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User tracking using wearable cameras

Milan Redžić, Conor Brennan and Noel E. O'Connor
CLARITY: Centre for Sensor Web Technologies
Dublin City University
Dublin, Ireland
milan.redzic@eeng.dcu.ie

ABSTRACT

Wearable camera technology has evolved to the point whereby small unobtrusive cameras are now readily available, e.g. the Vicon Revue. This has allowed research effort to focus on analysis and interpretation of the data that such devices provide. This paper addresses the automatic tracking of a user indoors using fusion of WLAN and image sensing. Our motivation is the increasing prevalence of wearable cameras, some of which can also capture WLAN data. We propose to use image-based and WLAN-based tracking individually and then use fusion approach to obtain better performance overall. Seamless indoor user tracking is achieved using novel version of Viterbi-based multiple-state model with selective Markov-jump linear parameters. A way to convert times between two consecutive locations into probabilities is found in order to construct the most likely route traversed by a user. Dynamic and adaptive confidence-based weighting between two modalities is used to better reflect ratio between WLAN and image-based tracking. More sophisticated classifiers such as neural networks are analyzed to potentially increase the accuracy and the precision of the system. The experimental setup consisted of two scenarios and they were performed in the University building. The first experimental setup represents calibration points in areas with less number of obstacles. All offices and the corridors were used and in total this area covers 1834.08 square meters. The second experimental setup introduced more complex environment such as walls between calibration points and more obstacles inside the smaller office spaces in which the calibration points were placed. There were also humans present in these offices to make the data more challenging. We envisage the potential usefulness of our approach in a range of ambient assisted living applications.

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KEYWORDS: wearable cameras, WLAN, SURF, tracking, Viterbi, HMM