



RF Signal-Based Human Context Inference for Health and Safety Monitoring

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BACKGROUND

There is considerable interest in using communication signals, such as radio frequency (RF) signals, for sensing. Potential applications include smart health, smart spaces, structural health monitoring, and more. Monitoring and measuring body movement, e.g, gait analysis, is important for many physical and mental health conditions and has been studied extensively in medical fields. In addition to monitoring physical and mental health conditions, detection of body motion can also be useful for safety and security applications. Because motion or abnormal motion can be an indication of a state of distress, pain, or harm, it can also be used as a general measure of the well-being of an individual.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a cutting-edge technology that leverages commodity RF signals (e.g., WiFi) to sense and interpret human body motion and movement, providing insights into an individual's health, mood, intentions, and activities. This method employs advanced techniques such as new mathematical modeling, signal processing, and machine learning to extract vital information from the way human motion affects RF signals. It can then perform detailed gait analysis and assessment, detect and identify abnormal gait patterns (e.g., neurological disorders), track changes in gait over time, recognize unintentional body movements (such as reflexes, startles, falls, or signs of physical injury), assess mental health, and detect heightened stress states, among other capabilities. Overall, it offers a novel approach to health and activity monitoring, with cheap off-the-shelf RF transceivers such as WiFi, and without the need for specialized equipment.

ADVANTAGES

- ▶ Leverages existing RF signals, eliminating the need for additional hardware
- ▶ Is privacy preserving as compared to cameras
- ▶ Is robust through occlusions and blockage
- ▶ Operates effectively in areas lacking video surveillance, offering broader application possibilities
- ▶ Facilitates non-invasive health assessments, ensuring user comfort and convenience

APPLICATIONS

- ▶ Physical and mental health monitoring
- ▶ Elder health

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OTHER INFORMATION

KEYWORDS

rf signals, health monitoring,

safety monitoring, wifi, health,

mental health, smart health,

smart homes, search and

rescue

CATEGORIZED AS

- ▶ [Communications](#)
- ▶ [Other](#)

RELATED CASES

2025-337-0

- ▶ Mental health
- ▶ Gait disorder assessment
- ▶ Neurological disorder assessment
- ▶ Intention analysis
- ▶ Startle detection
- ▶ Vestibular health
- ▶ Gait analysis and monitoring
- ▶ Fall detection
- ▶ Stress monitoring
- ▶ Smart health
- ▶ Smart homes/spaces
- ▶ Search and rescue
- ▶ Intruder detection

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Sensing with RF Signals by Exploiting Edge Diffraction
- ▶ Generating Massive Synthetic RF Data for RF Sensing Applications
- ▶ RF Signals for Crowd Analytics and Collective Behavior