

Localisation in wireless LANs

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Wireless LANs (WLANs) following the IEEE 802.11b standard are well known and widely used to support the LAN infrastructure [1]. A new approach is to use cheap and available wireless LAN accesspoints for localisation of PDA and notebook users or autonomous mobile devices. The localisation of users is useful to provide location based services, similar as know as cellular phone applications. The tracking of mobile WLAN devices can be used to support the localisation of mobile robots. The advantage of this approach is to use the necessary communication medium also for localisation. All modern wireless lan card windows drivers provides information about received beacon signals and the field strength of the available accesspoints. The opensource hostap (host accesspoint) Linux-kernel driver for Intersil-Prism II wireless lan chipsets is also enabled to get this information. With a capable calibration and a minimum of 3 received accesspoints, a localisation with an average precision of 1 meter is possible. This precision is adequate for location based services. For the localisation of mobile robots this precision is sufficient for a rough estimation of the position and could be used as part of a sensor-fusion based localisation.

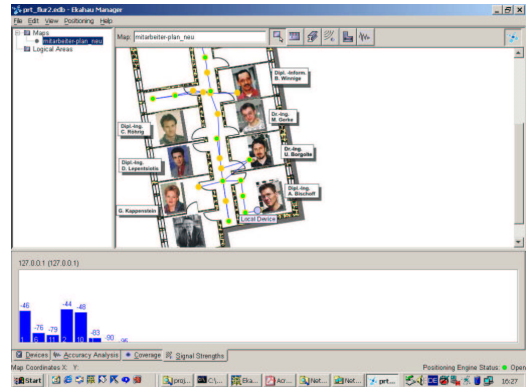


Figure 1: Calibration of the PRT office area



Figure 2: "mixed reality" VRML environment with located WLAN-user

Our first implementation of a localisation system uses the hostap driver together with the Linux wireless-tools [2] and own extensions for a rough estimation of the positions. A more accurate calibration is possible with a new commercial application, the EkaHau positioning engine [3]. This software provides Java interface classes which can be easily connected with a representation of the user in a virtual reality environment.[4] In this context localisation in wireless LANs can be used as cheap and robust tracking system. Tracking systems for areas of around $3m^3$ are usually very expensive (about 10000 Euros), so this solution is a cheap alternative. A sample calibration for the office of the Control Systems Engineering group (PRT) and a tracked path is shown in [Fig.1]. With this kind of tracking system a "mixed reality"

environment, a shared space for collaboration of local and distant user can be realised [Fig.2].

[1] <http://grouper.ieee.org/groups/802/11/>

[2] http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/Tools.html

[3] <http://www.ekahau.com/>

[4] http://prt.fernuni-hagen.de/pro/virtuelle_umgebung/