Platform for Hybrid Positioning based on a Sensor Description Language

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ABSTRACT

Indoor positioning is one of the most active research areas in the field of pervasive computing. While many different methods and approaches have been presented in recent years, no single system has emerged yet that satisfies the requirements of most possible application scenarios. We propose to solve this problem with a platform for hybrid positioning which chooses the most suitable from all available sensor information for position estimation. For that task, a sensor description language is defined which allows for the description of different sensors for indoor positioning, but also offers the possibility to describe various sensor fusion algorithms or even existing positioning systems. We define a sensor to be an entity measuring some phenomenon, thus including also sensor fusion algorithms and positioning systems to the definition. Hence, the contribution of our work is twofold: First, the platform for hybrid positioning is presented, followed by the sensor description language as the heart of the platform.
The platform consists of a sensor management component, a sensor discovery mechanism, a component for position estimation, and an advanced sensor combination mechanism which dynamically chooses those sensors for fusion and position estimation that are best with respect to the user criteria. This is achieved by comparing the capabilities and requirements of all available sensors, which are described in the sensor description language, thus computing all possible combinations of sensors and the estimated properties of each combination. These are matched to the user criteria and he best matching combination is utilized for position estimation. The feasibility of our approach is demonstrated by a prototypical evaluation of the sensor combination mechanism and estimation component, showing that hybrid positioning is possible and offers advantages over single existing systems by being able to cope with dynamically changing environments and varying user preferences.

KEYWORDS: Indoor Localization Systems, Opportunistic Sensor Fusion, Sensor Description Language, Hybrid Positioning Platform.
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