About Philips Drachten

At Philips Drachten, we develop innovative products in the Personal Care and Personal Health domains, including shavers, trimmers, epilators and electric toothbrushes. As part of a multidisciplinary engineering environment, you will work on real product technology together with experienced electronics, software and mechatronics engineers.

Assignment

In most cases, a PI-controller is used to achieve a constant and defined speed for functions such as shaving and epilating. The speed is estimated using an algorithm that is only accurate when the system has stabilised. In addition, hardware and software limitations require considerable filtering to prevent aliasing.

These factors can make speed control inaccurate during load changes and relatively slow. Fast speed control is becoming increasingly important due to the different motors and functions within Philips Health Tech. This Master thesis focuses on investigating and implementing a State Observer solution for fast motor speed control.

The following elements are part of the assignment:

1. Investigate / get understanding of how motor speed control and speed estimation / measurement is done in current appliances.
2. Investigate State Observer theory and options (e.g., via books and analytical calculations).
3. Investigate State Observer behavior and options in a simulation environment (e.g., Matlab).
4. Implement the best State Observer option, including speed control, in software (on a MicroController).
    - Investigate the motor control setup in the current software.
    - Define the software platform and constraints: what can be left out and what should be included.
    - Write / change micro-controller software.
5. Check the newly defined system against the old way of working.
    - Define test setup and test cases.
    - Evaluate and compare performance / responses.
6. Optionally: investigate other State Observer possibilities.

What we are looking for

You are a Master’s student in Electrical Engineering, Mechatronics Engineering, Control Engineering, or a related field. You have an interest in control systems, motor control, embedded software and modelling/simulation.

Practical information

- **Type of assignment:** Master thesis
- **Preferred duration:** At least 5 months
- **Location:** Philips Drachten
- **Initiator/Supervisor:** Bernardo Mulder