Standing Meeting: EGoT DTM & ESI Technical Meeting
October 19, 2021, 1400-1450

Previous Minutes

- ☑ ~~Link to Discord~~

EGoT DC2 Test Plans

PEG Knowledge Share Spreadsheet

Attendees: Bass, Adham, Farooq

Agenda

- Adham
    - State project objectives for the ~next two weeks:
        - Wrap up the EMCB paper
        - Progress on COP plot
    - The progress you've made since the last meeting
        - EMCB paper:
            - Finished the Abstract and Introduction
            - Working on the Methodology section
                - Are including all plots from the report in the paper?
                    - I honestly don't want to exclude any of them. They are all directly related to the project.
                    - To find Tylor's papers: https://scholar.google.com/citations?hl=en&user=-9rObiQAAAAJ&view_op=list_works&sortby=pubdate
                    - ^^ Nope
                    - GMLC/PSU. (Jeopardized)
        - COP:
            - Last time, there was an error in calculating COP.
                - The error was using a fixed EnergyTake Value as 75 Wh.
                - The error was fixed. The EnergyTake difference in each timestep is taken.
                - Share screen
                - Here's a link to journal end of page 45
                    - Github has been having some issues this morning.
                - Q = [...] vector of thermal energy accumulation (Wh)
                - E = [...] vector of electrical energy accumulation (Wh)
                - COP = [Q1/E1...QN/EN] <-- will be noisey
                - Fit Q

        - Fit E
        - COP = [Qfit1/Efit1….QfitN/EfitN]
    - What you need to do next?
        - Work on methodology section
        - I have a meeting with English tutoring center on Thursday. I will modify the paper upon the feedback received.
        - Work on COP equation
    - Technical questions for the team:
        - None

- Farooq
    - State project objectives for the ~next two weeks:
        - Reduce processing time of the code.
        - Code optimization.
    - The progress you've made since the last meeting
        - Changed the code completely in an attempt to reduce processing time. Used OOP but didn't work well. Back to my original code.
        - Did some code optimization:
            - Instead of reading csv files in every iteration, all csv files were read in the beginning and stored in arrays to be used in code later. Slightly reduced processing time.
            - **Memoization** - with random numbers there is a chance that slew rate might be calculated for the same frequency file and same window size more than once. Included a dictionary to return previous value if it's already there. Will reduce processing time when called more than once, cannot be checked directly.
        - Changed data modelling: After reading csv files, nominal frequency values are omitted to store only those values which are outside nomical band. It reduced size of data considerably and hence processing time. (See plot and discuss).
        - Literature search for my independent study.
    - What you need to do next?
        - See if the nominal frequency band can be increased without affecting the information in data files.
        - Amazon and google have cloud computing services. I will try to use it. Worth it?
            - To improve computational power.
            - To improve experimental control and repeatability.
            - Academic accounts? Trial accounts?
            - Midrar - has used Google collab
    - Technical questions for the team:
        - Related to Systematic literature review.

2022 Capstone Team:

Project Tasks:

As there is no industry-standard definition of a frequency event, we want the detection algorithm to be customizable to match the definitions of various balancing authorities. This can be done by custom tuning the thresholds of each of the tuning parameters. A PSU graduate student is developing an optimization method for performing this tuning. This method will return the required tuning variables to set the detection system to match expert opinions of what constitutes a frequency event.

The 2021 capstone team developed a system for gathering expert opinions on frequency events. The system presents an expert with a series of survey questions, which displays plots of frequency over time. Experts review the presented plots and indicate whether they observe a frequency event or not. The 2022 capstone team will improve this survey and make it more user-friendly. A web app with user accounts may need to be developed so the survey can be taken multiple times and tracked across attempts. Being able to customize the detection system for different tolerances and sensitivity is key to the entire project and will be a major focus.

The survey will be sent to industry exports, results will be tabulated, and these results will be used to tune the algorithm according to those experts' opinions.

The 2021 Capstone team developed an event detection algorithm in Python. They were only able to test it using archived event files and post-processing data analysis methods. The summer 2021 interns wrote the algorithm within the RTAC directly using structured text. The 2022 capstone team will conduct real-time testing of the algorithm using either live grid data or by running prerecorded events through the NHR grid simulator. Real-time testing will be done to verify if optimized tuning parameters return results are commensurate with experts' opinions.

The 2022 capstone team will be to package the logic of the detection algorithm into an easy-to-implement SEL library. In order for this system to have widespread industry use, it will have to be exportable and have minimum setup requirements. As part of the library, the 2022 capstone team will develop a user interface to easily set the desired tuning parameter variables given by the survey or web app and give feedback on performance. Once packaged into an SEL library, engineers and researchers elsewhere will be able to implement and modify our work to improve their own frequency detection capabilities.