# 03 Optimization of real-time collective navigation
- Finding efficient navigation by Bayesian optimization -

Abstract

We are developing a technology for finding efficient navigation of moving crowds of people or vehicles. This technology predicts upcoming risks of congestion caused by the crowds and searches for the collectively optimal navigation to avoid the congestion. It is difficult for humans to figure out when, where, and how they should navigate the moving crowds to ease congestion. We present an algorithm for deriving a collectively optimal navigation using Bayesian optimization that evaluates which navigation contributes to solving congestion by various simulations. We further envision an advanced and adaptive navigation by incorporating real-time sensing data of people and vehicles. Our technology can navigate people on the fly and establish secure and comfortable event operations as well as stabilized infrastructures.

Our goal: secure & smart mobility of crowds via ICT & machine learning technologies

Real world

Sensing
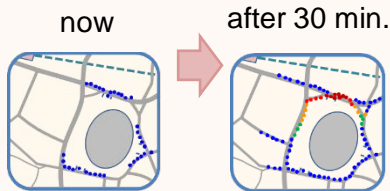
Navigation

find optimal navi.

Simulation environment
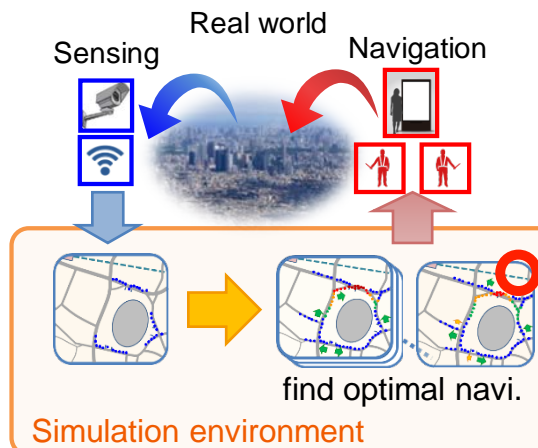
■ Learning intelligent navigations with various simulations & what-if scenarios
→ online & optimal navigation

■ Adaptation of the simulation env. to the real world for generating realistic navigations
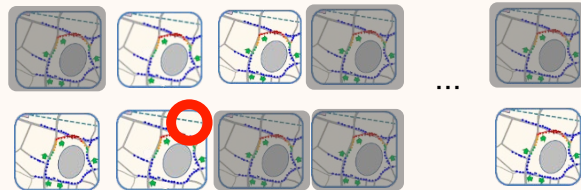
Scenarios

✓ Navigation from stations to event site

■ Adaptive queuing at airports/theme parks

■ Navigating vehicles around a mall

This panel: navigating crowds around a stadium via Bayesian optimization

Congestion risk estimation by short-scale simulation

now

after 30 min.

Search for navigation with least time to reach the goal using Bayesian optimization

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Reference

[1] "Automated learning of optimal collective navigation," NTT R&D Forum 2017.
http://labevent.ecl.ntt.co.jp/forum2017/elements/pdf_eng/03/C-13_e.pdf

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