

Title of Invention: PORTABLE LASSO: A PORTABLE BED EXIT MONITORING SYSTEM WITH TOUCHSCREEN

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Background of the Invention: Falls among older adults and individuals with limited mobility are a significant concern worldwide in healthcare and aged care settings. Statistics indicate that one in three older adults experiences a fall each year, with many incidents leading to severe injuries, hospitalisation, or long-term disability. The associated healthcare costs are staggering, with annual fall-related hospitalisations amounting to over USD 300 billion.

Traditional fall detection and bed exit monitoring systems, such as bed mat sensors and camera-based solutions, have several limitations. Bed mat sensors are prone to false alarms and require direct physical contact, which may cause discomfort for users. Camera-based systems, while accurate, raise privacy concerns and are often met with resistance in aged care environments. Additionally, these systems usually involve complex installations, including wired networks and dedicated server setups, which increase deployment costs and operational complexity.

To address these challenges, the need for a non-intrusive, accurate, and cost-effective solution for monitoring bed exits and detecting falls has become increasingly urgent. Such a solution must balance technological sophistication with user privacy, ease of deployment, and adaptability to diverse care environments.

The Portable LASSO system was developed to address these critical gaps. It utilises advanced depth imaging and sound recognition technologies to detect abnormal events, such as bed exits or falls, without relying on invasive cameras, wearables or panic buttons. The system features a touchscreen interface, allowing users to configure settings such as Wi-Fi, alert types, and volume with ease, and is mounted on a portable base for flexible placement beside beds or wheelchairs. By combining portability, privacy, and precision, Portable LASSO offers a groundbreaking approach to improving safety and care in healthcare and aged care facilities.

The invention aims to enhance patient outcomes, reduce caregiver burden, and provide a scalable solution for fall prevention in hospitals, nursing homes, and private residences globally.

Summary of the Invention: The Portable LASSO is an innovative safety monitoring system designed to detect bed exits and falls using a combination of depth imaging and sound recognition technology. The system ensures real-time monitoring and alerts while preserving user privacy by avoiding cameras. Its portable design allows it to be easily deployed beside any bed or wheelchair within minutes, offering flexibility and scalability for various care environments.

Key Features and Advantages:

1. **Depth Imaging Technology:** Accurately detects bed exits and falls by monitoring user movements in a non-intrusive manner.
2. **Sound Recognition:** Identifies distress sounds, such as cries for help, enabling caregivers to respond promptly.
3. **Privacy-Preserving Design:** Eliminates the need for cameras, ensuring dignity and compliance with privacy standards.
4. **Ease of Deployment:** Portable and wireless, requiring no complex installation or network cabling.
5. **Advanced AI Analytics:** Minimizes false alarms and enhances system accuracy through continuous learning from real-world data.
6. **Integration Capability:** Compatible with existing healthcare systems for seamless operation.
7. **User-Friendly Touchscreen:** Includes a touchscreen interface that allows users to easily configure Wi-Fi, alert types, volume settings, device location, and server settings, simplifying the setup and operation of the device.

Detailed Description of the Invention:

The Portable LASSO system comprises:

- **Hardware Components:**
 - The depth imaging sensor (110 and 160) is designed to capture three-dimensional images of the environment while maintaining privacy. This sensor uses advanced technologies such as infrared light or time-of-flight (ToF) measurements to create detailed depth maps that depict the shapes and distances of objects within its field of view. This sensor protects individual privacy by focusing solely on spatial data rather than capturing identifiable features. Its compact design and high accuracy make it ideal for applications in various environments, including hospitals and aged care facilities.
 - The processing unit (120) includes a high-performance microprocessor capable of executing complex computations and data processing tasks. The microprocessor (170) processes data from the depth imaging sensor, and the microphone collects. The touchscreen (140) interface provides a user-friendly means to control the system, view processed data, and adjust settings as required. This powerful processing and interactive display combination ensures efficient and effective operation in various settings.
 - The mobile base (130) is a versatile platform that supports and transports the depth imaging sensor and processing unit. It enables smooth movement across different surfaces, making it easy to reposition or transport the system as needed. The mobile base (130) enhances the system's usability, allowing it to be deployed in various locations, such as

hospital rooms or aged care facilities, to monitor patient safety and detect falls or bed exits.

- An AC/DC power module (180) that converts 240V to 5V 4A to power up the processing unit, which allows the Portable LASSO to employ a long power cable (190) and is not restricted by the location of the wall power outlet.
- A button (220) on the processing unit allows the user to activate and deactivate the touchscreen without switching off the microprocessor (170).

- **Software Components:**

- AI algorithms for recognising bed exits, falls, and abnormal sounds.
- A user-friendly dashboard for caregivers to receive alerts and monitor activities.
- Vision analytics system (240) that acquires images (230) from the depth imaging sensor (110 and 160) and performs bed object recognition (250), body posture recognition (260), and human tracking (270).
- A sound recognition module (330) that acquires sound from a microphone (210 and 320) with an audio interface (200) can detect abnormal sounds of screaming for help.
- All abnormal events will be evaluated by the rule-based engine module (280), which will determine if the Portable LASSO should trigger an alert.
- Each alert consisting of a message and sound or video clip will be sent to the cloud server (290) to determine which user account to trigger an alert on the call bell system (300) and mobile app (310)
- A touchscreen user interface (140) to ensure a user-friendly setup process.

- **Deployment:**

- The device is mounted on a mobile base (130), allowing it to be positioned beside any bed or wheelchair.
- To power up the Portable LASSO, the user connects the AC power cable (190) to the wall power outlet.
- When all the software in the Portable LASSO is loaded, no software calibration is required.
- The user may configure the device settings through the touchscreen (140). The configurable settings include Wi-Fi, alert types, volume settings, device location, monitoring mode, and server settings
- Wireless connectivity ensures rapid setup and integration with facility infrastructure.

Claims:

Claim 1: A portable monitoring system for detecting bed exits and falls, comprising:

- A depth imaging sensor (110 and 160) to classify body posture.
- A processing unit (120 and 170) with a touchscreen (140) configured to perform sound recognition and vision analytics and generate alerts.
- A mobile base (130) that allows the device to be easily pushed to any location.

Claim 2: The system of claim 1, wherein the depth imaging sensor (110 and 160) operates without using cameras to preserve privacy.

Claim 3: The system of claim 1, further comprises a mobile base (130) for easy deployment beside beds or wheelchairs.

Claim 4: The system of claim 1, wherein the processing unit (120 and 170) utilises edge computing for real-time analysis.

Claim 5: The system of claim 1, wherein the alerts are transmitted wirelessly to the caregiver call bell system (300) and the mobile app (310).

Claim 6: The system of claim 1, further comprises a touchscreen interface (140) for configuring Wi-Fi, alert types, volume settings, device location, monitoring mode, and server settings.

Claim 7: The system of claim 1, wherein the rule-based engine module (280) determines the severity of abnormal events before triggering alerts.

Drawings:

1. The overall system setup, including the Portable LASSO unit and its placement.
2. Internal components include the depth imaging sensor, sound recognition module, processing unit, and touchscreen interface.
3. Workflow diagrams showing how data is captured, analysed, and transmitted.

Conclusion:

The Portable LASSO addresses critical safety concerns in healthcare and aged care by providing an accurate, non-intrusive, easy-to-deploy solution for bed exit monitoring and fall detection. Its innovative depth imaging and sound recognition technology ensure a reliable system that improves care quality while preserving user privacy.



