Wireless Power Supply Technology for Running Vehicles: Experiment Using a Model Vehicle

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1. Studies on wireless power supply

The NILIM has been working, in partnership with Tokyo University, on developing and testing a technology that realizes power supply and battery charging for running electric vehicles. Until last year, our focus was to conduct some basic testing, such as electricity transfer over a big gap, and supplying electricity in a large area with an asymmetrical power transmission and reception unit, to identify the essential elements to achieve this goal. Using a power transmission and reception unit, 35cm in diameter, we have successfully transferred electricity over an approximately 80cm gap, which simulates the distance when transferring the power on an actual road. Another test using a model vehicle with a bulb attached has also proved it possible to supply power continuously, over 3m in distance, by employing transmission and reception units with different sizes and shapes. (See Photo 1)

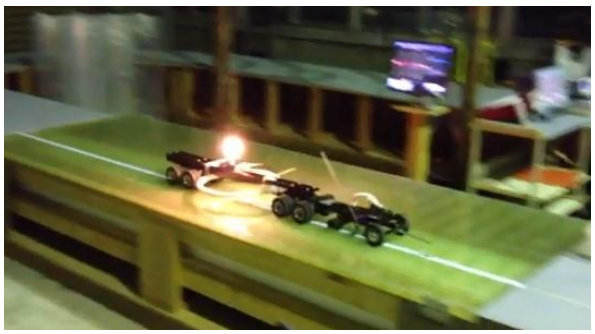

Photo 1 Experiment using a model vehicle

This year, we built a system where a model vehicle can run continuously using transferred electricity, and, by doing so, we identified a set of essential factors for wirelessly supplying power for a running vehicle. At ITS World Congress Tokyo 2013, we presented our experiment as well as its result.

2. The Challenges: from bulb to motor

Transferring electricity to a bulb, as seen in our experiments last year, is a favourable condition for wireless power supply using magnetic field resonance. With light bulbs, load is consistent, and the most of the energy is turned into heat and light, not returning to the power source. On the other hand, with electric vehicles, the load varies depending on conditions like the driver's control and the amount of power stored in the battery. This is a critical issue in achieving wireless power transfer with a magnetic field resonance system, resulting in situations like not being able to transfer electricity at all, or unexpected voltages applied to the storage battery.

Many of the wireless power supply devices currently in development for commercial use are for parked vehicles, and maintain optimal charging conditions by passing load status information from the vehicle to the power transmission unit. However, this method is not valid when the vehicles are running. We at The NILIM have achieved wireless electricity supply for a running model vehicle, by implementing a control circuit where both the power source and the receiver automatically maintain optimal conditions. (See Photo 2)

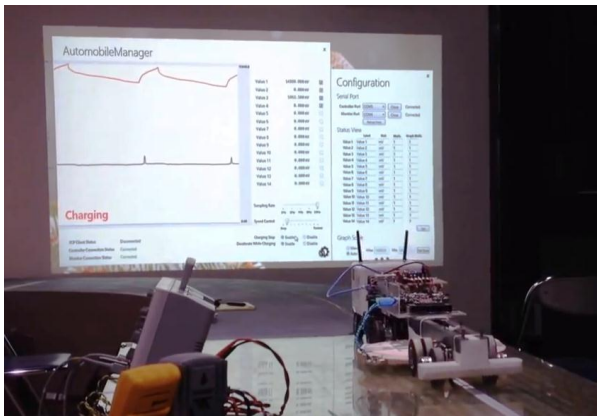

Photo 2 Experiment on power supply for a running vehicle

In Photo 2, you can see that the red graph, representing charging status, increases at the power supply point (where the car is, in the photograph), indicating that the battery is successfully charged while the model vehicle is running.

3. Supplying electricity for running vehicles

The test with the model confirms which technologies are required in order to supply electricity for running vehicles. However, it is still essential to test at higher levels of electrical power, in order to apply these results to real electric vehicles. Thus, our next step is to progress further with technical verification, aiming for a life-sized experiment and testing with greater power.