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*Keio University*

# Thesis Abstract

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Thesis Title

An Indoor Positioning Architecture Based on Visible Light Communication and Multiband Received Signal Strength Fingerprinting

Thesis Summary


In this dissertation, we focus on developing a new indoor positioning architecture that does not require any extra infrastructure and has long life cycle. The study approach focuses on the following technologies; visible light communication (VLC) that uses next generation light bulb as transmitter and multiband received signal strength (MRSS) fingerprinting created from existing wireless infrastructure.

Chapter 1 presents an introduction to the localization technology. First, we explain the need of indoor positioning system, including the key performance evaluation index for positioning system. Then, we move on to introduce our proposed architect, which does not require any modification on the core equipments after being implemented. We deploy machine learning algorithms in both subsystems to ensure the system involvement throughout the system.

Chapter 2 presents VLC based positioning subsystem architecture. The detailed investigation on characteristics of VLC based positioning subsystem is presented in this chapter. Based on system characteristic, field of view (FOV) limit and sensitivity limit, we proposed a switching estimated receiver position (SwERP) scheme that can improve positioning accuracy more than 80 % over the conventional VLID system.

Chapter 3 presents an additional module that help eliminating sensitivity limit requirement to enable SwERP scheme. To be specific, nearest transmitter classification (NTC) method based on optical orthogonal code (OOC) is used instead of relying on the presence of sensitivity limit. Moreover, based on FOV limit we propose a physical layer simulation model as a reference for future simulation purpose.

Chapter 4 is the proposal on deploying frequency diversity in received signal strength (RSS) fingerprinting, denoted as multiband received signal strength (MRSS) fingerprinting, which can improve positioning accuracy of the conventional RSS fingerprinting system over 50%. The characteristics and parameters that affect the positioning accuracy are provided in this chapter.

Chapter 5 concludes this dissertation. Design and implementation guidelines are suggested based on the performance study of the proposed indoor positioning architecture. The future possible developments based on this proposed architecture are also explained.