Internship: Visible Light Based Indoor Positioning System

Company: Nokia Bell Labs (Paris-Saclay) https://www.bell-labs.com
Department: Augmented Machine Interaction, Nokia Bell Labs, Route de Villejust, Nozay 91620, France
Supervisors: **Calvin C. S. Chen**, DMTS, Nokia Bell Labs
Fabio Pianese, Group Leader, Nokia Bell Labs
Starting date: Position available immediately (to start as soon as possible)
Contact: Calvin C. S. Chen (chung_shue.chen@nokia-bell-labs.com)

Context

Indoor positioning system attracts a lot of attention during recent years due to new applications. For example, positioning system can detect the position of a mobile device and use it to provide various services such as tracking, navigation, social networking, augmented reality, etc. It is also expected for many applications in industrial automation, intelligent systems, robotics and control. Visible light based indoor positioning systems have been proposed to provide highly accurate localization with low cost and low system complexity, built on conventional light emitting diodes (LEDs) and photodetectors (PDs) or sensors. They are different from traditional solutions and can offer some unique and interesting features and advantages.

Objective

In this work, we will develop a novel visible light based indoor positioning solution, which is highly accurate, low cost and energy efficient. Using conventional light emitting diodes, photodetectors and sensor devices, we will result in a concrete system and hardware design and derive an efficient localization algorithm to be implemented. Meanwhile, it is expected to support users in mobility and under ambient lighting. This work will be under a strong team of international research collaboration and finalize with a basic experimental prototype and technical report. Suitable technical results can be submitted to a distinguished conference or journal. It can be also considered as a preliminary work for a PhD program.

Tasks

- Study existing algorithms in the literature
- Feasible design of new visible light based indoor localization methods
- Numerical study and possible computer simulation
- Experimental set up and system implementation (prototype) for possible industrial demo
- Performance evaluation and technical report

Criteria of skills

- Mathematics for localization and triangulation method, vector calculus, 3D geometry, matrix operation, basic optimization method
- Knowledge of electronics, basic circuit (to design and build) and signal processing, basic optics, hardware knowledge (MPU, analog-to-digital/digital-to-analog converter, light emitting diodes, photodiodes, light sensors, see for example [9-13]), experiment and measurements
- Knowledge of basic wireless and light signal propagation models, principles of communication system, data analytics and machine learning (ML/DL)
- Software programming for MPU and the system implementation
- Language: fluent in English, we are in a multi-culture multi-language work environment

References

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