Patient Positioning System using the existing wireless infrastructure of hospitals.

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ABSTRACT

The pressure on healthcare is increasing with more short-term hospitalization and day-hospitalization visits. In order to cope with this drastic increase, improvements in hospital logistics are required. Therefore a solution is proposed to manage patient flows in-hospital by developing a patient positioning system using the hospital WIFI infrastructure to accurately position a person using his smartphone (or in a later phase using a dedicated wristband). This technology could hold many benefits such as accurately tracking patient whereabouts at different departments throughout the hospital, optimize workflow logistics based on time management, create dynamic scheduling and appointments by reducing waiting times and providing routing information to the patient while visiting the hospital. To date different techniques are available to realize indoor tracking, this system implements a technique named Received Signal Strength Indication (RSSI) which is using fingerprinting by using an open source location service provided by Redpin. The location data is collected and processed by a separate service that also provides an online Graphical User Interface (GUI). Accurate fingerprinting of a location consists of two phases: training and positioning phase, also called offline- and online phase see Fig 2. A fingerprint is a collection of multiple received signal strength indications (RSSI) from different locations or wireless access points (AP) combined with their unique address (MAC address). In the offline phase, the network modalities of a smartphone are used to build a database by mapping each room using specific reference points. At these reference points specific grid coordinates, a symbolic ID of the location and the collected RSSI information are combined. In room E1 six fingerprints are measured see Fig 1 and send to the database, each of these six measurements contain RSSI values of the AP’s.

Afterwards an online phase can start by running an application on the smartphone that is scanning at regular intervals to obtain the RSSI information it can cross correlate with the best possible match in the designed database. If a suitable match is found the server responds with a location.

The GUI keeps track of a patients whereabouts bye time stamping every location response and writing it with the patients ID to the location DB. The GUI can interpret and visualize the location data per patient.

From testing it’s known that the Redpin location service is capable of returning a location back at room accuracy. The purpose is to create a stable system that can return coherent location data of different patients at room. One concern is the capability of the open-source Redpin location service.

Figuur 1 Map Grid

Figuur 2 a) training phase, b) online phase