Micro-module B: Mobile Sensing Applications

Mobile sensors can record the actual situation in the living environment in real time, which has a very wide range of applications in scientific research. With the advancement of technology, many mobile sensors are built into smart phones, which can be used to monitor the environment, location, human activities and other information, greatly improving the application range of mobile sensing.

There are two micro-modules in this subject, micro-module B1 will give you a brief introduction to different types of wearable sensors and practical research in the urban studies field. Micro-module B2 will introduce the use of mobile sensing applications with geo-location tags to record people's routes or the location where crowd gathering and import the data into QGIS for visual illustration.

1. Introduction

Mobile sensing is the sensors of a mobile device (i.e. smart phone or tablet computer) to acquire data from the environment.

A sensor is a device that can detect changes in the environment nearby and send data to the operating system or processor.

Mobile sensor originally refers to the sensor equipment that can be worn on the human body. With the advancement of technology, smart phones have also become a very commonly used sensor. Various types of sensors can be embedded in smart phones, which can be used to capture human behavior data, record location information, sense environmental changes, analyze sensor data, and play an important role in data collection and processing in many research fields.

Source: https://www.wireflow.com/products/software/wf-smartphone-sensor-toolkit/

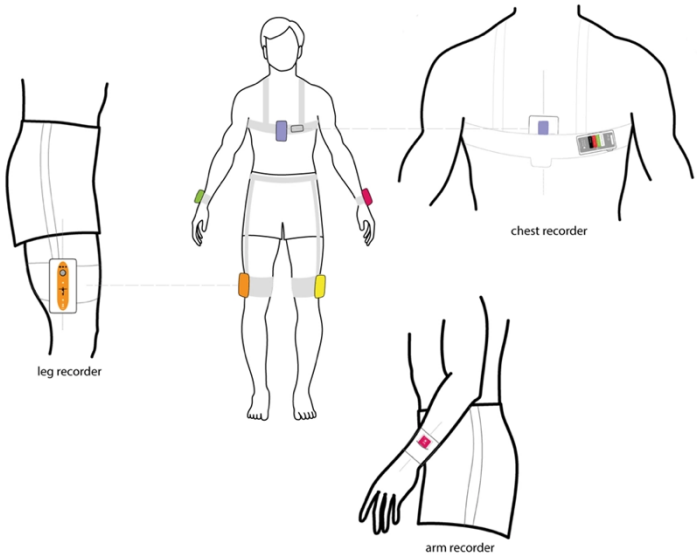
Mobile sensing has a wide range of applications, from environmental monitoring to medical and military missions. For example, in the field of medical and health, it can detect people's sleep and activity as well as the physical condition of patients with serious diseases. In the field of environmental monitoring, it can carry out disaster, traffic monitoring, weather forecast and air pollution.

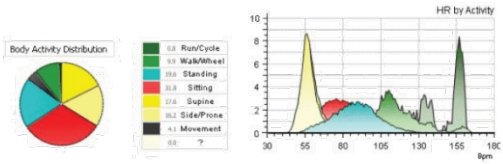
The two micro-modules under this subject will introduce the types of mobile devices that monitor environmental characteristics and their applications in the research, as well as the use of location-tracking app for smart phone and its role in research.

2. Micro-module B-B1: Mobile Sensing for Environmental Features and Well-being

Measurement methods such as environment-installed sensors and questionnaire surveys have been widely employed in data gathering of human physiological and psychological states for mental healthcare. Sensing via tiny sensors and wearable devices has recently become simple, due to better sensing technology with IoTs. This micro-module will give you a brief introduction to different types of wearable sensors and pratical research in the urban studies field.

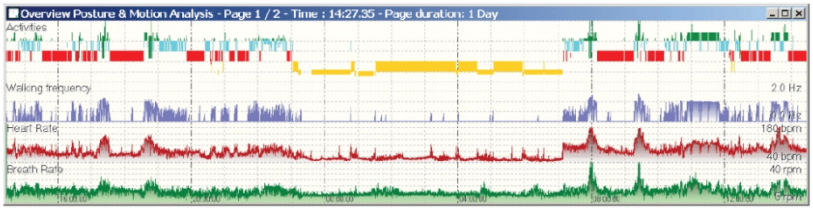
Wearable sensor





Body activity distribution
24hours, 25-year female with an active life-style: 1/3 is spent actively 'on-your-feet'

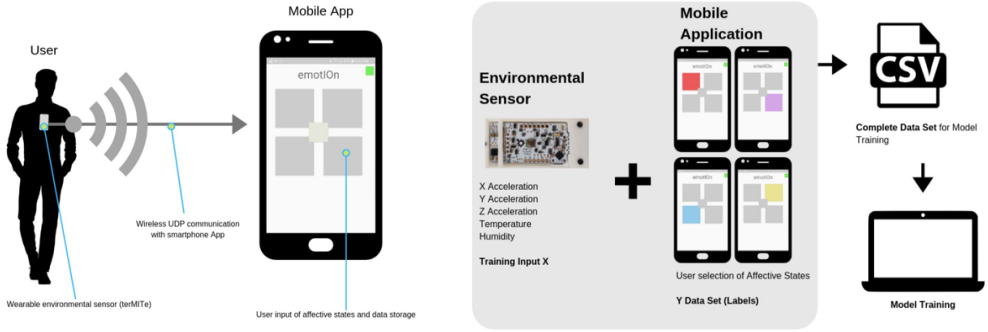
Heart rate by activity
HR is 140bpm when jogging, 160 during fast cycling and drops to 55 while sleeping



24 hour posture and motion analysis overview
Activities : yellow = lying, red = sitting, blue = standing, green = motion
Walking frequency : 0-2Hz (0-120 steps/minute), Heart rate : displayed from 40-180bpm, Breath rate : displayed from 5-40 per minute

VitaMove, Source: https://www.2mel.nl/projects/vitamove-multi-sensor-activity-monitor-with-ecg/

Practical research of mobile sensing for environmental features and well-being

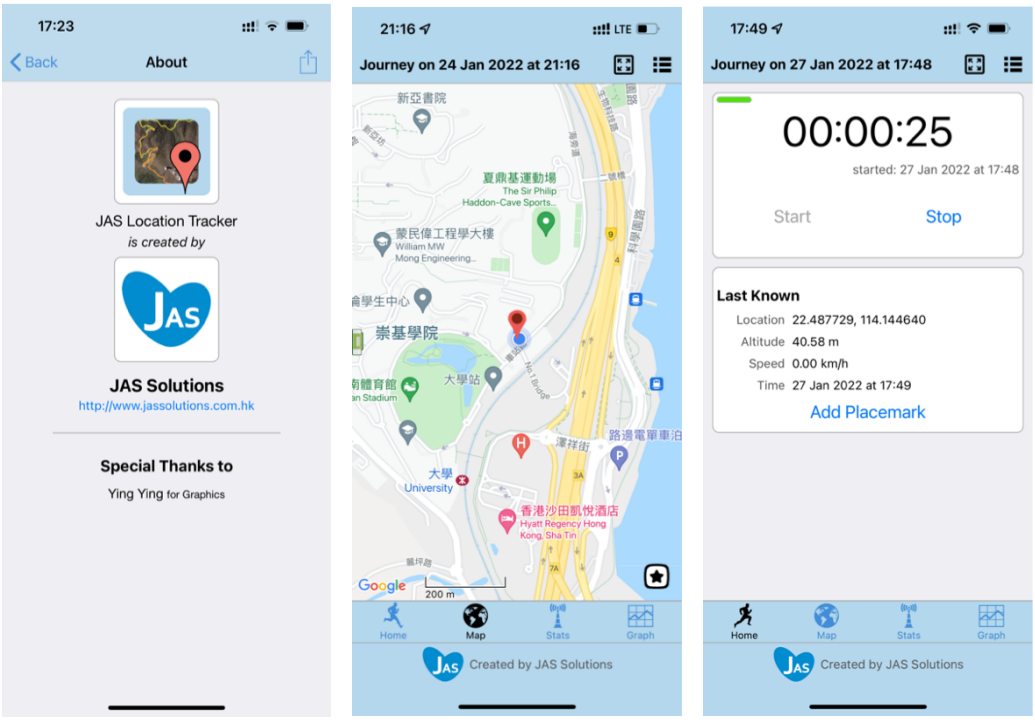


Feed Forward Classification Neural Network For Prediction of Human Affective States Using Continuous Multi Sensory Data Acquisition, DOI: 10.1007/978-3-030-33749-0_9

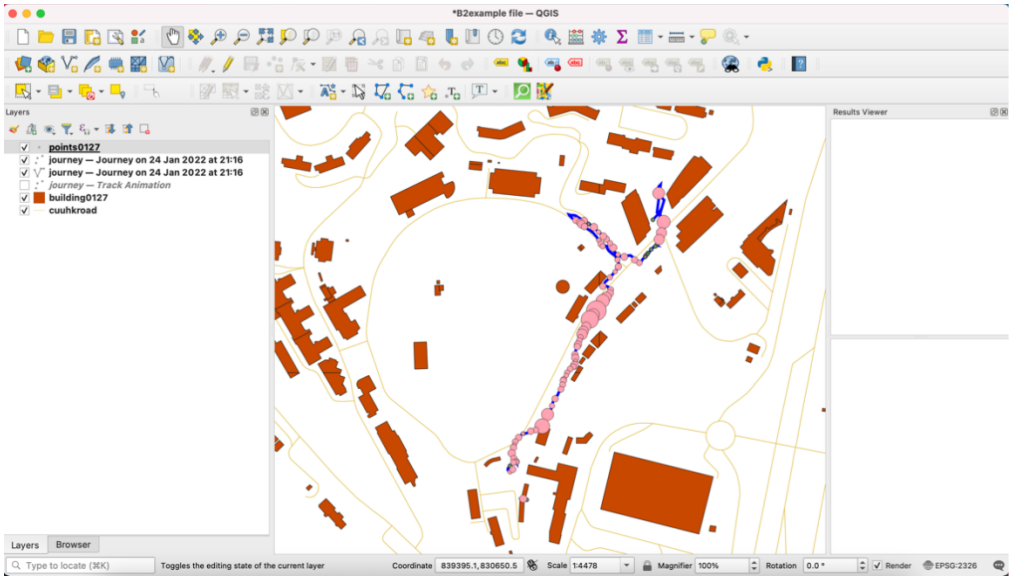
3. Micro-module B-B2: Geolocation Tracking Applications

In this micro-module we will introduce the use of mobile sensing applications with geo-location tags to record people's routes or the location where crowd gathering and import the data into QGIS for visual illustration. This can be used to record the gathering of people in the research area, the extent to which people prefer existing spaces.

The first part will introduce how to use the JAS location tracker to record routes or mark locations, and the export of geographic data.



The second part will explain how to import data recorded by mobile phones into QGIS, how to process data, and how to visualise the data to analyse problems.


*B2example file — QGIS
Layers
points0127
journey — Journey on 24 Jan 2022 at 21:16
journey — Journey on 24 Jan 2022 at 21:16
journey — Track Animation
building0127
cuuhkroad
Results Viewer
Layers
Browser
Type to locate (⌘K)
Toggles the editing state of the current layer
Coordinate
839395.1,830650.5
Scale
1:4478
Magnifier
100%
Rotation
0.0 °
Render
EPSG:2326