**last modified**

2008-04-16

**reason for most recent change**

Two tracesets mannheim/compass/802.11 and mannheim/compass/fingerprint have been added.

**release date**

2008-04-11

**date/time of measurement start**

2006-02-11

**date/time of measurement end**

2006-10-14

**website**

[www.informatik.uni-mannheim.de/pi4/projects/loclib/loctrace.html](http://www.informatik.uni-mannheim.de/pi4/projects/loclib/loctrace.html)

**network type**

802.11 infrastructure

**collection environment**

Positioning systems are one of the key elements required by location-based services. We design and implement a positioning system called COMPASS which is based on 802.11-compliant network infrastructure and digital compasses. On the mobile device, COMPASS samples the signal strength values of different access points in its communication range and utilizes the orientation of the user to preselect a subset of the training data. The remaining training data is used by a probabilistic positioning algorithm to determine the position of the user.

While prior systems show limited accuracy due to blocking effects caused by the human body, we apply digital compasses to detect the orientations of the users so that they can deal with these blocking effects. After a short period of training the COMPASS system achieves an average error distance of less than 1.65 meters in the experimental environment of 312 square meters.

**network configuration**

The test environment is equipped with five Linksys / Cisco WRT54GS and four Lancom L-54g access points. All access points support 802.11b and 802.11g. One Lancom and all Linksys access points are located on the same floor as our testing area whereas three Lancom access point are located in other places inside the building. The exact position of the access points located inside the testing area is marked by squares in the floor plan (see the download link below).

**data collection methodology**

We deployed our positioning system in the hallway of an office building on the campus of the University of Mannheim. The operation area is nearly 15 meters in width and 36 meters in length, covering an area of approximately 312 square meters. The floor plan of the testing area is shown in the floor plan figure (see the download link below). The large hallway in the left part of the map is connected by two narrow hallways that are separated by rooms such as archives and a kitchen.

We marked the floor plan (see the download link below) with markers depicting the grid of the reference points (light-colored dots) and the online measurement points (dark dots). The access points are marked by squares.

As a client, we used a Lucent Orinco Silver PCMCIA network card supporting 802.11b. We collected the signal strength samples on an IBMThinkpad R51 running Linux kernel 2.6.13 and Wireless Tools 28pre.

To obtain the orientation of the user we used the Silicon Laboratories C8051F350 Digital Compass Reference Design Board. This device provides a USB-to-Serial bridge to access the data and is powered by the USB electricity supply. We calibrated the compass in the middle of the operation area. In a closer area around the calibration point we measured a variation of 1 degree. However, variations up to 23 degree were rarely detected at a few points of the testing area. These measurement errors occured always close to electromagnetic objects such as high-voltage power lines and electronic devices.

**offline file**

**last modified**

2006-11-14

**short description**

A trace of signal strength values from 802.11 APs measured at reference points for different orientations.

**description**

A trace of signal strength values from 802.11 APs measured at reference points for different orientations for the offline phase of the COMPASS positioning system.

**reason for most recent change**

the initial version

**derived**

false

**release date**

2006-09-13

**date/time of measurement start**

2006-02-11

**date/time of measurement end**

2006-03-09

**configuration**

During the offline phase, the signal strength was measured at reference points for different orientations. We collected 110 signal strength measurements at each reference point and for each orientation. This leads to 146,080 measurements for the offline phase. We spent over 10 hours to collect all the data.

**format of trace data**

t="Timestamp"; id="MACofScanDevice"; pos="RealPosition"; degree="orientation"; "MACofResponse1"="SignalStrengthValue","Frequency","Mode"; ... "MACofResponseN"="SignalStrengthValue","Frequency","Mode"

t: timestamp in milliseconds since midnight, January 1, 1970 UTC

id: MAC address of the scanning device

pos: the physical coordinate of the scanning device

degree: orientation of the user carrying the scanning device in degrees

MAC: MAC address of a responding peer (e.g. an access point or a device in adhoc mode)

with the corresponding values for signal strength in dBm, the channel frequency and

its mode (access point = 3, device in adhoc mode = 1)

**online file**

**last modified**

2006-11-14

**short description**

A trace of signal strength, which is derived from mannheim/compass/signalstrength/offline.

**description**

A trace of signal strength, which is derived from mannheim/compass/signalstrength/offline for online phase of the COMPASS positioning system.

**reason for most recent change**

the initial version

**derived**

true

**release date**

2006-09-29

**date/time of measurement start**

2006-02-11

**date/time of measurement end**

2006-03-09

**configuration**

We randomly selected 60 coordinates and orientations for the online phase. The only condition to select a point inside the testing area as an online set point is that it is surrounded by four reference points. Again, we collected 110 signal strength measurements for each online set point, leading to 6,600 measurements in total.

**format of trace data**

t="Timestamp"; id="MACofScanDevice"; pos="RealPosition"; degree="orientation"; "MACofResponse1"="SignalStrengthValue","Frequency","Mode"; ... "MACofResponseN"="SignalStrengthValue","Frequency","Mode"

t: timestamp in milliseconds since midnight, January 1, 1970 UTC

id: MAC address of the scanning device

pos: the physical coordinate of the scanning device

degree: orientation of the user carrying the scanning device in degrees

MAC: MAC address of a responding peer (e.g. an access point or a device in adhoc mode)

with the corresponding values for signal strength in dBm, the channel frequency and

its mode (access point = 3, device in adhoc mode = 1)