

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

The Industrial Problem

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.

Name of Research Group

Research
group



The research topics are **Data Collection, Signal Processing, Sensor Fusion, Short-range radio communication.**

Company name

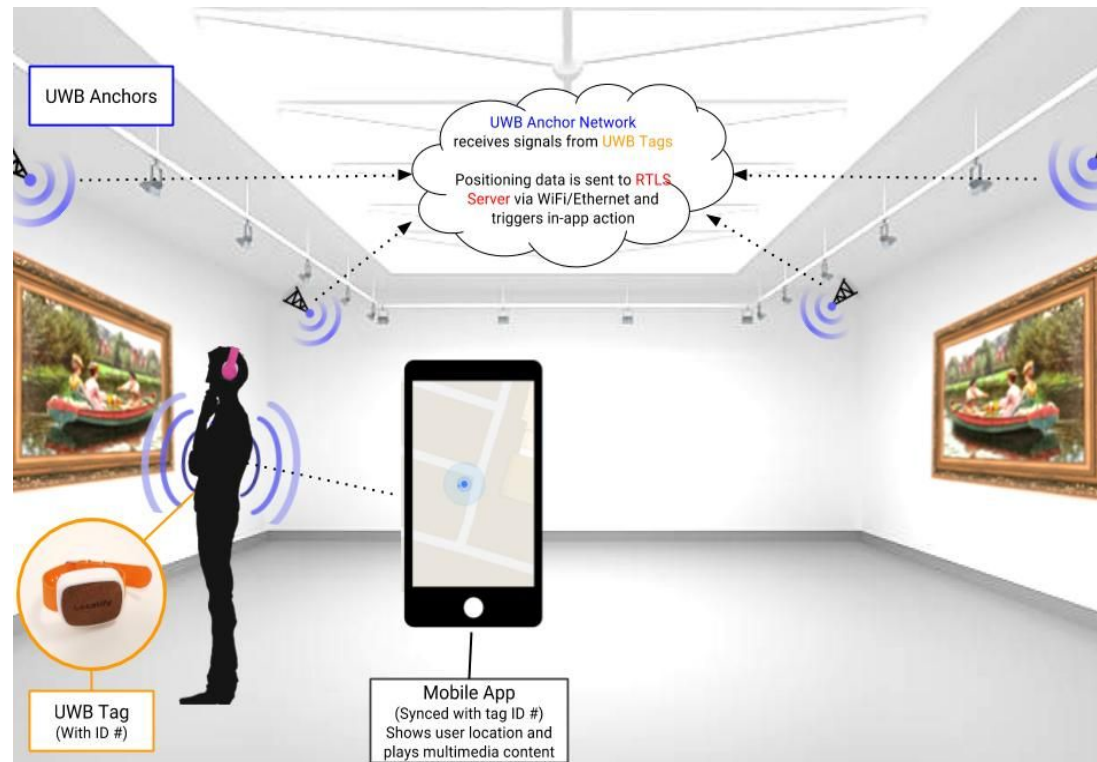
Company



TEConncept Hungary Ltd. is a professional and stable enterprise. They have relevant experience in digital signal processing short-range radio communication.

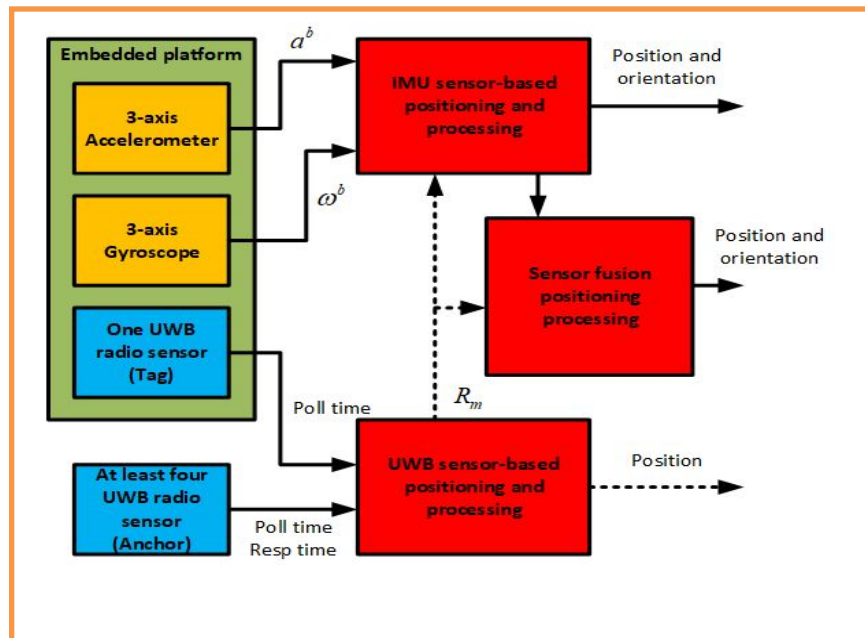
Challenges & Goals

- 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)

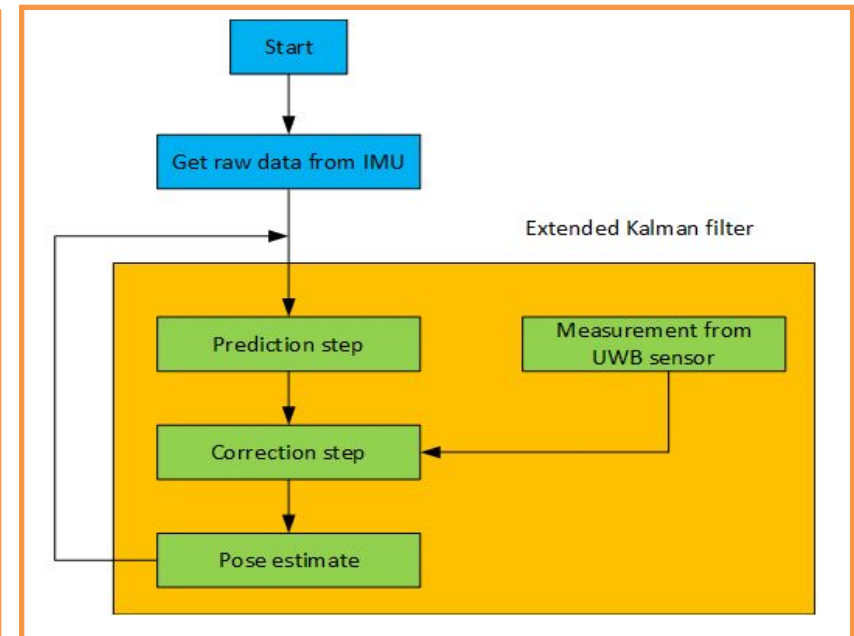


Proposed system

- 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 Flight (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)



Hardware architecture



Algorithm

Results & Benefits to the company

We developed a hardware and software that is capable of

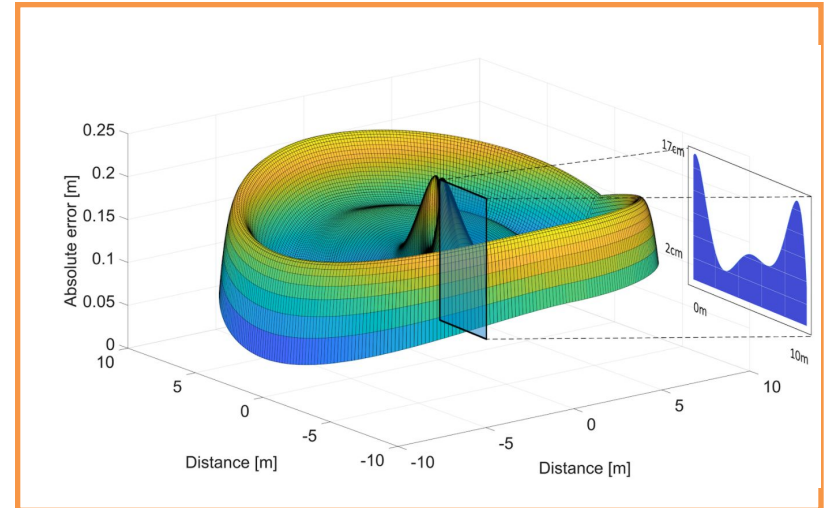
- Correcting the measurement based on the short-range radio distancing
- Calculate the exact indoor position using sensor fusion.

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



Error measurement