Experimental vehicles, driving simulators, posters exhibited

Advanced Mobility Research Center

(ITS Center)

Intelligent Transport Systems

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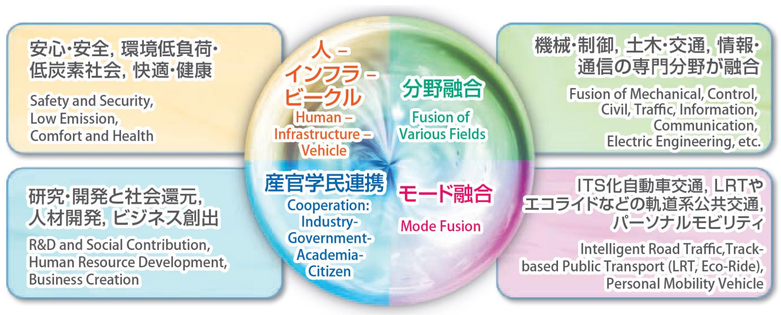
http://www.its.iis.u-tokyo.ac.jp/

- **ITS (Intelligent Transport Systems)** is an advanced transport system in which various fields, such as transport engineering, vehicle engineering, information technology, are integrated.
- The Advanced Mobility Research Center promotes research and development of ITS through collaboration of academia, public, and private sectors.



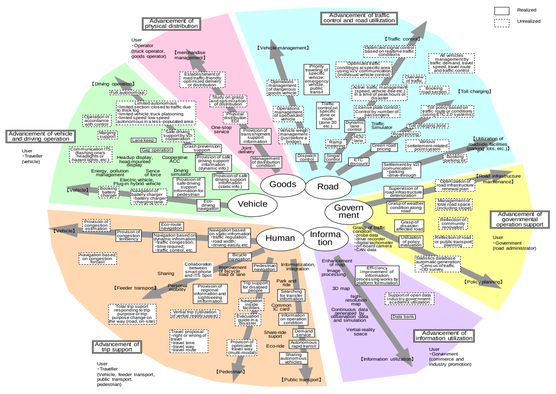
History

- ◆2003.4 “Sustainable ITS”, a cooperative project among academia, industry, and the government, started in CCR
- ◆2005.3 "Collaborative Research Center for Advanced Mobility (ITS Center)” established in IIS (Director: Prof. Dr. Ikeuchi)
- ◆2009.4 Upgraded to "Advanced Mobility Research Center (ITS Center)," an university-authorized research center (Director: Prof. Dr. Kuwahara)
- ◆2014.4 "Advanced Mobility Research Center (ITS Center)" (Director: Prof. Dr. Suda)

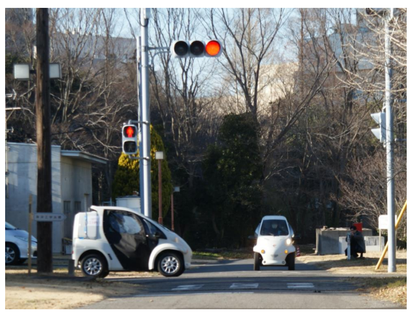
Research Activities

Cooperative ITS

- **Proposal of “Cooperative ITS”**
  Schematic Systems for ITS services



- **Next-Generation PTPS**
  PTPS using electric waves within 700 MHz band



Advanced Safety Vehicle (ASV) Project in Hiroshima

World-first on-road FOT of ADAS between tramcar and car, driving simulations for service evaluation, targeting ITS Connect (760MHz band) services.

DS experiments

On-road FOT in Hiroshima

Next-Generation Infrastructure

- **Road Space Design**

“Optical Dots” developed for safe and comfort driving , adopted by Tokyo Metropolitan Expressway

- **Public Address System in Tunnels**

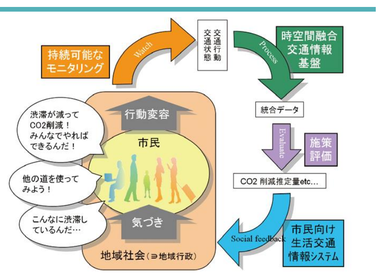
Public address system developed for the case of emergency evacuation in long tunnels, adopted by Tokyo Metropolitan Expressway

Tohoku Restoration Project

As a support for the earthquake disaster reconstruction of Tohoku region, the “Next-generation Energies for Tohoku Recovery (NET) Project” was initiated in 2012 to promote R&D of a mobility integrated energy management system (EMS) that supports the sustainable development of a disaster resilience region.

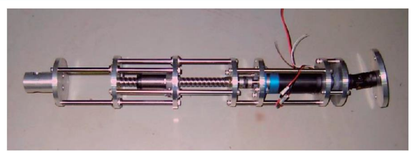
Kashiwa ITS FOT Model City

ITS research activities launched for environment-friendly transport society in kashiwa City, which is designated as one of the ITS FOT model cities by the Cabinet Office of Japan



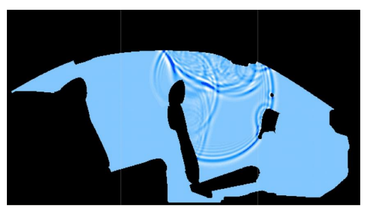
Next-Generation Vehicle

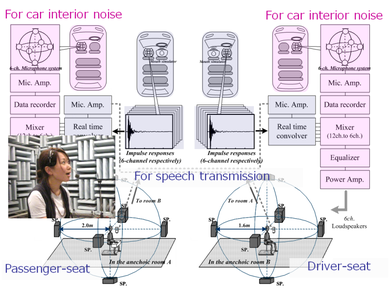
- **Electromagnetic Suspension**
  Composed of an electric motor and a ball-screw-and-nut, for an active suspension of an automobile



- **Analysis on Vehicle’s Vibration**
  Monitoring system of vehicle's vibration using ICA, which is a signal processing method to extract characteristics from mixed complicated observing signals, developed

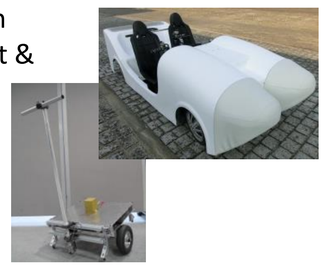
- **Sound Field Analysis and Assessment in Vehicles**
  Sound field prediction and assessment carried out by numerical analysis to create the acoustical comfort in vehicles





- **In-vehicle Layout**
  In-vehicle layout for improving passenger ride comfort adopted by Tokyu 7000 Series

- **Personal Mobility Vehicle (PMV)**
  Environment-friendly new urban transportation mode for comfort & efficient short-distance trip



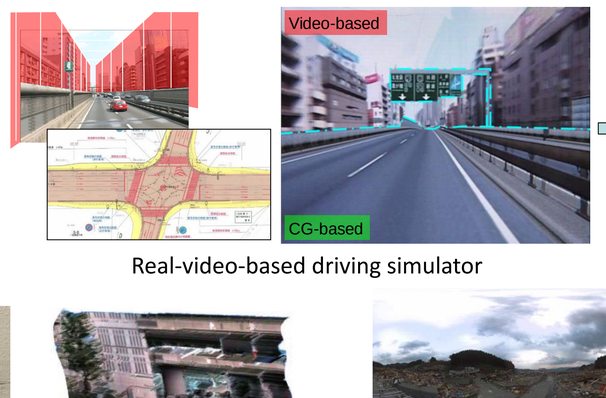
Traffic Simulations

- **Huge-scale traffic network simulator development and its application to Metropolitan three ring roads**
  about 400 thousand links, 200 thousand nodes, 110 thousand kilometers length and more than 1100 zones

Virtual City Modeling

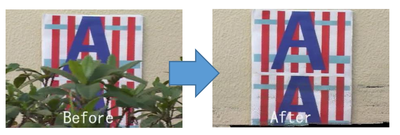
- Construct a virtual space using 3D geometric data and videos obtained by several kinds of sensing systems and digital maps

Mobile sensing system



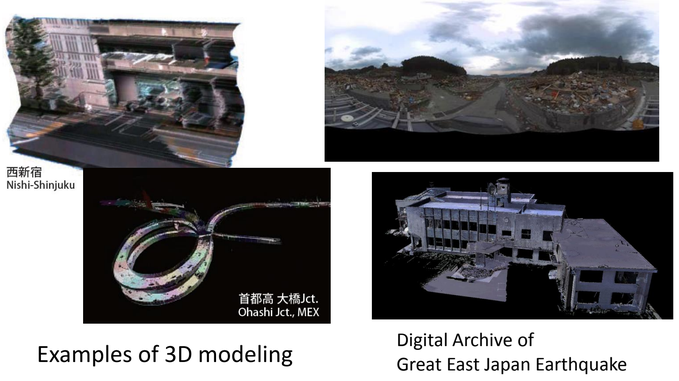
- Evacuation simulation
- Disaster prevention

Real-video-based driving simulator



Separation of background and foreground using spatio-temporal filtering

Super-resolution of on-vehicle video



Examples of 3D modeling

Digital Archive of Great East Japan Earthquake

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Research Activities

Smart Tourism

- The “Smart Tourism” is a novel ITS service for tourism taking advantage of mixed-reality (MR) technologies, next-generation mobility, etc.
- We classify actions of tourists as four steps: (1) Motivation (2) Visiting (3) Impression (4) Revisit, and provide visual information services using WWW and MR system, and mobility aid service using EV and PMV.

HMI

- V2X communication-based in-vehicle information systems, e.g., in-vehicle traffic lights

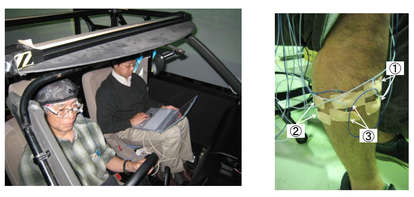
Truck Platoon

- Truck platoon system to reduce energy consumption using ITS technology

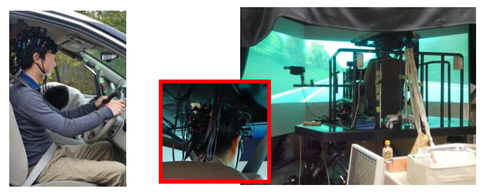
- Evaluation of social acceptability of truck platoon using universal driving simulator

Driver Sensing

- Analysis of driver’s fatigue and stress via perspiration rate, electromyography, heart beat rate, EEG, etc



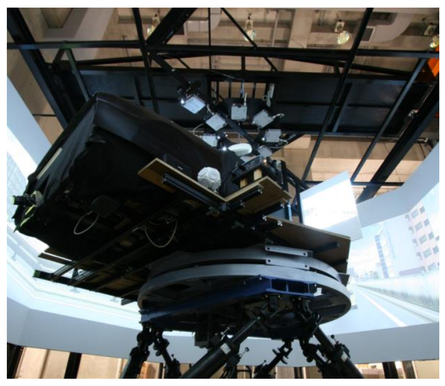
- Research on the relation between the driving operations and the cortical brain activity using brain measurement (fNIRS).



Research Facilities

Universal Driving Simulator (DS)

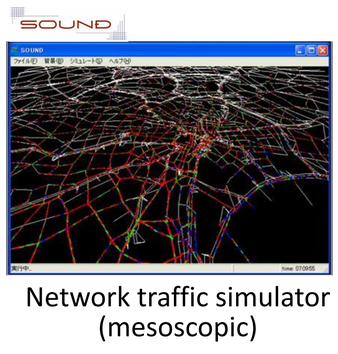
- Six-DOF motion platform with one-DOF turntable mechanism and image generation system for 360-degree view and door mirrors adopted with a car navigation system
- Reproducing driving environment and traffic condition close to the real world
- Used for experiments about driving behavior, assessment of driving safety on a new road infrastructure, etc



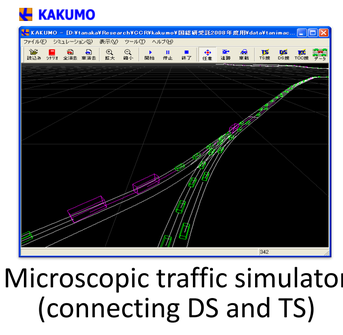
Various Traffic Simulation Models (TS)

- Traffic simulators (TS) of various scales developed, and ITS technologies and policies simulated and evaluated with high accuracy
- SOUND : A network traffic simulator, covering a wide network including expressways, while vehicles are considered individually .
- AVENUE : A street-level traffic simulator, based on the detailed maneuvers of individual vehicles, such as lane changing at an intersection. Used for evaluating traffic operation strategies, reducing congestion on streets, etc.
- KAKUMO : A micro traffic simulator, connecting TS and DS. It fills the gap of spatiotemporal resolution between TS and DS by calculating driver‘s behavior and vehicle dynamics of hundreds of vehicles around the test driver in DS. Simultaneously, the behavior of the test driver in DS is reflected to TS, and then the movements of surrounding vehicles and the traffic condition change interactively.

Street-level traffic simulator (mesoscopic)



Network traffic simulator (mesoscopic)



Microscopic traffic simulator (connecting DS and TS)

Chiba Experiment Station

- The Chiba Experiment Station of IIS are equipped with experiment fields for automobile and train and a driving simulator for large vehicle.

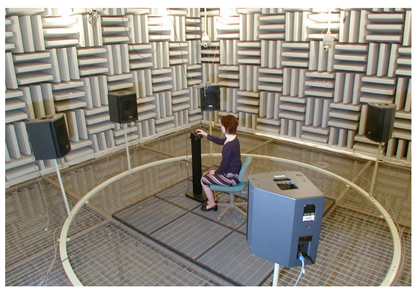
Proving ground with traffic light

Test track

DS for large vehicle

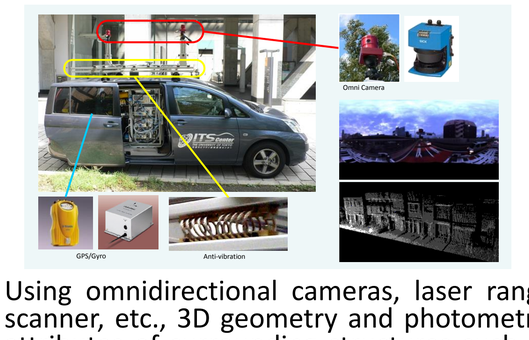
Anechoic Room

- Psycho-acoustical influence of an acoustical environment on human evaluated in an anechoic room equipped with 6-channel recording/reproduction system



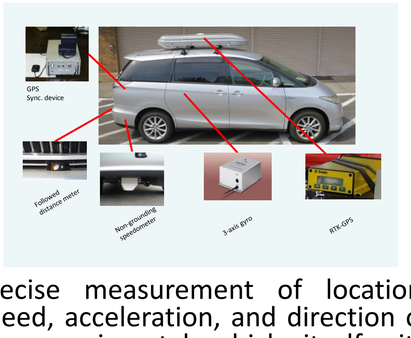
Development of Sensing Vehicles

- ARGUS



Using omnidirectional cameras, laser range scanner, etc., 3D geometry and photometric attributes of surrounding structures such as buildings and roads are collected

- MAESTRO II



Precise measurement of location, speed, acceleration, and direction of the experimental vehicle itself with relative positioning of the following vehicle

Human Resource Development and Social Return Activities

- **ITS Seminar**: Series of seminars organized about three times a year, and ITS based on needs from local areas as well as central administration promoted
- **Lectures**: Not only lectures for students but also a special course for private sectors organized for developing human resource in ITS industry
- **Research Committee**: Informal discussions about latest ITS topics hosted every month inviting speakers from academia, industry, and government

Global Collaboration

ITS Center hosts an international symposium every year and exchanges faculty members and students with other universities and institutes through international collaboration as well as domestic collaboration.