# Y. Honma LAB.

## [Design of Urban Environmental Systems]

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# **Design of Urban Environmental Systems**

Mathematical Engineering for Sustainable Society

Urban environmental systems in present society have become large and complicated. However, by such upgrading of urban systems, lots of intractable problems are also pointed out. To tackle such problems in the society, In our laboratory, we have proposed to manage the above systems and grasp the basic structures using the "mathematical model".

> Mathematical Modelling

Analysis of Landscapes by Computational Geometry

The solid angle, which is closely related to the sky factor, has been used to assess urban landscapes. In this study, we propose a new algorithm to calculate the solid angles of urban landscapes.



#### Analysis of Fireworks Using Building Data



Fireworks displays are typical features of summer in Japan. In this study, we propose a mathematical model to evaluate the optimal view points for fireworks displays.

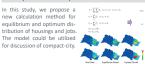
### Urban Concentrations by Japanese Railway Networks



In this study, we focus on the flow dynamics of urban activity distribution. Particularly, we examine how the construction of Japanese Shinkansen bullet train affects the developments of cities in Japan.

#### Equilibrium and Optimum Location of Housings and Jobs

Information Network for Sustainable Environment





 $\omega = \exp \left[-\gamma c_{ij}\right] \frac{W}{W}$ 

 $W_{\beta D} = \sum \exp \left[-\gamma C_{l_{\ell}}^{iD}\right] + \delta_{\beta i}$ 

Analysis of EV Movement Using Japanese Road Network



EV have attracted an increasing amount of attention, but the cruising distance is still insufficient. In this study, an elegant mathematical model for supporting infrastructure is proposed.

#### Sight-seeing Behavior Focused on Trip-chain

Analyzing sight-seeing behaveiors is important for sustainable developments of regions. In this study, focusing on the trip-chaining behavior in Japan, and estimate the number of Tourists.





We present a new multi-path

routing -MLB-routing-. Since

MLB-routing is pure multi-

path routing, it reduces the

convergence on some links

and also increases bandwidth

utilization in the network.

 $= \left(\sum_{i=1}^{n} \frac{(sp)^{ii}}{st} + \frac{s^{i}}{st} \sum_{i=1}^{N} \rho^{ii}\right)$ 

Some company has proposed an EV operations system called "battery switch system". In this study, we are focusing on the infra-structure required to support the optimal operation of battery switching system.

