ECCV Control Benchmark for Sustainable Transport

Lars Eriksson, Robin Holmbom, Max Johansson, and others

Introduction

A control problem for a driving mission of a fuel cell electric heavy-duty truck was proposed for the IFAC World Congress 2023, where six teams presented their solution at the World Congress.

Challenge

The challenge was formalized as four evaluation criteria and hard constraints for a driving mission. The evaluation criteria were:

- **Hydrogen consumption**

$$\min \int \dot{m}_{H_2} dt$$

- **Fuel Cell Stack durability**

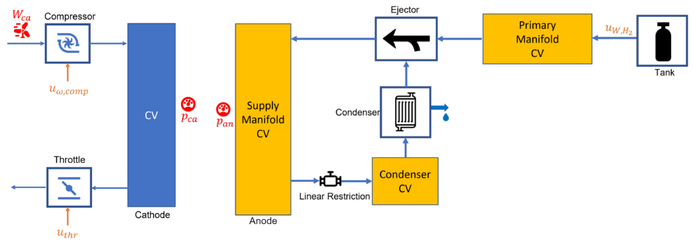
$$\min \int (\max\left[U_{fc}(t) - 718.5 + 5.85(T_{fc}(t) - 303), 0\right])^2 dt$$
$$\min \int (p_{an}(t) - p_{cat}(t) - 2\ \text{kPa})^2 dt$$

- **Minimum Execution time**

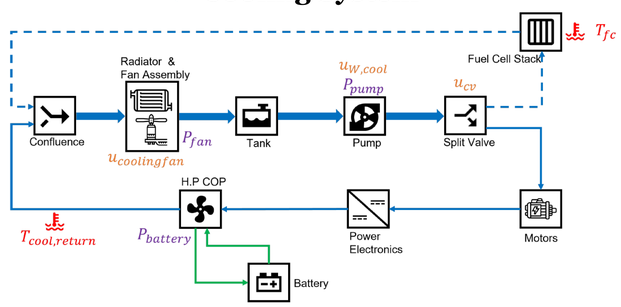
Constraints:

- Time of Arrival
- Vehicle Speed
- SOC Limits
- Battery Current Limits
- Fuel Cell Temperature
- Coolant Temperature
- Cathode humidity
- DC-Bus Voltage

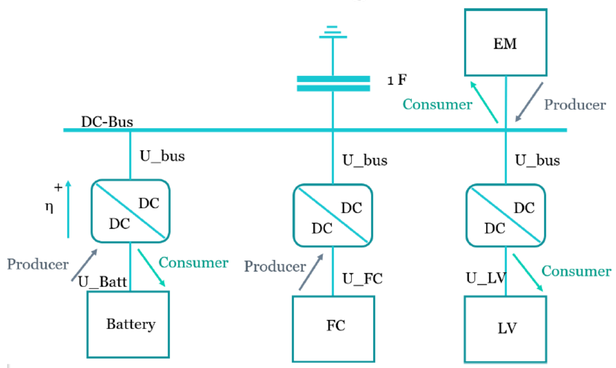
Fuel Cell Stack



Cooling System

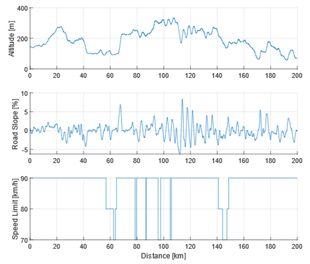


Power Management



Final Evaluation

Ödeshög - Göteborg



Team Origin	Speed Planning	Energy Mgmt	Fuel Cell Opt	FC MEA	FC Thermal	Vehicle Thermal	Total FC
Kuyngpook National University, KR		✔			✔	✔	
TU Eindhoven, NL	✔	✔					✔
TU Wien, AT*	✔	✔		✔			✔
University of Salerno, IT			✔	✔		✔	✔
University of Alabama, US	✔	✔					
Ohio State University, US		✔		✔	✔	✔	

*Announced as winner of the challenge

- Very challenging problem
- No silver bullet among the teams

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