Recognising user actions during cooking task (Cooking task dataset)

Documentation

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1 General information

Experiment title	Recognising user actions during cooking task
Experiment id	D2011-KTA-KHY
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Type	Measurement
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Language	English
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1.1 Objective

Recognise the actions of a user and the manipulated objects while executing kitchen tasks.

1.2 Problem Statement

One person is preparing a meal in the kitchen that includes: preparing the ingredients for a soup; cooking the soup; serving the soup; having meal; cleaning the table; washing the dishes. The task is to recognise the fine-grained actions that constitute these tasks and the objects in the environment which the person is manipulating.

2 Description

The dataset contains the data of acceleration sensors attached to a person during the execution of a kitchen task. It consists of 7 datasets that describe the execution of preparing and having a meal: preparing the ingredients, cooking, serving the meal, having a meal, cleaning the table, and washing the dishes. The aim of the experiment is to investigate the ability of activity recognition approaches to recognise fine-grained user activities based on acceleration data. The results from the dataset can be found in the PlosOne paper "Computational State Space Models for Activity and Intention Recognition. A Feasibility Study" by Krüger et al. [1]. Other publications related to the dataset are [3, 2, 4, 5].

2.1 Data format

The `Raw/` folder contains 7 data files, one for each recording. The sensor data was recorded with motion capturing system based on wearable inertial measurement units (IMUs). Each data file contains the 16 most significant features from the original data for each time stamp.

The `annotation/` folder contains the corresponding annotation for the 7 datasets. For each time stamp it contains:

16 action classes where the observed class is indicated with 1, the rest with 0;

4 locations where the observed location is indicated with 1, the rest with 0;

6 fixed places where the observed place is indicated with 1, the rest with 0;

10 objects where the observed object is indicated with 1, the rest with 0;

hands where 1 indicates that there is object in the hand, 0 that the hands are empty.

annotation where the executed action, the place, and the objects being taken are described in the form *action-object-fromLocation-toLocation*.

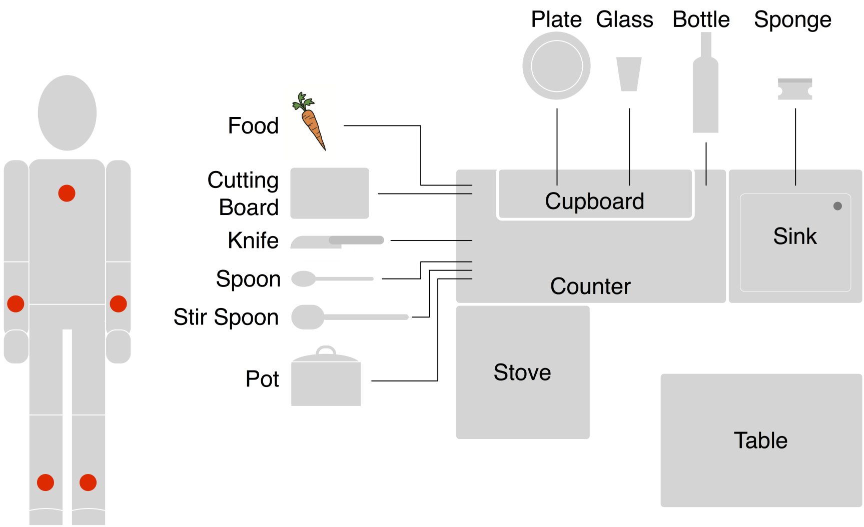

Figure 1: Positions of the sensors on the body (with red). Layout and objects in the experiment.

2.2 Dataset recording

The sensor data was recorded with motion capturing system based on wearable IMUs. For each sensor three axis acceleration and angular rates were recorded, with a sampling rate of 120 Hz. The resulting data stream of 5|6 30 signals was segmented into frames using a simple window-based segmentation with a window size of 128 samples and 75% overlap, giving a frame rate of 3.75 Hz. For each frame, mean, variance, skew, kurtosis, peak, and energy were computed for each signal. This stream of 180-dimensional feature vectors at 3.75 Hz was then subjected to dimension reduction by applying principal component analysis to the full set of feature vectors, choosing the loadings of the factors corresponding to the 16 largest eigenvalues as effective observations. The sensor data was then scrambled to reduce order effects and dependencies between observations in durative actions. The experiment layout and the sensors locations are shown in Figure 1. Seven voluntary subjects acted according to a script to generate the observation data for the datasets.

3 Bibliography

References

[1] Frank Krüger, Martin Nyolt, Kristina Yordanova, Albert Hein, and Thomas Kirste. Computational state space models for activity and intention recognition. a feasibility

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