Instruction of simulation exercise

Direct Field Oriented Control of Squirrel-Cage Induction Motor

The aim of the exercise is to get familiar with direct field-oriented control method of squirrel-cage induction motor. The simulation model includes:

- *Control system* – speed control system, which includes control algorithm, speed setpoint block *speed_prof* and speed change rate block *Speed_ramp*,
- *Scopes* – allows visualisation of space vectors of currents, voltages and fluxes (*Space vectors* block). *CONST.1* selects coordinate system: 0 – rotating, 1 - stationary.

Plan of the exercise

1. For three different values of speed setpoint (eg. 10%, 50%, 90%) and different load torque values (eg. -90%, -50%, -10%, 10%, 50%, 90%) measure the values of x and y components of motor current and voltage (at steady state). Reduce the rotor flux setpoint *F_req* (CONST.13) by 20% and do the same measurements. Comment the obtained results.

2. Set the nominal value of the rotor flux setpoint. For three different values of speed setpoint (eg. 80%, 10%, -80%) for motor and brake operation (load torque equal to eg. 60% and -60%) observe the waveforms of mechanical (torque, speed), electrical (voltages and currents) and control (x and y components of current and voltage) quantities. Comment the obtained results.

3. For two different values of speed setpoint (eg. 80%, 10%) for no-load, motor and brake operation (load torque equal to eg. 0%, 60% and -60%) observe the space vectors of motor current, voltage and flux (*Space Vector Ploter* block) in rotating coordinate system. Make the observation during the simulation proces. It is possible to slow the time elapse by setting the *Pause time* parameter to 1µs. Comment the obtained results.

4. For the speed setpoint equal to 0 for Dla prędkości zadanej równej %) for no-load, motor and brake operation (load torque equal to eg. 0%, 60% and -60%) observe the space vectors of motor current, voltage and flux (*Space Vector Ploter* block) in rotating coordinate system. Make the observation during the simulation proces. It is possible to slow the time elapse by setting the *Pause time* parameter to 1µs. Comment the obtained results.