**INVENTION DISCLOSURE FORM**

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**Note: Please create a separate box in case of more than 4 Inventors**

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| **1. Title**  What do you call the proposed invention? |
| Suite Safe |

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| **2. Brief Description of Proposed invention**  Please describe briefly what you consider to be the proposed invention. |
| 2.1. **Problem**  **a)** State the problem to be solved and how the proposed invention solves it. |
| 1. **Problem** Falls are one of the leading causes of injury, disability, and even fatalities among elderly individuals and workers in high-risk environments. Falls often result in severe physical injuries, such as fractures or head trauma, and can lead to long-term psychological impacts like fear of falling, which reduces mobility and independence. Existing fall detection devices either lack accuracy, leading to false alarms, or fail to provide effective injury prevention, addressing only post-fall assistance rather than mitigating fall impact.   **b) Solution** The proposed **fall safety jacket** is a comprehensive solution that not only detects falls but also prevents injury through its innovative features:   1. **3D Posture Analysis**: The belt utilizes five MPU 9050 sensors strategically positioned to provide accurate and real-time posture tracking. By fusing data from these sensors, the system can differentiate between regular movements and falls across various scenarios. 2. **Flexible Lumbar Sensor**: A flexible sensor at the back monitors the curvature of the spine and contributes to detecting falls caused by improper posture or sudden movements. 3. **Heart Rate Monitoring**: Integrated heart rate sensors analyze abnormal changes in BPM, helping identify falls related to fainting or medical emergencies. 4. **Airbag Deployment System**: When a fall is detected, the belt deploys airbags instantly to cushion the user and prevent serious injuries. 5. **Real-Time Coordination**: The system compiles and processes data from all sensors in real time, ensuring quick and accurate fall detection with minimal false positives.   This invention not only addresses the problem of delayed fall detection but also minimizes the physical harm associated with falls, offering a proactive and life-saving solution for at-risk individuals |
| **b)** Statehow & when the problem statement came in to your mind. |
| The idea for this problem statement emerged while observing the growing number of fall-related injuries, especially among elderly individuals and workers in hazardous environments. Falls often result in severe injuries, loss of mobility, and reduced confidence, impacting both physical and mental health. Existing devices either detect falls inaccurately or provide help only after the fall, leaving a significant gap in proactive injury prevention. This realization, coupled with the need for a more advanced, real-time solution that could not only detect falls accurately but also minimize the risk of injury, led to the conceptualization of this fall safety Jacket. |
| 2.2. **Technical Proposed invention** (Provide the technical system to which the proposed invention applies.) |
| Technical Proposed Invention The **Fall Safety Jacket** is an advanced wearable device designed for real-time fall detection and injury prevention. It applies to a technical system combining multi-sensor data fusion, real-time processing, and injury mitigation mechanisms. The system integrates several key components:  **3D Posture Analysis System**:   * 1. **Five MPU 9050 Sensors**: These sensors are strategically placed across the jacket to continuously monitor the user’s movement, orientation, and posture in three dimensions. They collect data on acceleration, angular velocity, and magnetic orientation, enabling precise posture tracking.   2. **Flexible Lumbar Sensor**: A flexible sensor at the back monitors the curvature of the spine to provide additional data on lumbar orientation and detect abnormal bending, aiding in fall detection.   **Health Monitoring System**:   * 1. **Heart Rate Sensor**: Tracks the user’s heart rate to identify anomalies such as sudden spikes or drops that may indicate fainting or other medical emergencies.   **Airbag Deployment Mechanism**:   * 1. The jacket features lightweight, compact airbags that deploy instantly upon detecting a fall. This protects the user’s head, back, and other critical areas, reducing the risk of severe injuries.   **Data Fusion and Processing Unit**:   * 1. A central microcontroller (e.g., ESP32 or STM32) processes the combined data from all sensors. It uses advanced sensor fusion algorithms (e.g., Kalman or Madgwick filters) to identify posture changes and differentiate between normal movements and falls.   2. The system ensures accurate detection while minimizing false positives   **Communication Module**:   * 1. An optional Bluetooth or Wi-Fi module enables the jacket to send alerts to caregivers, emergency contacts, or monitoring systems when a fall is detected or an abnormal health condition arises.   **Power Supply**   * 1. The jacket is powered by a rechargeable lithium-ion battery, optimized for long-lasting performance. Low-power components are used to extend battery life   **Application Areas**:   * 1. This technical system applies to personal safety devices in healthcare, elderly care, industrial safety, and sports. It is particularly beneficial for elderly individuals, patients with medical conditions, and workers in high-risk environments, ensuring proactive injury prevention and health monitoring. |
| 2.3. **Advantage** (describe what, specifically, makes the proposed invention different from state of the art.)  Avoid general statements that your proposed invention is "better." Please tell us why it is better, or what makes it better ( in terms of features , cost , efficacy etc ). |
| Advantage The **Fall Safety Jacket** offers several specific advantages over the current state of the art in fall detection and injury prevention systems. These advantages are based on the integration of advanced sensor technology, real-time data fusion, and immediate protective measures, making the system significantly more effective and comprehensive than existing solutions. Key differentiators include:  **Comprehensive 3D Posture Monitoring**:   * 1. Unlike many existing fall detection devices, which rely on single-axis or limited sensors, the Fall Safety Jacket utilizes **five MPU 9050 sensors** positioned strategically around the body to monitor posture in **three dimensions**. This allows for highly accurate detection of falls, even in complex or subtle scenarios, such as when a person is falling sideways or in an unusual position.   2. Traditional systems often fail to differentiate between a fall and regular movement, leading to **false positives**. The jacket's **multi-sensor fusion** ensures precise posture analysis and a reduced risk of false alarms.   **Flexible Lumbar Sensor for Enhanced Fall Detection**:   * 1. The addition of a **flexible lumbar sensor** in the jacket, which tracks the curvature and movement of the lower back, provides an extra layer of detection that current fall safety systems lack. This sensor helps monitor **lumbar-specific postures** and abnormalities, such as bending over too quickly, and plays a crucial role in **identifying falls caused by improper posture** or sudden movements.   **Instant Airbag Deployment**:   * 1. Most existing fall detection systems only alert others or activate emergency protocols once a fall has occurred. The Fall Safety Jacket goes beyond this by including an **airbag deployment system** that cushions the user during a fall, significantly reducing the risk of serious injury.   2. The airbags deploy **instantly** upon detecting a fall, unlike traditional systems that only provide emergency alerts, offering a **preventative safety feature** that sets it apart from current solutions.   **Integrated Health Monitoring (Heart Rate Sensor)**:   * 1. The jacket's **heart rate sensor** continuously monitors the user's vital signs to detect sudden **spikes or drops** in BPM, which can indicate fainting or other health emergencies. This integrated approach enhances safety by addressing both **fall detection and medical emergency identification**.   2. This level of integrated health monitoring is not typically seen in current fall detection systems, which are usually focused solely on detecting the physical fall.   **Advanced Data Fusion Algorithms**:   * 1. The Fall Safety Jacket uses sophisticated **data fusion techniques** such as **Kalman or Madgwick filters**, which combine the inputs from the multiple sensors (accelerometer, gyroscope, heart rate, lumbar, etc.) to accurately determine the user's posture and movement. This enables the system to not only detect falls more reliably but also **discern between different fall scenarios**, ensuring that it adapts to varying situations in real time.   **Low Power Consumption and Long Battery Life**:   * 1. The jacket’s **low-power components** and efficient **battery management system** ensure that the device remains operational for extended periods without frequent recharging. This is crucial for wearable systems that are intended for continuous use, especially for elderly or medically vulnerable users.   2. Many existing solutions are bulky and require constant maintenance, while this design focuses on **lightweight** comfort and **energy efficiency**.   **Communication Module for Real-Time Alerts**:   * 1. An optional **Bluetooth or Wi-Fi communication module** allows the jacket to send immediate alerts to **caregivers, emergency responders, or family members** in the event of a fall or medical emergency. This ensures that help can be summoned faster than relying on manual reporting or other passive systems.  Summary of Advantages:  * **Accurate 3D Posture Detection** using five sensors vs. limited movement tracking. * **Flexible lumbar sensor** improves posture and fall analysis. * **Instant airbag deployment** for injury prevention during a fall. * **Integrated health monitoring** with heart rate tracking to identify health emergencies. * **Advanced data fusion algorithms** for precise fall differentiation. * **Long battery life** and **low-power consumption** for continuous use. * **Real-time alerts** via communication modules for faster emergency response. |

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| **3. Inventive Step** |
| 3.1. Where does the ‘Novelty’ of the proposed invention lie? ( Mention the Innovative features of the proposed invention) |
| The **novelty** of the **Fall Safety Jacket** lies in its combination of advanced sensor integration, real-time data fusion, and proactive injury prevention mechanisms, making it a more comprehensive, effective, and reliable solution than existing fall detection devices. The innovative features of the invention include  **Multi-Sensor 3D Posture Monitoring**:  The jacket incorporates **five MPU 9050 sensors**, strategically placed on the body to provide comprehensive **3D posture analysis**. This allows for precise monitoring of movements in all directions (x, y, z), unlike current solutions that typically use fewer sensors or only 2D motion detection. This **multi-dimensional tracking** enables accurate fall detection and posture monitoring, even in complex fall scenarios or abnormal body positions.  **Flexible Lumbar Sensor for Targeted Monitoring**:  The inclusion of a **flexible lumbar sensor** that monitors the curvature and movement of the lower back is a unique feature. This sensor adds an extra layer of detection that focuses on the **lumbar region**, enhancing the system's ability to identify falls or movements that may not be detected by standard body sensors, such as sudden jerks or improper bending. This sensor is pivotal in **detecting falls caused by bad posture** or specific movement patterns.  **Instant Airbag Deployment System**:  The jacket features an **instantaneous airbag deployment system** designed to **cushion the user** during a fall. This is a **novel feature** in wearable safety devices that goes beyond just alerting others or sending notifications. It actively **protects the user by preventing injury** upon fall detection, providing a significant improvement over current systems that focus primarily on detection without any immediate protective mechanism  **Integrated Health Monitoring (Heart Rate Sensor)**:  The **heart rate sensor** embedded in the jacket is an innovative addition to the traditional fall detection system. It continuously monitors the user’s heart rate, enabling the device to detect **abnormal changes in heart rate** that could signal medical emergencies such as fainting or cardiac distress, in addition to falls. This **dual-functionality** (health monitoring + fall detection) sets the jacket apart from existing solutions that only focus on one aspect of the user’s safety  **Advanced Data Fusion Algorithms**:  The jacket employs **advanced data fusion techniques** as **Kalman / Madgwick filters** to combine the data from the various sensors. This enhances the accuracy and reliability of the system by effectively filtering out noise, correcting sensor errors, and improving the overall fall detection precision. Most current fall detection systems lack this level of sophisticated data processing and sensor fusion, leading to a higher risk of false positives or missed falls.  **Customizable Communication Module for Real-Time Alerts**:  The jacket includes an optional **Bluetooth or Wi-Fi communication module**, enabling the system to send **real-time alerts to caregivers, family members, or emergency services** in the event of a fall or health emergency. This feature ensures that help is summoned immediately, which is not commonly found in traditional fall detection systems that do not have an automatic communication feature.  **Long Battery Life with Low-Power Design**:  The Fall Safety Jacket integrates **low-power components**, ensuring extended operational life without frequent recharging. Many current fall safety systems tend to be bulky, with high energy consumption, which limits their effectiveness for continuous wear. This jacket’s energy efficiency and lightweight design make it more practical for long-term use. Summary of Innovative Features: **Multi-sensor 3D posture tracking** using five sensors, providing highly accurate fall detection.  **Flexible lumbar sensor** for advanced posture monitoring and early fall detection.  **Instant airbag deployment** that actively cushions the user during a fall.  **Heart rate monitoring** to detect medical emergencies such as fainting or distress.  **Advanced data fusion algorithms** for superior fall detection and posture analysis.  **Real-time alerts** sent to caregivers or emergency services, ensuring timely assistance.  **Low-power design** that maximizes battery life, making it ideal for continuous wear. |
| 3.2. What is the contribution of the proposed invention in the technology domain? |
| Contribution of the Proposed Invention in the Technology Domain The **Fall Safety Jacket** represents a significant advancement in wearable safety technology, offering a multi-faceted contribution to the fields of **healthcare**, **wearable technology**, and **safety systems**. Its innovations help address key challenges in real-time fall detection, injury prevention, and health monitoring, paving the way for smarter, more effective solutions in these domains. The specific contributions include:  **Enhanced Fall Detection Accuracy**:  By utilizing **five MPU 9050 sensors** for **3D posture monitoring**, the jacket improves the accuracy and reliability of fall detection systems. The ability to monitor posture in three dimensions (x, y, z axes) allows the device to detect falls in a wider range of scenarios, including those where falls occur in unusual angles or postures. This advancement in fall detection technology sets a new standard for wearable devices, addressing the limitations of current systems that rely on fewer or less accurate sensors.  **Advanced Sensor Fusion and Data Processing**:  The jacket integrates **advanced data fusion techniques** as **Kalman or Madgwick filters** to combine sensor data from accelerometers, gyroscopes, heart rate monitors, and lumbar sensors. This ensures **precise fall detection** and differentiates between normal movements and dangerous falls. The use of real-time sensor fusion algorithms represents an innovation in data processing for wearable safety devices, enhancing their performance and reducing false positives, which is a significant issue in current solutions  **Proactive Injury Prevention**:  The **instant airbag deployment** mechanism is a novel contribution to wearable safety devices, offering proactive protection to the user during a fall. While traditional fall detection systems focus on alerting others or sending notifications after the fall occurs, the **Fall Safety Jacket** **actively prevents injury** by cushioning the user during the fall. This system introduces a new level of **preventative safety** that could significantly reduce the severity of injuries, especially in elderly individuals or those with mobility challenges.  **Integrated Health Monitoring in Wearables**:  The inclusion of a **heart rate sensor** for continuous monitoring adds an additional layer of health surveillance. This integration enables the jacket to identify **medical emergencies** such as **fainting** or **cardiac events** that might occur alongside a fall. This is a new approach in wearable safety technology, where **health monitoring and fall detection** are combined, allowing the device to provide a more comprehensive safety solution. It also creates new opportunities for personalized healthcare applications and early intervention.  **Real-Time Communication and Assistance**:  The jacket’s ability to send **real-time alerts** to caregivers, emergency contacts, or medical personnel is an important advancement. It enhances the response time in emergencies by directly notifying relevant parties when a fall or health crisis occurs. This **automated emergency communication** feature is a step forward from traditional systems that either require manual alerts or only passively monitor the wearer without providing active support during emergencies.  **Long-Term Wearability and Power Efficiency**:  The jacket's **low-power design**, which maximizes battery life while maintaining all functionality, contributes to the development of more **energy-efficient** wearable devices. As wearable technologies become more pervasive, optimizing power consumption will be crucial to ensuring that these devices can operate effectively over extended periods without frequent recharging. This contribution helps make wearable safety devices more practical and user-friendly for daily, long-term use.  **Broad Application Scope in Multiple Domains**:  The technology used in the **Fall Safety Jacket** has broad applications beyond personal safety. It can be adapted for use in **elderly care**, **healthcare monitoring**, **sports safety**, and even **industrial safety**. The integration of fall detection, health monitoring, and injury prevention in one device opens the door to new, highly efficient applications in several industries that deal with physical safety and medical emergencies. |
| 3.3. Is there any visible output which can showcase improvements over the existing solutions? |
| Visible Outputs Showing Improvements Over Existing Solutions Yes, there are several visible outputs that demonstrate the improvements and advantages of the **Fall Safety Jacket** over existing solutions in the wearable safety technology domain. These outputs reflect the **advanced capabilities** and **innovative features** of the jacket that set it apart from current fall detection systems and safety devices.  **Real-Time Fall Detection and Airbag Deployment**:  **Visible Output**: In the event of a fall, the jacket’s **airbags instantly deploy**, visibly protecting the wearer from injury. This immediate, proactive response is a **major improvement** over conventional fall detection devices, which typically only alert others after the fall has occurred.  **Improvement**: Existing solutions, such as wearable pendants or wristbands, typically send alerts to emergency contacts but do not provide any physical protection. The **Fall Safety Jacket** offers **active injury prevention**, which is a significant step forward in wearable safety technology.  **Precise Posture Monitoring**:  **Visible Output**: The jacket offers **3D posture analysis** through data compiled from five **MPU 9050 sensors**. These sensors monitor posture across multiple axes, allowing the system to track **subtle body movements** and detect falls that might not be noticeable with traditional 2D sensors.  **Improvement**: Many existing fall detection systems use basic accelerometers or gyroscopes with limited axes (usually two), which often miss falls that occur in non-standard postures (e.g., falls from sitting or bending). The **Fall Safety Jacket’s** ability to track movements in three dimensions allows it to detect a wider range of fall scenarios, improving its overall **accuracy** and **reliability**.  **Health Monitoring Integration (Heart Rate)**:  **Visible Output**: The jacket’s **heart rate sensor** continuously monitors the wearer’s heart rate and can detect abnormalities such as fainting, distress, or sudden changes in heart rate. This information can be sent to emergency contacts in real-time, along with fall data.  **Improvement**: Unlike current fall detection systems, which focus only on the physical act of falling, the **Fall Safety Jacket** provides a **dual-functionality system** that also integrates **health monitoring**. This is crucial in identifying potential medical emergencies before or during a fall, adding another layer of safety and enabling early intervention.  **Flexible Lumbar Sensor for Targeted Fall Detection**:  **Visible Output**: The **lumbar sensor** in the jacket is uniquely designed to monitor the lower back and spinal region for unusual movements, such as bending or tilting that could indicate a potential fall.  **Improvement**: This sensor is a **novel feature** not typically found in current fall detection solutions, which often ignore the significance of movements specific to the lumbar region. This added **targeted detection** improves the overall system’s ability to detect falls or dangerous movements before they escalate, ensuring faster and more accurate responses.  **Real-Time Communication and Alerts**:  **Visible Output**: The **real-time alert system** sends immediate notifications to caregivers, family members, or medical personnel through **Bluetooth or Wi-Fi**. This ensures that the wearer’s fall or health emergency is communicated to the appropriate parties immediately, leading to faster response times.  **Improvement**: Traditional fall detection systems often require manual intervention (e.g., pressing a button) or fail to send real-time alerts in a comprehensive manner. The **Fall Safety Jacket** automatically sends **location-based alerts** without any action from the wearer, increasing the chance of a timely and effective response in case of a fall or medical crisis.  **Battery Life and Power Efficiency**:  **Visible Output**: The **long-lasting battery** ensures continuous operation over extended periods without the need for frequent recharging, making the jacket practical for daily use.  **Improvement**: Many existing wearable safety devices suffer from **short battery life**, requiring frequent recharging, which can disrupt their functionality. The **Fall Safety Jacket’s** **low-power design** improves usability by allowing for **extended wear time**, minimizing the inconvenience for the user.  **Data Visualization for Posture and Fall Patterns**:  **Visible Output**: The jacket can store and visualize the wearer’s **posture and fall data** over time, allowing caregivers or medical professionals to analyze the wearer’s movements and fall patterns. This data can be accessed via a mobile or cloud-based application.  **Improvement**: Unlike conventional fall detection systems that simply notify others of a fall, the **Fall Safety Jacket** provides valuable **data analytics** to identify patterns in the wearer’s movements. This helps with understanding the wearer’s health status and making informed decisions about future care or interventions. |

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| **4. State of the Art**  *Describe the most similar, already known, solutions (prior art) you are aware of.* |
| 4.1. What do you consider to be the closest item of prior art? (This may have a similar function or may be missing an important function which is provided by the proposed invention.) |
| **Medical Guardian Fall Detection Device** This device provides fall detection and emergency alerts but lacks proactive injury prevention and advanced health monitoring features.  [NCOA](https://www.ncoa.org/adviser/medical-alert-systems/best-medical-alert-systems-fall-detection/?utm_source=chatgpt.com)  IMG_256  **Bay Alarm Medical SOS Smartwatch** Offers fall detection and emergency response but does not include airbag deployment or advanced health monitoring.  [forbes.com](https://www.forbes.com/health/medical-alert-systems/best-medical-alert-watches/?utm_source=chatgpt.com)  IMG_257  **Oura Ring** A health-tracking ring that monitors various health metrics but does not offer fall detection or injury prevention features.  [WSJ](https://www.wsj.com/tech/personal-tech/how-a-little-known-finnish-company-became-one-of-the-worlds-hottest-gadget-startups-ec1b3d09?utm_source=chatgpt.com) |
| 4.2. How the similar problem has been addressed in the prior art? Indicate the disadvantages of approaches used. |
| Prior Art Approaches: **Airbag Vests (e.g., S-AIRBAG Intelligent Vest)**: These systems use sensors to detect falls and deploy airbags to protect the hip area.  **Disadvantages**:  **Limited Coverage**: Only protects the hip area, leaving other parts of the body, like the chest and back, unprotected during a fall.  **No Comprehensive Posture Analysis**: These systems generally focus only on detecting falls, without the ability to analyze the posture of the wearer to prevent false detections or optimize the response.  **Apple Watch with Fall Detection**: This wearable uses accelerometers and gyroscopes to detect falls and sends emergency alerts to contacts if a fall is detected.  **Disadvantages**:  **No Injury Prevention**: It lacks airbags or any proactive injury prevention features.  **Limited Body Protection**: It only alerts emergency services and doesn't provide any physical protection for the wearer.  **False Positives**: It may not always accurately distinguish between a fall and other sudden movements, leading to unnecessary alerts.  **Medical Guardian and Bay Alarm Medical Wearables**: These devices provide fall detection and emergency response.  **Disadvantages**:  **Lack of Airbag Protection**: They don’t offer any physical protection like airbags.  **Limited Health Monitoring**: These devices generally focus on fall detection and emergency alerts without integrating additional health sensors like heart rate or posture analysis, which could help in providing a more comprehensive safety system. How the ****Fall Safety Jacket**** Solves These Issues: **Comprehensive Airbag Protection**: Your jacket provides **full coverage for the upper body and hip area**, offering better protection compared to prior solutions that only focus on specific body parts.  **Advanced 3D Posture Analysis**: The jacket uses **multiple sensors** for **3D posture analysis**, improving fall detection accuracy and reducing false alarms by differentiating between regular movements and actual falls.  **Health Monitoring**: Integration of **heart rate sensors** adds a layer of safety by detecting health issues like fainting or cardiac distress, providing a more complete and preventative safety solution compared to current offerings. |
| 4.3. Please provide references to any research articles including articles, brochures, textbooks you may have. |
| **Fall Detection and Protection by Airbag System** This study discusses the development of a wearable airbag system that detects falls using accelerometers and deploys airbags for protection.  [IEEE Xplore](https://ieeexplore.ieee.org/document/10612384?utm_source=chatgpt.com) |
| 4.4. Please share any inspirations or ideas, available online, forming a basis or methodology for this proposed invention. |
| **3D Posture Monitoring Systems**: Research on posture analysis using multiple sensors (such as the **MPU 9050)**  **Apple Watch Fall Detection**: Apple Watch uses accelerometers and gyroscopes to detect falls and send emergency alerts. |

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| **5. Benefits** | | |
| 5.1. What benefit, or advantage might this proposed invention give in the overall product? | | |
| The proposed **Fall Safety Jacket** offers several unique benefits and advantages over existing solutions, enhancing its overall value as a product:  **Comprehensive Body Protection**: Unlike prior art that primarily focuses on protecting specific areas (e.g., hips), the jacket provides **full upper body and hip coverage** with airbags, significantly reducing the risk of serious injuries during falls.  **Accurate Fall Detection**: By using **5 MPU 9050 sensors** for 3D posture analysis and a **flexible sensor at the back**, the system achieves **enhanced accuracy** in differentiating falls from normal movements, minimizing false alarms.  **Health Monitoring Integration**: The inclusion of a **heart rate sensor** allows real-time monitoring of the user's health, detecting conditions such as fainting or cardiac irregularities, and triggering protective measures proactively.  **Dynamic Response to Diverse Scenarios**: The jacket can handle various fall scenarios with its advanced sensor coordination and airbag system, ensuring protection regardless of whether the fall occurs forward, backward, or sideways.  **Ease of Use and Wearability**: Designed as a lightweight and comfortable jacket, it is easy to wear for long periods, making it suitable for the elderly, workers in hazardous environments, and individuals prone to falls.  **Improved Safety Awareness**: The jacket provides **visual or audible alerts** (via integrated systems) to notify users of potential risks, ensuring proactive injury prevention.  **Cost-Effective Solution**: By integrating multiple sensors in a coordinated system and eliminating the need for separate devices for health monitoring and fall detection, the jacket offers a **cost-efficient all-in-one safety solution**.  **Enhanced User Confidence**: Users, especially the elderly or individuals with mobility issues, gain **greater confidence and independence**, knowing they are well-protected in the event of a fall.   * These advantages position the **Fall Safety Jacket** as a **superior, innovative, and practical solution** in the field of fall protection and injury prevention. | | |
| 5.2. What use do you envisage the proposed invention being put to other than the current implementation? | | |
| Features | Prior Art (Mention already existing Patent / Publication detail ) | Proposed Invention |
| Fall Detection Technology  Coverage Area  Health Monitoring | Accelerometers and gyroscopes (e.g., Apple Watch, Hip Airbags).  Hip-only airbags (e.g., Helite Hip'Air).  Limited or absent in prior solutions. | Uses 5 **MPU 9050 sensors** and a **flexible sensor** for **3D posture analysis**.  Full **upper body and hip protection** with airbags.  Integrated **heart rate sensor** for real-time health monitoring. |
| 5.3. What do you see as the market for the proposed invention? | | |
| ****Primary Markets**** **Elderly Population**:  **Target Users**: Individuals aged 65+ who are prone to falls due to age-related mobility issues.  **Market Need**: Fall-related injuries, such as hip fractures, are a leading cause of hospitalization among the elderly.  **Opportunity**: The global aging population is growing rapidly, creating a significant demand for effective fall prevention solutions.  **Market Size**: Estimated at **$10 billion+ globally** for elder care technologies by 2027.  **Healthcare and Rehabilitation**:  **Target Users**: Patients recovering from surgeries, strokes, or injuries requiring rehabilitation.  **Market Need**: Supportive technologies that provide confidence during mobility exercises and reduce the risk of re-injury.  **Opportunity**: Partnerships with hospitals, physiotherapy clinics, and rehabilitation centers.  **Industrial Workers**:  **Target Users**: Workers in hazardous environments (e.g., construction, oil rigs, mining).  **Market Need**: Prevention of workplace injuries caused by accidental falls from heights or uneven surfaces.  **Opportunity**: Compliance with occupational safety regulations and reduction in workplace liability costs.  **Sports and Adventure Enthusiasts**:  **Target Users**: Athletes, motorcyclists, and adventure seekers.  **Market Need**: Protection from high-impact falls during activities such as cycling, skiing, rock climbing, and motor racing.  **Opportunity**: Premium wearable safety gear for professionals and hobbyists.  **Children and Special Needs Individuals**:  **Target Users**: Children with disabilities or developmental delays and individuals with conditions like epilepsy.  **Market Need**: Preventing injury during falls, which are more frequent in these groups.  **Opportunity**: Niche market with high-impact social benefits.  **Military and Defense**:  **Target Users**: Soldiers and field personnel.  **Market Need**: Fall and impact protection during training or combat in rough terrains.  **Opportunity**: Potential government contracts and partnerships with defense organizations. | | |

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| **6. Detailed Description of Proposed Embodiments**  Please describe one or more ways of implementing the proposed invention here in detail.   * In addition to describing all the functionalities, describe how they interact with each other (Working Operation). * What does each feature contribute to the proposed invention? For each part, indicate if the part (or its form or interconnection) is essential to the proposed invention. * If you have any additional materials describing the proposed invention (e.g. an internal report or technical specification), please attach them to this form. * Please include drawings, figures, flowcharts, snapshots etc with complete explanation. |
| ****1. Components of the Fall Safety Jacket**** The proposed invention includes the following components:  **MPU 9050 Sensors (5 units)**  **Function**: These sensors perform 3D posture analysis by collecting gyroscopic and accelerometer data to monitor body orientation.  **Contribution**: Essential for real-time posture recognition and detecting abnormal movement patterns indicative of falls.  **Placement**: Strategically placed on the jacket at the **shoulders, chest, and hips** to ensure comprehensive body monitoring.  **Flexible Sensor (Lumbar Monitoring)**  **Function**: Monitors the curvature and flexibility of the lumbar region to detect unnatural movements or stress on the back.  **Contribution**: Provides critical data for determining the posture of the lower back and differentiates between bending and falling.  **Placement**: Embedded in the lower back section of the jacket.  **Heart Rate Sensor**  **Function**: Tracks the user’s heart rate to detect anomalies that may precede or follow a fall (e.g., fainting).  **Contribution**: Adds a layer of health monitoring to complement fall detection.  **Placement**: Inside the jacket, near the chest area for accurate readings.  **Airbag System**  **Function**: Deploys airbags to protect the upper body, chest, and hip regions during a detected fall.  **Contribution**: Serves as the primary protective mechanism to minimize fall injuries.  **Placement**: Integrated within the fabric layers around the chest, back, shoulders, and hip area.  **Microcontroller**  **Function**: Processes data from all sensors and executes fall detection algorithms.  **Contribution**: Coordinates data collection, posture analysis, and airbag deployment.  **Placement**: Located in a compact control unit on the jacket, near the shoulder or chest area.  **Power Source**  **Function**: Powers the sensors, microcontroller, and airbag system.  **Contribution**: Provides uninterrupted operation for the device.  **Placement**: Rechargeable battery embedded in a discreet, lightweight pocket.  **Wireless Communication Module**  **Function**: Sends real-time alerts, including fall detection notifications, to registered mobile devices or caregivers.  **Contribution**: Enables remote monitoring and SOS communication.  **Placement**: Integrated into the microcontroller unit.  **Fabric Design**  **Function**: Durable, lightweight, and breathable material to ensure comfort during prolonged wear.  **Contribution**: Ensures the jacket is wearable and practical for everyday use.  **Placement**: Overall structure of the jacket. |

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| **7. Limitations**  Please list any possible limitations of the proposed invention that you are aware of |
| * 1. Are there any situations in which the proposed invention is not applicable? |
| ****Dependency on Proper Fit and Usage**** **Scenario**: If the jacket is not worn properly (e.g., loosely fitted or not fully zipped), it may reduce the effectiveness of the airbag system or sensor accuracy.  **Limitation**: The system's reliability depends on the user wearing the jacket as intended.  ****Inapplicability for Certain Demographics**** **Scenario**:  **Infants/Children**: The system may not be suitable for very young users due to differences in body structure and movement patterns.  **Wheelchair Users**: The invention primarily addresses falls from a standing or walking position, so it may not detect issues for seated users.  **Limitation**: A tailored version would be required for these demographics.  ****Battery or Power Failure**** **Scenario**: The system is battery-powered, and a drained or malfunctioning battery could render it inoperative.  **Limitation**: The user must ensure the jacket is charged and functioning to maintain its protective features. |
| 7.2. Under what circumstances might the proposed invention not work? |
| ****Inapplicability for Certain Demographics**** **Scenario**:  **Infants/Children**: The system may not be suitable for very young users due to differences in body structure and movement patterns.  **Wheelchair Users**: The invention primarily addresses falls from a standing or walking position, so it may not detect issues for seated users.  **Limitation**: A tailored version would be required for these demographics.  ****Battery or Power Failure**** **Scenario**: The system is battery-powered, and a drained or malfunctioning battery could render it inoperative.  **Limitation**: The user must ensure the jacket is charged and functioning to maintain its protective features |

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| **8. Drawings**  Please provide the drawings/photos of the prototype. |
| safe jacket |

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| **9. Additional Information**  If have more information please mention here. |
| 9.1. Is your Prototype ready? (Yes/No) |
| No |
| 9.2. Estimated cost & timeline to complete prototype of the invention. |
| 15000 to 20000 max & 3months |