Developing a sensor fusion based robust and reliable position estimation method in non-stationary indoor environment

CHALLENGES: Productivity, efficiency

PRODUCTIVE SECTOR: manufacturing process

PROBLEM DESCRIPTION

Visually impaired people lack the information of their indoor position, which makes their indoor movement very hard. The goal is to develop a position estimation system, over the voice machine they can get reliable information about their position.

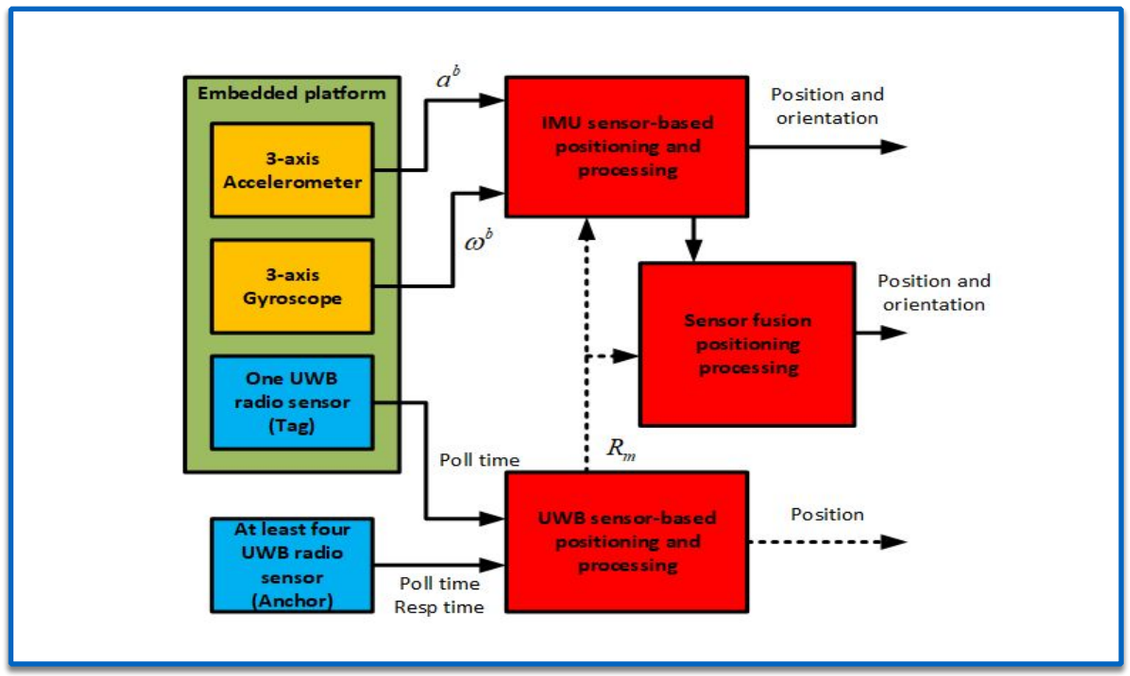
CHALLENGES AND GOALS

Given an indoor environment with some rooms, our task is to determine the position of the people wearing the localization unit using well-placed stationary anchors (transmitters with known position) in different rooms with time-of-flight (TOF) measurements fused with microelectromechanical systems (MEMS) based sensor data (accelerometer, gyroscope, magnetometer)

MATHEMATICAL AND COMPUTATIONAL METHODS

The problem can be interpreted as a nonlinear problem with a set of parameters from the mathematical model, the Microelectromechanical Systems (MEMS) sensors and the Time Of Fight (TOF) measurement, which can be solved using an extended Kalman filter (left side).

Inertial Measurement Unit (IMU) sensor-based position and orientation processing with extended Kalman Filter (right side)



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Results and Benefits

We developed a hardware and software that is capable of

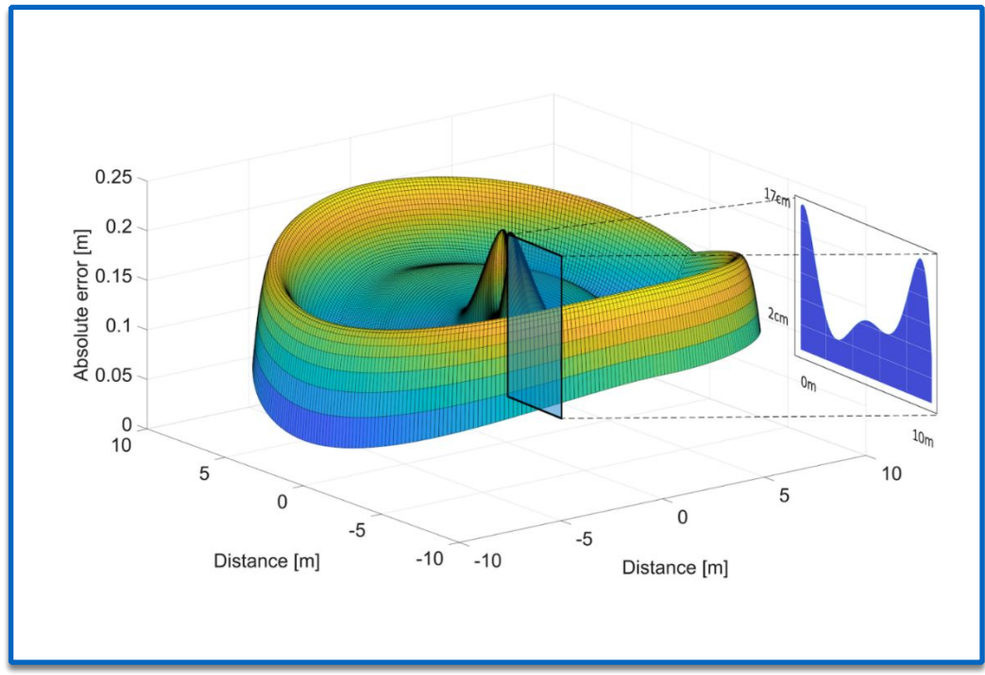
Correcting the measurement based on the short-range radio distancing
Calculate the exact indoor position using sensor fusion.

This system can be used by the company in their future projects like

Museum guide

The result was summarized in

Annales Mathematicae et Informaticae, May 19, 2020



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