E-Machine Rotor Position Estimate Function

Background

At Aurobay, we power the future with sustainable powertrains featuring different combinations of combustion engines and electrification. To make our work and products more efficient we need continuous knowledge development of the systems we control. Control of electric machines is a new area within Aurobay and we are about to develop a control software for this. The ambition for this software is to operate the e-machine at the highest possible efficiency with high torque accuracy, but also to be very robust to failures.

For efficient control of a synchronous AC machine, resolvers are typically used to determine the rotor position. In this thesis work a strategy for estimating the rotor position of a synchronous e-machine should be developed, but without relying on the resolver. The algorithm should also provide a quality assessment of the estimate. The resolver (or another angular sensor) must be adapted for offset and potentially also for a skewed signal. The algorithm should be used for these adaptations. If the position sensor is broken, the algorithm should also act as a good backup.

Objectives

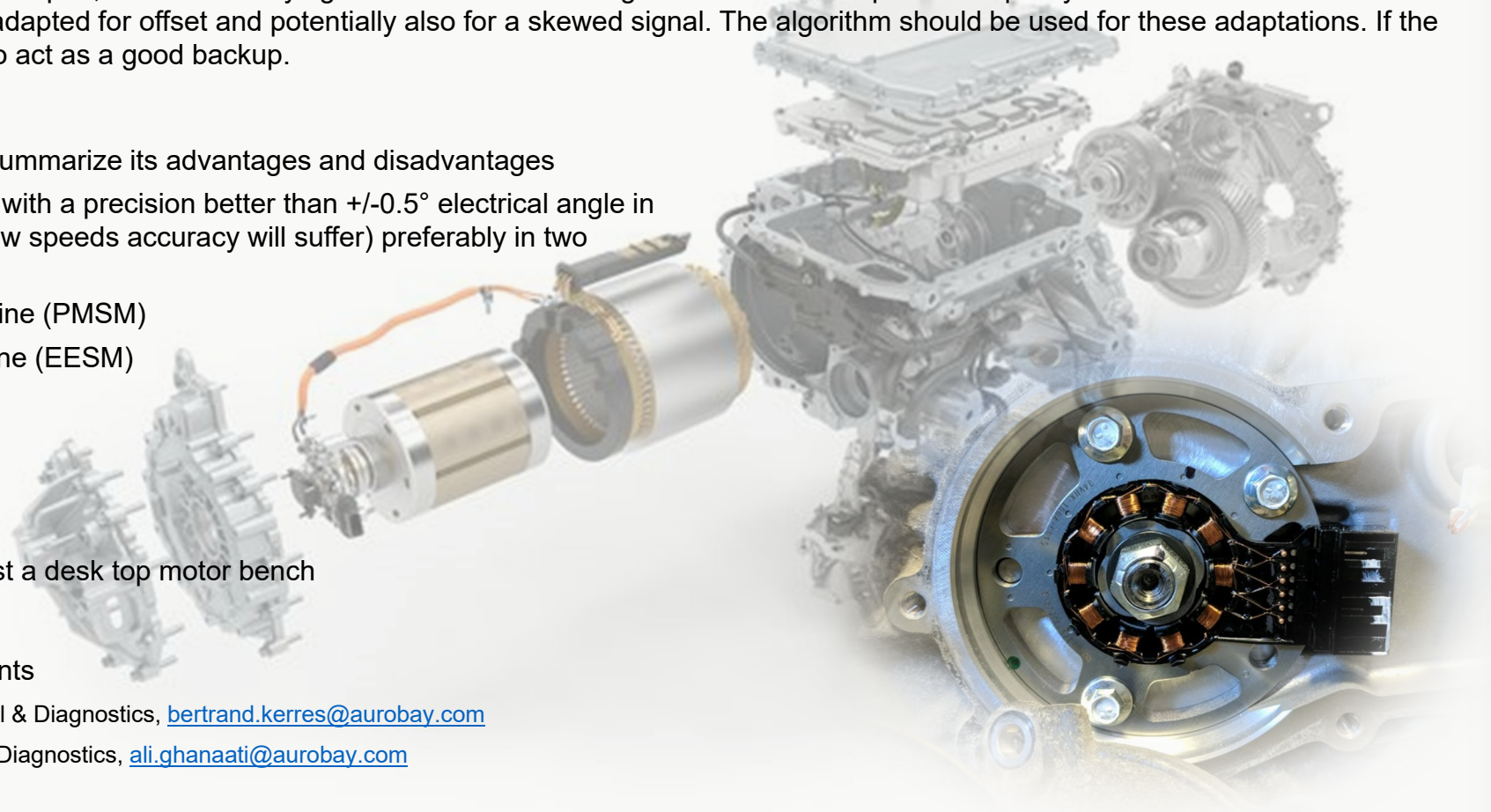
- Study the operational principle of a resolver, summarize its advantages and disadvantages
- Design a function for rotor position estimation with a precision better than +/-0.5° electrical angle in the most favorable operating points (at very low speeds accuracy will suffer) preferably in two motor configurations:
  - Permanent magnet synchronous machine (PMSM)
  - Electrically excited synchronous machine (EESM)
- Quantify the estimation precision

Activities

- Literature study
- Function design in Simulink/Target Link
- Implementation and test of the function against a desk top motor bench

Micellaneous

- Scope of work is suitable for one or two students



Aurobay contact: Bertrand Kerres, Engine Control & Diagnostics, bertrand.kerres@aurobay.com
Ali Ghanaati, Engine Control & Diagnostics, ali.ghanaati@aurobay.com

Aurobay