Diplomarbeitsbeschreibung

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2 Thesis

2.1 Working Title

Development of a LAN-based tracking system using Floor Plans

2.2 Summary

Positioning systems that use 802.11 for their positioning purposes are an eagerly developing field in the area of indoor positioning systems. The more promising among these systems use an approach called *fingerprinting* to estimate a user's position (e.g [1], [3]).

Hereby the positioning system compares live collected measurements to a pre-defined set of reference measurements stored in a database. The database entry that offers the best match is selected and the system returns the position where that reference measurement was collected at.

A major problem that such fingerprinting-based approaches have though, is the little but immanent probability to select a position far away from the real position of the user. This can happen, if - due to multipath propagation, scattering or other effects (see [5]) - the signal space is similar at two far distinct positions.

To overcome this issue, current tracking systems not only take current data but also the history of estimated user positions into consideration when making a new position estimation. This step already improves the situation, whilst still keeping lots of additional available information unexploited.

One major source of additional information are plans about the floor layout of the building the user is currently located in. With the help of such plans, it is quite easy to determine if a transition between two more or less adjacent reference positions is within the realms of possibility. For example, a user cannot move from one storey to the next within a few seconds if he is not near a stairway .

2.2.1 The Thesis

Subject of this thesis is the conceptual design, the implementation and the verification of positioning algorithms that exploit the additional information that can be gathered from floor plans or other structural building information.

During a first phase, an application shall be developed that uses a vectorized floor plan ([2]) and a set of reference positions and creates a weigthed graph with possible and impossible paths between the positions. To accomplish this task, the application shall be given a basic set of rules about possible and impossible transitions based on which it can make it's decisions.

If, for example, two positions lie in adjacent rooms that are not connected by a door, a movement from the one to the other position is unlikely in the short meantime between two position updates.

Subsequent, already available positioning algorithms (namely [1], [3])shall be modified to use information about the history of estimated positions as well as the transition probabilities from the graph computed in step one to eliminate unreachable or very unlikely positions from the algorithms' search space.

To verify the advantages of the algorithms modified in step two, the testbed for 802.11 based positioning algorithms that is already available at the "Lehrstuhl fuer Praktische Informatik IV" shall be extended to allow the comparision of the new algorithms with current ones.

Using the modified testbed, an evaluation of the advantages the novel algorithms offer shall be perfomed and an analysis of the achieved results shall be done.

In a closing step, final versions of the novel algorithms as well as the application to analyze the floor plans have to be integrated into the Loc-Suite of tools ([4]) for further experiments and reference.

Literatur

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