Institut "Jožef Stefan" Ljubljana, Slovenija

TECHNOLOGY OFFER

ACTIVITY MONITORING ALGORITHM USING A SMARTPHONE AND/OR WRISTBAND IS OFFERED AS A SERVICE OR AS A LICENCE AGREEMENT

Fields of use
Artificial Intelligence (AI), Data Processing/Data Interchange, Middleware, Remote diagnostics, Education and Training, Sports and Leisure

Current state of technology
Field tested/evaluated

Type of cooperation
Services agreement, Licensing agreement

Intellectual property
TBA

Developed by
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Summary

A Slovenian research institute is offering an algorithm for activity recognition with a smartphone and an optional wristband. The algorithm uses context specific machine learning models and therefore does not depend on the position of the smartphone on the body. The algorithm outperforms several consumer devices in terms of accuracy in real life setting. The algorithm is available via licensing or service agreement to companies and researchers developing wellbeing applications.

Description of the invention

Accurate activity monitoring is required in domains where further reasoning or person specific recommendations rely on the user's physical activity. These range from lighter topics such as sports and lifestyle to sensitive topics such as health. Current market offers smartphone applications and dedicated devices, whose scope is limited to step counters (pedometers) with inaccurate estimation of energy expenditure or to monitoring only certain type of activities that make them unsuitable for applications that require accuracy.

There are many activity monitoring applications and devices on the market which mostly rely on rather simple techniques such as step counters from which they estimate the energy expenditure or they require the user to explicitly state which activity is being performed (e.g. they do not perform any automated activity recognition). The evaluation of consumer devices has shown that they also lack accuracy in real-life every day activities. Algorithms that are more accurate have been developed in the domain of body sensor network where the user is required to follow the instructions about the exact placement of each of the used dedicated sensors which makes the technology hard to use.

The artificial intelligence researchers from a Slovenian public research institute have developed, evaluated and validated an algorithm for real-time continuous activity monitoring that utilizes sensor data from a smartphone or wrist-worn or chest-worn device and can fuse the data and decisions of both devices if both are present on the body.

The activity recognition and estimation of energy expenditure are using machine-learning techniques. The design of the algorithm enables the user to put the smartphone in any pocket or in a bag and in any orientation since the algorithm first detects the presence of the devices and then normalizes the orientation. The normalized signal is used to recognize the location in case of the smartphone. The recognized context of the sensors is used to select appropriate context-specific machine-learning model for activity recognition and estimation of energy expenditure.

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The investment is co-financed by the Republic of Slovenia and the European Union under the European Regional Development Fund.

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The technology is available either:
a) under the services agreement as a Software-as-a-Service (SaaS) through application programming interface (API) or
b) under licensing agreement for the algorithm which can be run on a smartphone.

Authors of the algorithm are computer science experts employed at the Slovenian institution for research in sciences and technology. They are specialized in development of proprietary methods and algorithms for analyzing wearable sensor data used mainly in health domain, but applicable to other domains. The team has been among finalists of the global competition for medical diagnostic devices. They have won the international competition for activity recognition. They are active in several projects for development smart watch monitors for independent living of seniors with dementia; detection of falls and abnormal behaviors for elderly; support older workers in reducing physical and mental stress using wristband and personalized advices and decision support to help patients with heart problems.

Main Advantages

Advantages of the real-time continuous activity monitoring algorithm: ▪ It self-detects the presence of the devices.
▪ It can monitor the activities with smartphone, wristband or chest strap alone or with a combination of two devices (smartphone + wristband, smartphone + chest strap).
▪ The devices can be worn in any orientation since the algorithm detects it and normalizes it.
▪ The smartphone can be worn on three locations (trousers pockets, jacket pockets, bag) which are recognized automatically utilizing machine learning techniques.
▪ The activity-recognition models are trained on the most typical every day activities (rest, home chores, gardening, eating, etc.) as well as sports activities (walking, Nordic walking, running, cycling, etc.).
▪ The models for estimation of energy expenditure are trained on the data labelled by the indirect calorimeter.
▪ The evaluation results show that the algorithm outperforms several consumer devices

Partner Sought

The researchers are looking for partners which are either:

a) companies or research institutions which develop applications and would need the service (SaaS) through API (service agreement) or

b) companies which are interested in obtaining a license for implementation of the activity monitoring algorithm in their application (licensing agreement).

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In particular following companies or research institutions active in wellness and health domains are sought:

- Companies that develop and produce wearable wireless wellbeing, sport and fitness devices.
- Companies that offer solutions for remote patient or elderly monitoring, onsite professional healthcare monitoring and home/office/work environment monitoring.

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