Sensorless rotor angle estimation for PSMs

- **Motivation:**
  Permanent magnet synchronous motors (PSMs) are widely used as traction drives and are usually equipped with a rotor angle sensor, e.g., a resolver. However, those sensors are costly, require space, and are subject to disturbances. Therefore, it is of interest to remove them and use other available measurement signals to estimate the rotor angle and speed, both needed for the control of the motor.
  The focus of this work shall be on standstill and low speeds. For these regions, sensorless position estimation algorithms often rely on physical motor properties which become less present for higher torques/currents. This results in an undesirable limitation of the operating range. The motivation for this work is to develop concepts to overcome such limitations and enable operation as if an angle sensor was present.

- **Objectives:**
  - Literature research for sensorless angle/speed estimation algorithms for PSMs for standstill/low speeds
  - Development and implementation of promising algorithms for PSM traction drives focusing on reasonable computational effort and enabling full utilization of the operating range w.r.t. torque in motoring and generating mode
  - Validation of the developed algorithms in simulation

- **Start:** now

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