SUPPLIMENTAL MATERIAL
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February 27, 2025

The University of Tokyo Collaborates with Yourstand Inc., NITTO KOGYO CORPORATION and MITSUBISHI MOTORS CORPORATION to Develop Plug & Charge Service for Normal Chargers using the Connected Data of EVs

IIS, The University of Tokyo
Yourstand Inc.
NITTO KOGYO CORPORATION
MITSUBISHI MOTORS CORPORATION

Institute of Industrial Science, The University of Tokyo (Meguro-ku, Tokyo; Hiroshi Toshiyoshi, Director General; hereinafter "UTokyo_IIS"), in collaboration with Yourstand Inc. (Shinagawa-ku, Tokyo; Nobuyuki Ura, CEO; hereinafter " Yourstand"), NITTO KOGYO CORPORATION (Nagakute City, Aichi; Tohru Kurono, President & COO; hereinafter "NITTO KOGYO"), and MITSUBISHI MOTORS CORPORATION (Minato-ku, Tokyo, Takao Kato, CEO & COO; hereinafter "MITSUBISHI MOTORS") carried out a joint demonstration experiment leveraging the connected data of electric vehicles (EVs) to achieve Plug & Charge (PnC) services that enable charging without the use of a dedicated card or app in order to enhance the ease of use/ simplify the use of normal chargers (hereinafter "chargers").

1. Background of this initiative

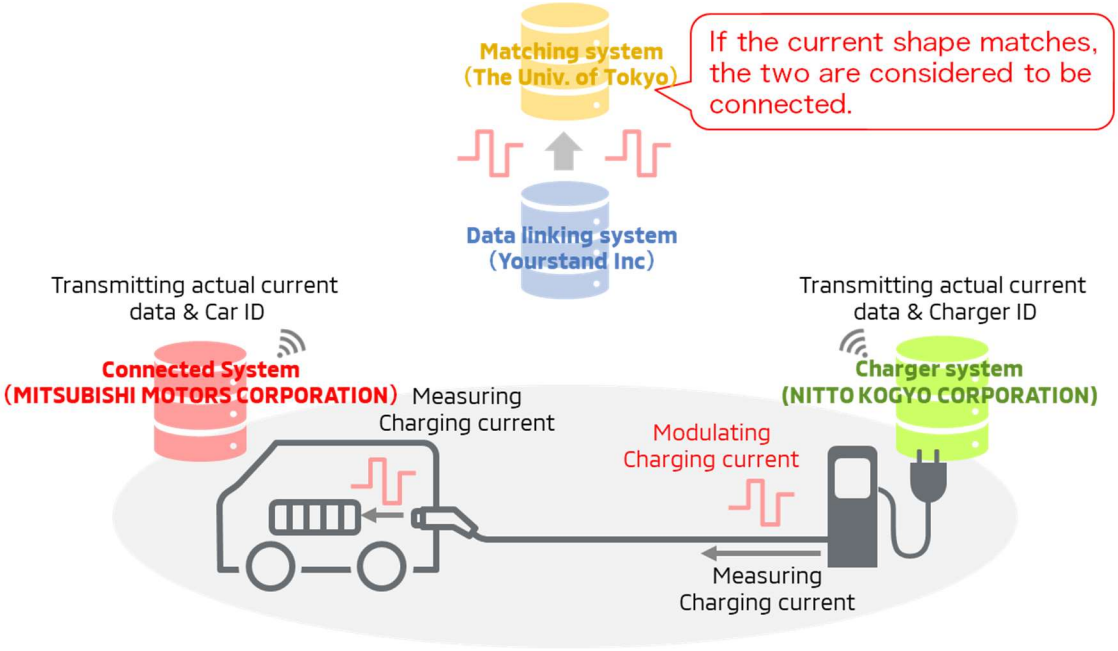
While factors considered necessary for the spread of EVs include improvements in driving range, charging speed, charging infrastructure, and the ease by which chargers can be used, to date, normal chargers have required the use of a dedicated charging card or app to identify and authenticate the EV because there is no function provided for identification between the EV and charger.
In order to eliminate this step, the demonstration experiment was carried out to test the feasibility of a PnC system that automatically identifies, by simply plugging in, the charger to which the EV is connected, authenticates it, and starts charging, using a PnC technology (hereinafter "the technology") proposed by Project Associate Professor Hiroyuki Baba of UTokyo_IIS.

*1 International patent pending by the University of Tokyo

2. Identification technology using connected data

For the demonstration experiment, a system developed by Yourstand was used for linking between the charging current sent by EV/PHEV Charging Equipment by NITTO KOGYO and the charging current sent by a light commercial EV MINICAB EV by MITSUBISHI MOTORS via connected technology (hereinafter "the connected system"). The two data sources were then confirmed using a matching sequence by UTokyo_IIS system.

Under this system, when the charger is plugged into the EV charging port, the current data (the current waveform) sent by the charger and the EV are verified against each other, and when the data matches, charging starts automatically.

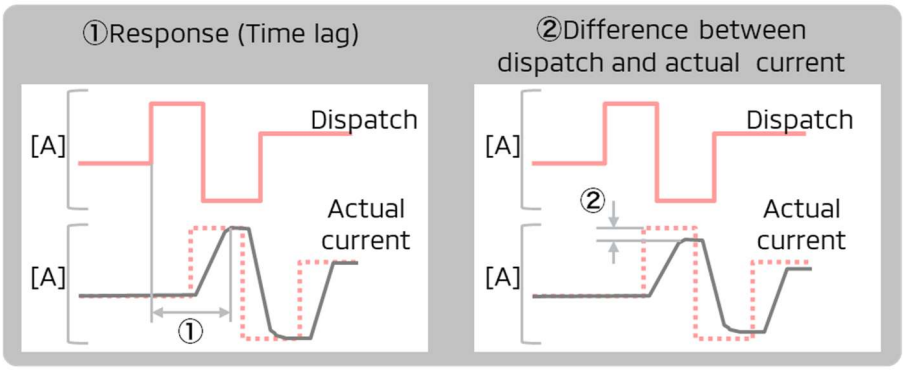


Basic configuration of the experimental system (two sets of chargers and EVs used)

3. Overview and example outcome of the demonstration experiment

Because the EV must respond to the modulated charging current quickly and accurately for this technology, the charging current responsiveness of the MINICAB EV was tested by MITSUBISHI MOTORS.

The results showed that high responsiveness was obtained when the charging current was modulated to the maximum that the MINICAB EV is capable, and the deviation from the modulation dispatch was small, demonstrating that it could be handled using this technology.



Furthermore, to test the feasibility of this technology, EVs were connected to two chargers in separate locations. Each was given a different pattern of modulated charging current, and the charging current shapes were verified. Because it was possible to identify which EV was connected to which charger, it was shown that the technology could be used for authentication.

MITSUBISHI MOTORS
a light commercial EV “MINICAB EV”

NITTO KOGYO
“EV/PHEV Charging Equipment”

4. Future prospects

Moving forward, each of the companies involved in the demonstration experiment will begin planning for the commercialization of new services using the technology. The ability to identify the combination of charger and EV simply by plugging in the charger using this technology suggests applications for a variety of services. Examples of plausible new charging services include smart charging services that propose the best charging times based on the utility market prices, or charging services for condominiums and workplaces where charging tariffs are billed automatically to the respective EV users based on the amount charged with automatic identification of EVs and chargers.

* Institute of Industrial Science, The University of Tokyo
Location : 4-6-1, Komaba, Meguro-ku, Tokyo, Japan
Director : Hiroshi Toshiyoshi, Director General
Business activities: Largest university-affiliated research institute in Japan
Established : May 31, 1949
Website : https://www.iis.u-tokyo.ac.jp
Role : Proposal of the modulated charging current technology, matching sequence, etc.

* Yourstand Inc.
Location : 5F KDX Higashi-Shinagawa Building, 4-10-13 Higashi Shinagawa, Shinagawa-ku, Tokyo, Japan
Director : Nobuyuki Ura, CEO
Business activities: EV charging and management services for multi-family homes, corporate and logistics sectors, smart charging capabilities
Established : March 16, 2018
Website : https://yourstand-ev.com/corporate/profile/
Role : Provision of charging spots and development of data linking systems

* NITTO KOGYO CORPORATION
Location : 2201, Kanihara, Nagakute City, Aichi, Japan
Director : Tohru Kurono, President & COO

Business activities: Manufacture and sale of electrical equipment including high voltage transformers, power distribution boards, and EV/PHEV chargers; and generation and sale of electricity
Established : November 24, 1948
Website : https://www.nito.co.jp
Role : Operation of chargers; and acquisition and linking of detailed charge current datafrom chargers

* MITSUBISHI MOTORS CORPORATION
Location : msb Tamachi Tamachi Station Tower S, 3-1-21, Shibaura, Minato-ku, Tokyo, Japan
Director : Takao Kato, CEO & COO
Business activities: Development, manufacture, sale, and financial business related to automobiles and automotive parts
Established : April 22, 1970
Established : https://www.mitsubishi-motors.com/jp/company/information/index.html
Role : Provision of EV, acquisition and linking of EV charge current data, and verification of EV responsiveness

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-MITSUBISHI MOTORS : Corporate public relations group
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<Reference>
More information is available on this technology via the YouTube channel for UTokyo_IIS.
Experiment summary: https://www.youtube.com/watch?v=4jzfEyU2oLc
and
Explanation of basic principles: https://www.youtube.com/watch?v=vuAg_1TVotM
The technical details will be reported as papers via the appropriate academic societies such as the Institute of Electrical Engineers of Japan.