



Indoor Localization System

HSG-IMIT (Villingen-Schwenningen, Germany)



BACKGROUND and BASICS

- For outdoor environments the Global Positioning System (GPS) provides an available and low-cost solution for position determination of people and objects.
- For indoor environments there is hardly any comparable localization technology. Especially radio based, GPS-like methods fail because of the disruption that a radio signal underlies due to walls and other objects.
- The HSG-IMIT has developed methods, which combine the information from various sensors with knowledge about the environment and the moving objects to enable a robust localization inside buildings.



Fig1: Tracking of a person inside a building

CONCEPT and SOLUTION

- The developed localization system is based on the Nanotron™ radio technology. Nanotron™ offers a small energy saving radio chip which enables, apart from robust communication, time-of-flight based distance measurements between transmitter and receiver. Additionally the localization system comprises acceleration and angular rate sensors and an electronic compass (Fig.2).
- Information about the environment and about the motion of the tracked objects is also included in position calculation:
 - An indoor map provides constraints on the possible path of an object.
 - A forklift has a maximum possible speed.
 - A person has a different walking speed, depending on the type of motion (walking, running, standing).
- All this information is combined using data fusion algorithms (Fig.3), to enable the best possible estimation of an objects current position.



Fig 2: Nanotron Development board with HSG-IMIT sensor board extension

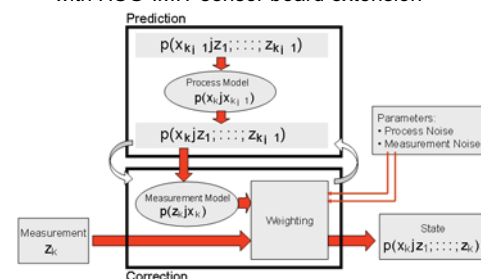


Fig.3 Recursive Bayesian Estimation Algorithms for sensor fusion

STATUS and OUTLOOK

We have developed a demonstrator system for tracking a person in an indoor environment. Fig. 4 shows the walking path of a person in the HSG-IMIT laboratories.

The algorithms have to be adapted to specific applications. We are looking for partners to go this step. Potential fields of application include:

- People tracking in care facilities or hospitals
- Flexible process control
- Intralogistics, materials handling
- Museum guide
- Mobile robots
- Location based services



Fig 4: Tracking of a walking person in the HSG-IMIT lab

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