

Using Natural Footstep-Accurate Traces for (Indoor) Positioning Evaluation

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ABSTRACT

With a plethora of indoor positioning systems available, their evaluation becomes more and more important. Even though most publications of positioning systems contain such an evaluation, the used ground truth often consists of predefined geometrical shapes, e.g. circles or lines, which do not correspond to the natural movement patterns of users. Some authors also use a second positioning technology, with a supposedly higher accuracy, to create the needed ground truth. Since the second positioning technology has to be evaluated first, a 'chicken and egg' situation is created. Also, depending on the design of the evaluation, users might unconsciously adapt their movements to the output of the tested positioning system, e.g. walking slower or walking toward the positions indicated by the system. The results of such evaluations are sometimes accuracies in the range of millimetres, which is odd when considering the fact that humans are not mathematical, dimensionless points.

In this paper, an evaluation method using natural footstep-accurate traces as ground truth is proposed. Said ground truth was obtained by video-taping people who were naturally walking in the foyer of our company building. These video-clips were then manually analysed, using the tiles of the foyer's floor as a coordinate system. The result of this analysis are not simply the positions of the filmed users as they progress through the foyer, but the coordinates of each single footstep of each user including timestamps for each step. To evaluate the position accuracy of an indoor positioning system, these traces were laid out on the floor and 're-walked' while carrying the hardware for the positioning system. A short sound was played according to the timestamps of each recorded step of the ground truth, to ensure that the walking speed was close to the real walking speed. The final paper will include detailed descriptions on how the comparison of the ground truth with the obtained positions is done on the example of an active RFID based indoor positioning system.

KEYWORDS: Positioning Evaluation, Natural Ground Truth, Active RFID.