Wireless Power Transfer based on Strongly Coupled Magnetic Resonance (CKJ1c-13)

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Introduction
In an era where everything is going wireless, wireless power transfer (WPT) technology has various promising applications including charging mobile electronic devices, providing energy to electric powered vehicles, driving implantable medical devices, powering robots and so on.

However, the current methods have limitations in transmission distance, efficiency and security, which restricts the development of this technology. Therefore, a novel means of transferring energy through magnetic field is studied.

In this project, a novel method of WPT using a strong magnetic coupling will be studied in depth to see how it can greatly utilize the efficiency.

Aims and Objectives
The main objectives of the project are to search ways to establish a high efficient WPT system without significant drawbacks like central positions, path dependency and potential safety concerns. In a word, the main important objective is to find the characteristics of a WPT system more suitable for real application.

Implementation
The aim of the project is to design methods to establish a design of efficient WPT system via strong magnetic resonance. Therefore, one critical process is to determine how different factors affect the efficiency of power transfer. Simulations will be done using the software Comsol Electromagnetic Analyst to understand the particular effect of each factor on the performance of the WPT system.

Results
From the magnetic field distribution, it can be observed that the magnetic field created from the transmitter focuses on the receiver at resonance, thus establishing an efficient transmission. The field distribution is shown in Figure 1 and Figure 2.

The voltage transfer ratio can reach 90% at a distance of 1 meter, regardless of the relative angle.

Apart from that, some issues related to real applications including transmission between different coil units, disturbance of chaos and practical health concerns have also been discussed.

Conclusion
From the results of the project, coupled magnetic resonance has shown capability of efficient mid-range, undirected power transmission. With the assistance of a relay, a system can pick up 90% of the transmitted voltage 1 meter away from the transmitter. It is expected that this novel technology can save our everyday life as the main method of wireless power transmission.