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Summary
of
oral presentations

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Future Mobility and Urban Development

Asst. Prof. Dr. Pawinee Iamtrakul

Thammasat University, Thailand

The “future mobility and urban development” is about to allow the interaction between land use and transportation in more systematic approach. By incorporating “smart mobility” to ensure quality of smart planning, “users” as the target groups of the system and the “key informants” of the city has become significant role to be considered and ensure for “improving quality of life” on the basis of service of transportation.

The multilayers of analysis must be performed by considered;

- end users;
- infrastructure;
- vehicles.

This is in order to exeat “smart mobility” to explore for suitable solution for our society which will finally bring benefits in several terms of;

- promote local to global economy;
- enhance the quality of environment for all sources; (air, water, noise)
- sustain living environment for all groups of people;
- help for safety and security environment for urban environment;
- facilitate people to freely mobile to their desire destination.

Finally, “smart mobility” can be starting point of “Thai society” to employ data for establish society solution. However, it must be incorporated with city’s vision and comprehensive planning to ensure social and environmental benefit to bring about “prosperity” to the whole society in more digitalizing approach and enable for monitoring and evaluation in efficient and equitable solution.

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SMART MOBILITY: Advanced Driver Assistance Systems towards Autonomous Driving Technology

Asst. Prof. Dr. Nuksit Noomwongs

Chulalongkorn University, Thailand

1. There are three big issues in mobility
    - Safety
    - Traffic congestion/ Assessment to mass transit
    - Energy/ Environment

2. Road safety is very important. There are three factors concern to road safety, human/ car/ road, human is one major factor. Advanced Driver assistance System (ADAS) is an ACTIVE Safety system helping driver to control a car in same condition human cannot control. Examples of ADAS are Adaptive Cruise Control (ACC), Lane Keeping Assistant (LKA), Automated Emergency Breaking (AEB), etc.

3. Autonomous vehicle was developed based on ADAS. We can classified it into level 0-5.
    - Level 0: No system.
    - Level 1: There is at least 1 ADAS in a car.
    - Level 2: Many ADASs work together to take control the car in situation that driver loose concentration/ drowsing, etc. Therefore the car can prevent from accident.
    - Level 3: Car can be automate driven in some area that the traffic is not complicate. The road has to be satisfied to use with level 3. Driver has to take control when needed.
    - Level 4,5: Car has very high automation. It can be used anywhere level 4 still need human in a car while level 5 does not need. To allow level 3 up autonomous car to be used in public road, rules and regulation, social acceptance, mutual technology, business model must be developed to support.

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Monitoring and Modelling of Air pollution in Chiang Mai Province

Assoc. Prof. Dr. Sate Sampattagul

Chiang Mai University, Thailand

1. The air pollution is a crisis disaster in Northern Thailand which affects to environmental, climate change, human health, socioeconomy aspect.
2. This study has developed the small sensor system for monitoring the PM 2.5, PM 10 concentrations by using A polarization-sensitive laser-light-scattering method and intelligent network systems for haze database.
3. We were reporting the haze data through an intelligent network system based on the website in order to be accessed the information of haze and air pollution situation more quickly and comprehensively.
4. Mostly air pollution in Northern Thailand was issued from open biomass burning in the area. Moreover, the trans-boundary pollution from neighboring countries, such as Myanmar, China, Laos and Indonesia is also important. These findings could be used to lead guidelines in the best practices of air pollution policy for the North of Thailand during the dry season to preventing or decreasing the cause of air pollution for sustainable sort out the air pollution problem and climate mitigation for the future.

Important Messages

- Global warming is real
- GW has contributing to tremendous climate change effects
- There are still the way out to relief and stop the crisis, LCA, CF, WF, Ecological Footprint.
- Many studies real clearly evidence that some gov policies will not fit well with sustainable future and we need to give them the strong voice and the right direction.
- There is nothing to loose now to fight against with GW and CC troubles, just do it today, do it now for yourselves and your children's children, for our beautiful planet that we have only the same one

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Climate Change Impacts and Mitigation Potentials in Thailand's Agriculture with Policy Update

Assoc. Prof. Dr. Witsanu Attavanich

Kasetsart University, Thailand

Thailand's Intended Nationally Determined Contribution (INDC) currently defines a mitigation target of 20% against business as usual (BAU), while the ambition can be further increased to 25%. So far, the economy wide INDC target includes major sectors such as energy, transport, industry and waste while agricultural sector does not be included. Therefore, this study aims to close the gaps in the current INDC by analyzing the mitigation potential in the agricultural sector.

There are several steps to obtain the future estimated GHG emission reduction under mitigation options. We firstly collected the primary and secondary data from official sources and experts. The collected data are then used as the input in the econometric model. Thirdly, we obtained the estimated coefficients from the previous step to quantify the Business as Usual (BAU) scenarios of crop/livestock activities and corresponding GHG emissions from 2005-2030 under changes in climate and socio-economic conditions. We selected the BAU under IPCC RCP6.0 with moderate fertility rate of population growth as a baseline for comparison. Finally, we added in the application of each mitigation option mainly captured by the change in the cost of production and levels of adoption rates to observe changes in crop/livestock activities and hence the corresponding changes in GHG emissions. Several criteria were used to select the mitigation options including: 1) Technical mitigation potential; 2) Effect on total emission reduction; 3) Investment costs; 4) Co-benefit; 5) Ease of implementation; 6) Timescale of implementation; and 7) Creditability of option base on literature. According to the criteria and several rounds of meetings with experts, five out of 26 mitigation options were selected for this study.

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Here we find that, for the option 1 (Applying alternative wetting and drying; AWD), the corresponding national GHG emissions of out-of-season rice can be reduced up to 12.70, 24.80 and 34.60 percent from the BAU in 2030 under low, medium, and high adoption scenarios, respectively. For the option 2 (Reducing field burning of crop residues), the national GHG emissions of all crops are projected to decrease 22.22, 44.28, and 66.47 percent from the BAU in 2030 under low, medium, and high adoption scenarios, respectively. For the option 3 (Application of site-specific nutrient management; SSNM)), this study revealed that total national GHG emissions of all crops are projected to slightly increase 0.14, 0.58, and 0.99 percent from the BAU in 2030 under low, medium, and high adoption scenarios, respectively. For the option 4 (Improve feed quality for livestock), this study discovered that the GHG emissions generated from option 1 are estimated to drop 0.83, 1.05, and 1.28 percent from the BAU in 2030 under low, moderate, and high adoption scenarios, respectively. For the option 5 (Anaerobic digester replacing uncovered anaerobic lagoon), we revealed that the national GHG emissions can be reduced up to 5.78, 7.83, and 9.88 percent from the BAU in 2030 under low, medium, and high adoption scenarios, respectively. Several policy recommendations can be extracted from the current study and will be discussed during the conference.

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From Practical to Future Research Issues on Water Resources Management

Mr. Adisorn Champathong

Royal Irrigation Department, Thailand

The presentation aims to link practical to future research issues on water resources management. According to IPCC AR5 Report, climate impacts on Asian countries are categorized into three issues: flood, heat, and drought. Responding to the key risks, Climate Action (Goal 13) of the UN Sustainable Development Goals (SDGs) was established in order to take urgent action to combat climate change and its impacts.

Several adaptation issues, for example, exposure reduction via structural and non-structural measures, or even effective land-use planning, were proposed in the IPCC Report. However, there are still obstacles due to relevant factors. To achieve the goals, the researches corresponding to local conditions could be expanded to tackle the future risks.

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Smart Water Management and Disaster Operation

Dr. Surajate Boonya-aroonnet

Hydro and Agro Informatics Institute, Thailand

Hydro and Agro Informatics Institute (HAII) has been working on research and development of the ICT to improve the water resources management in Thailand. HAII's core technologies range from data warehousing, data integration and management, high performance computing, mathematical modeling, data visualization and analytics. Since 2011 severe floods in Thailand, National Hydroinformatics and Climate Data Center (NHC) was established to unify the hydro-meteorological observations and other data related to water monitoring, forecasting and management in order to provide an online data access and central DSS for flood monitoring and forecasts. Currently, the NHC continuously collects 390 data items from 35 Thai agencies and provide a real-time data access so that the "smart water management and operations" especially for flood and drought disasters can be any water operation centers in Thailand.

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Research Challenges in LoRaWAN

Assoc. Prof. Dr. Rardchawadee Silapunt

King Mongkut's University of Technology Thonburi, Thailand

The Lower Power Wide Area Network (LPWAN) is a type of wireless network that has been adopted extensively for IoT applications that do not require high data rate transmission. One of the most widely used LPWAN technologies is the Long Range Wide Area Network (LoRaWAN). LoRaWAN uses the specific form or signal modulation known as Chirp Spread Spectrum, making the signal robust to the interference, thus providing a larger coverage area. In this talk, research challenges in LoRaWAN will be presented. My research group is focusing on improving the scalability and capacity of the LoRaWAN. First, we adapt and apply the CSMA (Channel Sensing Multiple Access) technique to manage the traffic of LoRA channels and second, we develop an algorithm to automatically allocate the spreading factor to end devices based on information of the receive signal strength indicator (RSSI), which offers more flexibility compared to the traditional LoRaWAN protocol.

Our group is also working on delivering IoT solutions using LoRaWAN. Examples include car tracking and dairy cow's estrus detection.

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AI-Based Logging System for ALICE O2 Facilities

Dr. Phond Phunchongharn

King Mongkut's University of Technology Thonburi, Thailand

CERN also known as The European Organization of Nuclear Research is a European organization that conducts research on particle physics to study the composition of matters in the universe. The experiments are using a particle accelerator to make particles colliding near the speed of light. This process allows physicists to understand particle interaction and insights into the basic principles of nature. CERN has four main particle detectors that will capture and record the effects of these collisions. ALICE (A Large Ion Collider Experiment) is a powerful particle detector on the Large Hadron Collider (LHC). It is designed to study the physics of interaction with high energy density substances, called plasma quark-gluon. O2 is the computing facility support team for ALICE experiments. O2 facilities have approximately 2000 nodes which is working all the time. Currently, there is no any logging system in ALICE O2. As a result, O2 operational team cannot provide preventive maintenance for the system effectively. We have, therefore, proposed an AI-based logging system for O2 facilities. The proposed system must provide the following functions: i) to collect, process, store and visualize the relevant information of the vast amounts of system logs that will be generated by the O2 hosts and services ii) to detect abnormal situations and alarm to the subsystem experts iii) to analyze the survival period of the cluster and recommend the pre-maintenance in order to reduce the cost and time of maintenance iv) to advance analyze the data within the domain of data analytics. Our team will take an ownership of the AI-based logging system in the full stack of software engineering activities from collecting the requirement from CERN, designing, implementing to maintaining the system for 3 years in the first phase. The main output of this project is the AI-based logging system, which has high potential for commercialization. This project does not only improving knowledge and skill of our researchers and students but also giving Thai people an opportunity to be recognized in the world-class research organization.

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Inter-Airplane Mesh Networking

Prof. Dr. Ichiro Kanaya

University of Nagasaki, Japan

1. Flying Airplane is the only practical choice for long-distance travel (e.g. Thailand – Japan) for many decades.
2. Over 6,000 airplanes are flying simultaneously in the world.
3. Air Traffic Management is highly important for safety of air travel in such a traffic jam.
4. Location of flying airplanes are collected by radars and second-surveillance radar (SSR) of airports, however, control towers and airplane pilots are community by voice.
5. We'll need digital communication method between ground to airplane, and, airplane to airplane.
6. It is hard to install new radio device on surface of airplane.
7. So, let's use existing hardware (SSR) and build the ad-hoc mesh network for inter-airplane communication.
8. Computer Simulation said the proposal was okay.
9. Future work: take advantage of structure of flying routes.

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Applying Hybrid System Optimization Method to Air Traffic Management

Dr. Daichi Toratani

Electronic Navigation Research Institute, Japan

The topic of this presentation was the optimization method for the hybrid system which includes both continuous and discrete systems. In the real world, there are various kinds of hybrid system, but the hybrid system optimization problem is one of the most difficult for the optimization techniques problem to solve. One of the promising approaches to solve the hybrid system optimization is the Mixed Integer Linear Programming (MILP). The MILP is a kind of Linear Programming which can treat both linear and integer variables, namely continuous and discrete variables. This presentation shown one example for applying the MILP to an optimization problem, merging optimization problem. The merging optimization optimizes the trajectory and sequence for arrival aircraft simultaneously while maintaining sufficient separation. The optimization result can reduce the total flight cost of the arrival aircraft than the radar data.

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Activities for Sustainable Energy in North Japan Area

Prof. Dr. Kenji Itaka

Hirosaki University, Japan

The topic of his talk was snow trouble on the solar power generation. He installed the test solar panel arrays with tilted angles, 10, 20, 30 degrees. The difference between the backside temperature and air temperature suggests the difference of covered or uncovered snow on the panel. The load cells installed at the legs pf test solar panel arrays show sharp jumps caused by snow drops. The drops were consistent of the temperature differences.

The discussion for his talk was as follows:

- How to avoid the damage of solar panels
- Is it possible to generate the electric power with snow?
- The optimization for the legs of panel arrays for the snow drops and wind-proof.

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CC and LCA in Transport

Dr. Yuki Kudoh

National Institute of Advanced Industrial Science and Technology, Japan

1. Presented the relationship between transport CO_2 and life cycle stages of vehicles.
2. Introduced the concept of “Well to Wheel”, an LCA variation for estimating the environmental emissions associated with vehicle use.
3. Pointed out the importance of the importance of identifying the “Right Vehicle” considering the energy supply structure and the needs for using vehicle in a certain counting or region from Well to Wheel perspective.

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Prevention of Lake Hachiro's water Pollution with GNSS Auto-steer Rice Transplanter

Dr. Yoshisada Nagasaka

National Agriculture and Food Research Organization, Japan

To reduce nutrient runoff from paddy field, we use RTKG GNSS auto steering system for puddled field water. Comparing with human operation, auto-steer has enough accuracy and it can reduce the nutrient runoff.

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Labor-saving Management for the Resumption of Farming in Disaster Area: Using IoT Prototyping Kit

Dr. Yoshimichi Yamashita

National Agriculture and Food Research Organization, Japan

Seven years has passed since Fukushima Daiichi nuclear disaster. Farmers have started farming in coastal and mountainous area. In the disaster area, most of them cultivate wet rice or glow flower in greenhouse in large scale paddy fields. Now, they commute their crop field. In addition, some of the farmers are not ready to start farming their crop field now. Farming corporation has to farming whole crop field in local area. The crop fields are big and “distant” from each other. These days, rice farming corporation in other area of Japan worries same thing because they are expanding their crop field. Therefore, we developed a self-made remote monitoring system using IoT prototyping kit for rice farmers. In order to manage the water pool for raising rice seedings, it is cheap enough for farmers and sends a message to farmer’s smartphone in any interval or when the temperature of the green house rises high or low. It worked well during growing period in the real scale.

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Knowledge sharing and integration with AI computers

Prof. Dr. Yoshikazu Nakajima

Tokyo Medical and Dental University, Japan

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Internet of Toys (IoT)

Asst. Prof. Dr. Keiko Yamamoto and Prof. Dr. Ichiroh Kanaya

Kyoto Institute of Technology and University of Nagasaki, Japan

Internet of things era has come. Everything is to be connected digitally. Key technologies of IoT are: low power and high-performance processors (e.g. ARM), long-life battery (e.g. LiPo), and low-energy network (e.g. Bluetooth Low Energy, LoRA, SIGFOX). From factory to society, Japan is a rapidly aging country, and factory-class efficiency is required everywhere. Taking care of children is exception. There have been wearable devices like smart phones, smart watches, etc. that can monitor accidents. However, kids don't like such wearable devices. We are media artists, so we design a system including toys that can monitor children's activity and connect it to the Internet. It's the Internet of Toys (IoT). Sensors inside the IoTs obtain children's activity data. And using deep learning, features extraction and classification are executed with the data. Based on the result of the deep learning, parents and nursery teachers can get the notification when the children face danger, check the unusual behavior and change of their children's emotion and so on. Additionally, people apart from the children can play with them thorough the Internet. 2011 March, the huge wave attacked to Miyagi prefecture in Japan. Many children who lost one of their parents or both of them. They lost their family, they also lost their memorable material. One of the serial problem is that they lost BOSHI-TECHO at that time. It means they lost their growth record. BOSHI-TECHO is a mother and child health handbook originated in Japan and Now BOSHI-TECHO has widely spread in some Asian and African countries. It contains the information for mothers, and the recording space for their children's physical and medical information. If the children lost their parents or BOSHI-TECHO, they couldn't know their own history of growth. In 2016, new version of BOSHI-TECHO for twelve years record is published in Japan. But these information are still recorded by hand writing by mothers or nursery teachers and it is physical handbook, so if other people (including children themselves) want to check it, they need to ask their parents. Now we are developing digital portfolio system like this. In the future, all of these dada are gathered automatically without any help of parents and nursery teachers, and the system can show each information against each people optimally, to solve problems surrounding children.

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