2023 CAE Symposium
University of Memphis – Student Research Projects

Tony Pinson: Lightning Talk Presentation

Center of Excellence in Information Assurance Education

The Center for Information Assurance (CfIA)

- Nationally-designated Center of Academic Excellence in Cyber Defense Education and Research (CAE-CDE, CAE-R).

Department Collaborations:

- Computer Science Department

- Management of Information Systems (Fogelman College of Business and Economics)

- Cecil C. Humphreys School of Law

- Criminology and Criminal Justice

- Electrical and Computer Engineering Department (Herff College of Engineering)

Center of Excellence in Information Assurance Education

Training & Career Development

- The center provides student-centered research environment where both undergraduates and postgraduates get to work on federal-funded projects.

Current Student Research Projects

- Hierarchical Multi-factor Authentication
- 5G Math Modeling & Cybersecurity
- Autonomous Truck Platoon Security
- Dynamic Wireless Charging System Project
- Water Pumping System Project
- Autonomous Car Project

Autonomous Car Project

Student Researchers:

- Luke Carrington, Douglas Espinoza II, and Adam Thieme

Faculty Advisors:

- Dr. Dipankar Dasgupta, Professor of Computer Science

- Dr. Myounggyu Won, Assoc. Professor of Computer Science

Project Description:

- A standard R/C car was modified to include a camera, raspberry pi, and servo board for the purposes of transforming it into an autonomous vehicle.

Simulated Critical Infrastructure Cyber Attacks:

- SSH Remote Brute Force Login Attack

Water Pumping System Project

Student Researchers:

- Hans Siegfried Amelang
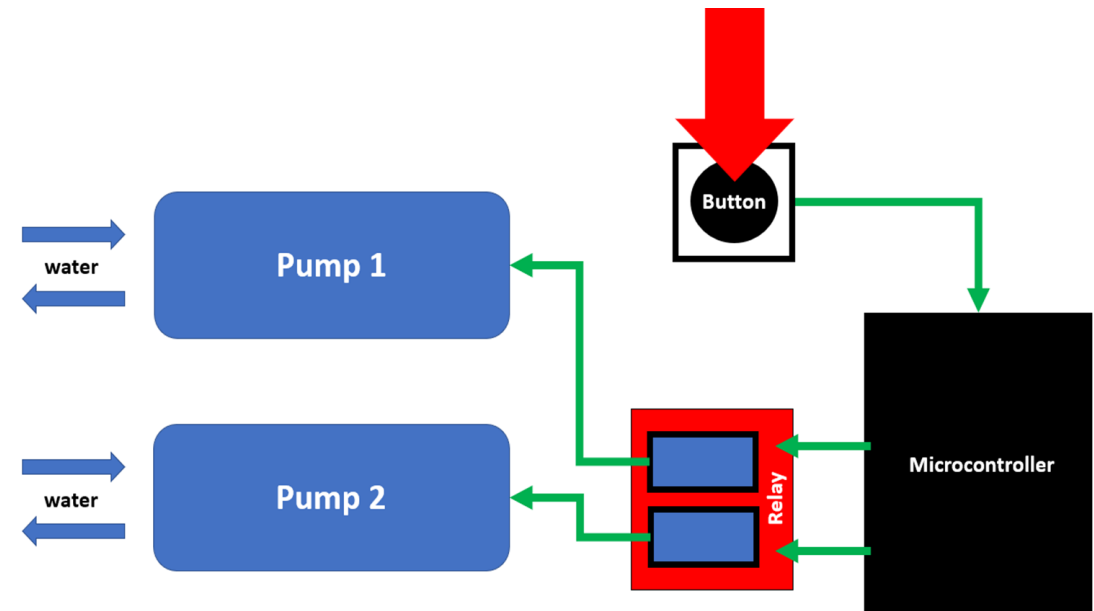
Faculty Advisors:

- Dr. Dipankar Dasgupta, Professor of Computer Science

- Dr. Myounggyu Won, Assoc. Professor of Computer Science

Project Description:

- A microcontroller-based model design to mimic a dual pump/reservoir industrial system where treatment chemicals are introduced into a water system to help meet water quality requirements.

Planned Critical Infrastructure Cyber Simulations:

- USB injection

- Web application network compromise attacks against the system

- Wireless IoT device update attacks

Dynamic Wireless Charging System Project

Student Researchers:

- Nathan Farrar

Faculty Advisors:

- Dr. Mohd Hasan Ali, Assoc. Professor of Electrical & Computer Engineering

- Dr. Dipankar Dasgupta, Professor of Computer Science

Project Description:

- A controlled inductive coil apparatus is used to simulate electric grid voltage supplied to a transmitting coil located under the road and conversely to a secondary coil located on a traveling electric vehicle.

Planned Critical Infrastructure Cyber Simulations:

- Denial-of-service attack (DoS)

- Attacks against coil alignment, primary controller, and vehicle autonomous control systems

Figure 1. Block diagram of an EV wireless charging system.
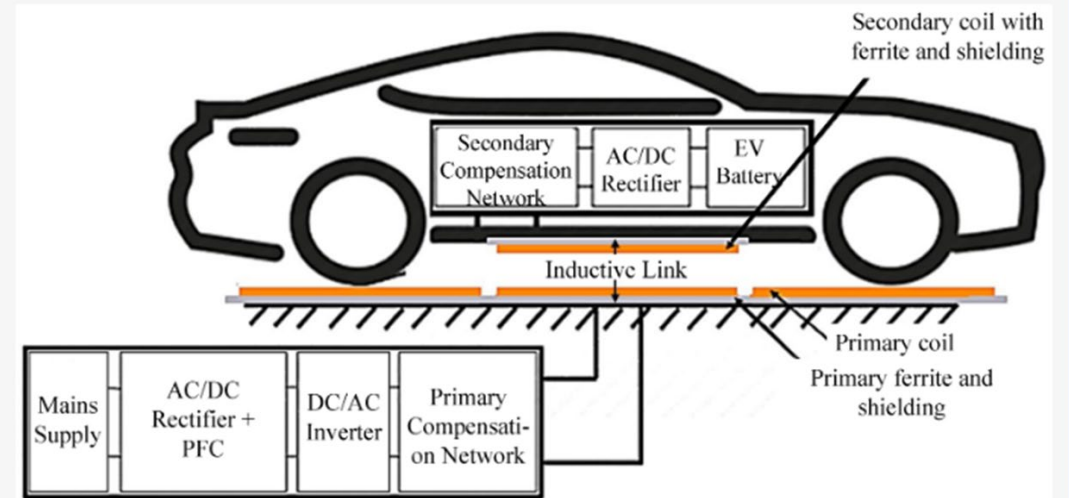
Note: Figure 1 adapted from *Design of a High Power, LCC-Compensated, Dynamic, Wireless Electric Vehicle Charging System with Improved Misalignment Tolerance* by Chunhua Liu, published by MDPI. [https://www.mdpi.com/1996-1073/14/4/885]

Thank You!