Passive device-free indoor localisation based on RSSI on a mobile phone

***Abstract*—We propose a device-free passive indoor localisation system by analysing the fluctuation in received RSSI packets received from environmental WiFi access points. With a single device in each room the system is able to detect presence and to provide a broad classification of the actual location of a single person dividing the room into a grid of four regions.**

I. Extended abstract

Device-Free Localisation (DFL) was defined by Youssef et al. as the localisation or tracking of a person using RF-Signals while the entity monitored is not required to carry an active transmitter or receiver [1]. They initially considered fluctuation in the direct link between WiFi devices in order to track movement that physically intercepts this line-of-sight connection. By separating the sensed region into a grid of clusters, Wilson et al. [2] achieved an average error of about 0.5 meters. Later, Zhang et al. could demonstrate a high accuracy of below 1m for the simultaneous tracking of five moving targets by isolating the LoS path between nodes [3].

But RSSI has also been utilised for the recognition of other purposes such as the monitoring of breathing frequency [4], the recognition of activities [5] or attention [6].

Common to all these studies is that they utilize active systems incorporating transmit and receive devices. Recently, the recognition of capabilities of a passive, single receiver RSSI-based recognition system have been reported [8] They demonstrated the potential of such a system to recognise presence and distance of movement to a receive device. In this demo, we utilise a similar approach for indoor localisation.

II. System description

Our system utilises fluctuation in received RSSI packets from environmental WiFi access points for the detection of movement in the proximity of receive devices. It consists of receive devices placed in each room and a mobile monitoring point that displays the sensed activities. As receive devices we utilise Nexus One mobile phones. These phones constantly monitor RSSI packets from environmental WiFi access points via tcpdump.[1] On the phones, the captured stream of packets is pre-processed to filter the RSSI of only meaningful packets. This data is regularly broadcast to the mobile device utilised as monitoring point. At the monitoring point, the various data streams are then further processed to distinguish the presence of individuals in specific rooms as well as heir relative location towards the receive device. We attempt to distinguish up to four distinct areas in a single room. This scenario is depicted in figure 1. Main parts of the processing are implemented in python. For the machine learning part we utilise classifiers from the Orange data mining tool.

[1]The access points are not part of our installation.

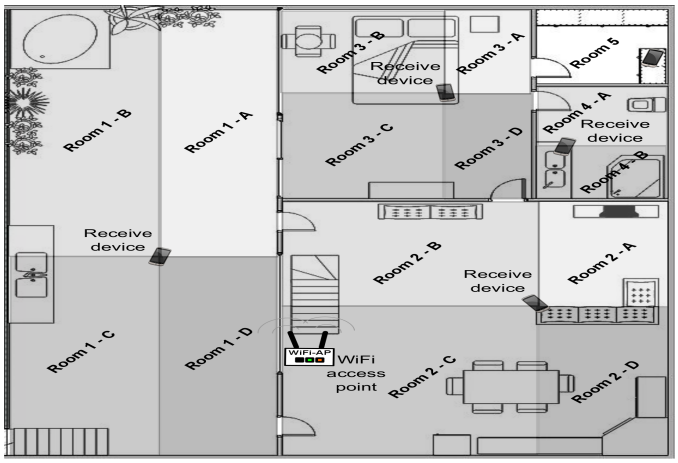

Fig. 1. Schematic illustration of a possible instrumentation of the system

References

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