***Basic format for theses (M.S.) and dissertations (Ph.D.):***

1. J. K. Author, “Title of thesis,” M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

***Basic format for patents:***

1. J. K. Author, “Title of patent,” U.S. Patent *x xxx xxx*, Abbrev. Month, day, year.

*Example:*

1. G. Brandli and M. Dick, “Alternating current fed power supply,”U. S. Patent 4 084 217,Nov.4,1978.

***Basic format for journals (when available online):***

1. Author. (year, month). Title. *Journal.*[Typeofmedium].*volume (issue),* pages. Available: site/path/file

*Example:*

1. R. J. Vidmar. (1992, Aug.). On the use of atmospheric plasmas as electromagnetic reflectors .*IEEE Trans. Plasma Sci.*[Online].*21(3),*pp. 876–880. Available: <http://www.halcyon.com/pub/journals/21ps03-vidmar>