

Experiment title: Probabilistic Action Selection

Experiment id: D133028-Office-FK

Study: Tracking multiple persons in indoor environments

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Type: Measurement

Keywords: tracking, binary sensors, PIR, passive infrared, office environment

Relation: Data collection experiment is based on the ideas outlined in Mundt, T.; Kruger, F.; Wollenberg, T., "Who Refuses to Wash Hands? Privacy Issues in Modern House Installation Networks," *Broadband, Wireless Computing, Communication and Applications (BWCCA), 2012 Seventh International Conference on*, vol., no., pp.271,277, 12-14 Nov. 2012, doi: 10.1109/BWCCA.2012.51

Rights: none

Language: English

Objective: Create a dataset similar to the data that might be recorded from the KNX BUS of the Computer Science Building. The main purpose of this dataset is to answer the question if it is possible to track multiple independent persons moving in office environments. An additional question is if anonymized tracking (without considering symmetric states) is viable with CCBM.

Problem-Statement:

No public available dataset exists that contains binary sensor observation of multiple persons in office environments. This dataset (imposes) the simultaneous tracking and identification problem in partially observed environments. Only a few (public accessible) rooms were observed by PIR sensors. Objective of this dataset is to track persons also in unobserved regions/rooms.

Description: Sensor data recording of multiple (1-7) interacting persons in indoor environments by use passive infrared sensors. The dataset was recorded in the context of the diploma thesis of Martin Kasparick.

Preparation and instruction of subjects:

In order to create a data set that contains realistic action sequences for each person, a plan that describes the actions sequence including duration was created for each

subject. A base plan for 7 interacting persons was proposed, then revised and afterwards adjusted to the concrete environment setting (e.g. durations for moving from one room to another were extended to fit the distance of these rooms.). Action sequences for each subject were extracted from this plan. Each subject got only information about his/her action sequence including durations. In order to repeat the experiment for decreasing number of participating subjects, a plan for N-1 persons was generated from the plan for N persons by omitting the Nth person and changing the action sequence of the N-1th person. The following changes were done to the plan of the N-1th person: (1) the group meeting was skipped and (2) another action like getting a coffee was executed during this time. The generated, revised and adapted plan can be found in the documentation.

A more detailed description of the experiment can be found in the diploma thesis of Martin Kasparick (Sensorbasierte Analyse des Verhaltens mehrerer interagierender Personen in Büroumgebungen unter Verwendung kausaler Modellierung)

Environmental settings:

Each public accessible room was instrumented with a passive infrared motion detector (five sensors on the corridor and one within room 207). A mobile computer executing an application for lightswitch simulation was placed in each office and the meeting room (Rooms 218, 214, 205, 208, 210, 211). Subjects with the number 1,2 and 3 were instrumented with accelerometers at the hip and ankle. The region between office 211 and the stairs was instrumented with 5 sensfloor mats.

Unfortunately, the accelerometers and the sensfloor mats turned off at some point during the experiment with 6(?) persons. The layout of the office environment is given in roomplan.pdf.

Execution:

The experiment started with seven persons. The number of persons was decreased by one until each configuration was recorded. For each configuration (number of participating persons) the experiment was repeated five times. Five cameras were used to keep track of the actual action sequences for each iteration. These videos were later used for ground truth annotation. The schedule for all persons can be found in the "ablaufpläne" subfolder. A detailed documentation of experiment start and end times is provided in zeiten_experimemente.xls

List of Sensor:

Name: no name given

Type: Passive Infrared Sensor (PIR);

Description: Self constructed sensor used together with firmware.

Name: Lightswitch

Type: Java implemented tool

Description: A software implemented simulation was used.