



## SYSTEM AND METHOD FOR DETERMINING ACTIVITIES OF A USER IITM Technology Available for Licensing

### Problem Statement

- Human Activity Recognition (HAR) technique & classification of human body movements help to automatically recognize human activities. The conventional system utilizing HAR technique fail to distinguish between simple & complex activities. Camera-based HAR systems are expensive, complex, & are prone to privacy & pervasive issues.
- Data captured by more number of accelerometers make processing complex & increase obtrusiveness of the HAR system. Additionally, accelerometers are more prone to add noise to the data.
- Present patent addresses the technical problem of **how to provide an efficient method of collecting and processing data related to movements of a user** that can also be easily used & integrated in daily routine of the use..

- 3rd step** explains about **execution of one or more machine learning models for:**

a) **extracting** one or more features related to the **movements of the user** from the **segmented data;**

b) **performing dimensionality reduction** of the one or more features to obtain dimensionally reduced data;

c) **determining the one or more activities performed** by the user by classifying the dimensionally reduced data;

### Technology Category/ Market

**Technology:** wearable device for data collection for determining activities of a user;

**Industry:** Healthcare, Medical Industries;

**Applications:** Healthcare.

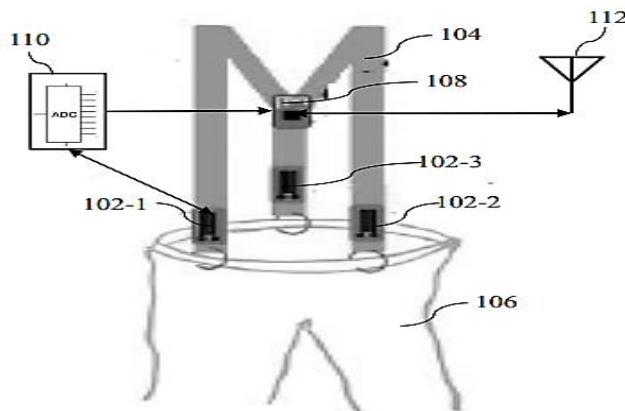
**Market:** The global wearable devices market is projected to grow **USD 643.84B** at a **CAGR** of **18.7%** during forecast period **(2024-2031)**.

### Technology

- Claimed a **system** for determining **activity** of a user wherein one of the user device transfers the movement data to a cloud server.
- Further, one of the user device and the cloud server is configured to do a set of operations mentioned hereinbelow:

- 1st step** explains about **generating a time series** of the movement data of the user;

- 2nd step** explains about **segment the time series** of the **movement data**, to obtain segmented data;



**Fig.1** illustrates system for determining activities of a user;

### Intellectual Property

**IITM IDF Ref. 2451;IN Patent No.515174**

### TRL (Technology Readiness Level)

**TRL-3/4**, Proof of Concept ready, tested and validated in Laboratory

### Research Lab

**Prof. Boby George;**

Dept. of Electrical Engineering.

**Prof. Prathap Haridoss;** Dept. of Electrical Metallurgical and Materials Engineering.

### CONTACT US

**Dr. Dara Ajay, Head TTO**  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

**IITM TTO Website:**  
<https://ipm.icsr.in/ipm/>

Email: [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)  
[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)  
Phone: +91-44-2257 9756/ 9719

### Key Features / Value Proposition

#### ❖ Technical Perspective:

- Provides a **wearable device** for data collection for determining activities of a user.
- provides a technique for determining complex activities & improves accuracy in determination of said activities.
- Further reduces position-based dependency for determining activities of the user.

#### Prototype:

- The present invention is worn on the upper portion of the body to the waist, & it amplifies and senses activities on the upper portion of the body.

#### Sensors:

- Said device uses a single type of sensor i.e. **strain sensor** to determine different activities.

#### Activity of the user:

- Present invention further uses a combination of **smart suspender** and **machine learning algorithm** to **realize** the activities listed hereinbelow:
- There are **14 different normal day-to-day activities** such as standing, exercising (arms front stretch, arms lateral stretch and arms lifted), walking, sitting, eating, drinking, washing hands, on phone, texting over phone, coughing and deep breathing.
- Said features related to the movements of the user is one or more of mean, standard deviation, mode, maximum, minimum, signal magnitude area, autoregression coefficients, correlation coefficient, energy, signal average energy, interquartile range, entropy, skewness, and kurtosis.

#### Machine Learning Model:

- One or more machine learning models is K-Nearest Neighbours (KNN), Long Short-Term Memory (LSTM), Random Forest (RF), Support Vector Classifier (SVC), Support Vector Machine (SVM), Logistic Regression (LR), Neural Networks (NNs), Decision Tree (DT), and Gradient Boosted Decision Tree (GBDT).

#### ❖ Industrial Perspective:

- By using **wearable device**, present invention is useful in a wide variety of applications, such as **health monitoring** in secure manner & cost-effective manner.

### Images

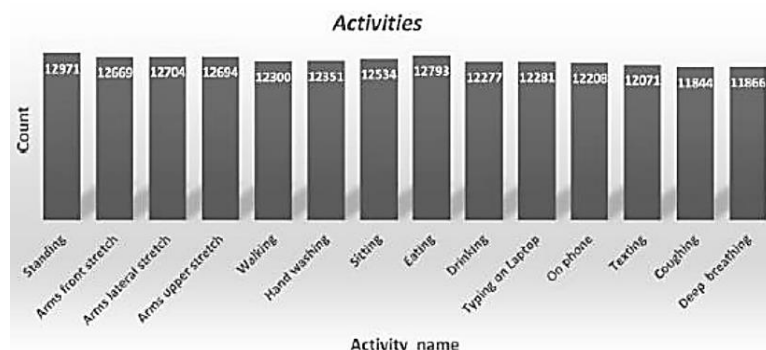
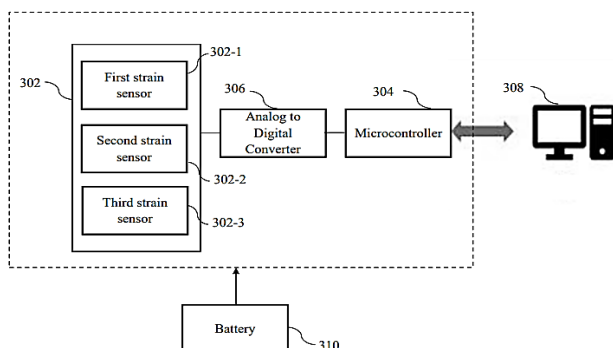


FIG.1a: : Illustrates a block diagram of a system for determining activities of a user

FIG.2: Illustrates plots of count of data points in input dataset based on activities performed by users;

### CONTACT US

Dr. Dara Ajay, Head TTO  
Technology Transfer Office,  
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:  
<https://ipm.icsr.in/ipm/>

Email: [smipm-icsr@icsrpis.iitm.ac.in](mailto:smipm-icsr@icsrpis.iitm.ac.in)  
[sm-marketing@imail.iitm.ac.in](mailto:sm-marketing@imail.iitm.ac.in)  
Phone: +91-44-2257 9756/ 9719