

I. IDENTIFICATION DATA

Thesis name:	Determination of Induction motor speed using Kalman Filter
Author's name:	Ranjan Tiwari
Type of thesis :	master
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Electrical Power Engineering
Thesis reviewer:	Ing. Tomáš Burda
Reviewer's department:	KOSTAL CR, spol. s r.o.

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
The aim of the thesis was to implement the Kalman Filter to determine speed of induction motor. It requires understanding of Kalman Filter theory and its adaptation for the induction motor case. Furthermore, it requires implementing Kalman Filter for model of an induction motor in Matlab Simulink. Finally implementing and verify all the algorithms using dSPACE control system on the laboratory induction motor. I consider the thesis challenging because of various areas of knowledge that author has to gain to fulfill the assignment.	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
The final thesis fulfills the assignment.	

Method of conception	correct
<i>Assess that student has chosen correct approach or solution methods.</i>	
Author's approach and solution methods are correct.	

Technical level	B - very good.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
The technical level of thesis is very good. The author had to study expert literature about control theory, created simulations in Matlab Simulink and implemented proposed algorithms in dSPACE control system and tuned the control's parameters to obtain sufficient speed estimation of induction motor in laboratory. It required spending time in laboratory to achieve experimental results.	

Formal and language level, scope of thesis	C - good.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
Language level is good. Some parts of thesis are less to understand, because some terms in thesis are misleading. For example usage of term "offset" for the error of speed estimation.	

Selection of sources, citation correctness	A - excellent.
<i>Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.</i>	
Author used relevant sources, which are quoted in thesis.	

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

Author described the mathematical model of Kalman Filter, created simulation of Kalman Filter in Matlab Simulink and presented charts of estimated speed of induction motor for various conditions. Author also implemented algorithms of Extended Kalman Filter using dSPACE control system and achieved the experimental results of estimated speed of induction motor in laboratory. Student presented results of estimated speed in charts for various conditions of induction motor drive.

The experimental results show some limitation of determination of speed especially in low speed region of the electric drive, where is the estimated speed more inaccurate. Furthermore, for the case of no load condition for the electric drive is the estimated speed less accurate, the root cause is described in conclusion.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

The presented thesis shows the aspects of developing control algorithm. First describes general theory behind the problem and continue to implement mathematical equations into blocks of Matlab Simulink. This approach enables to examine the system behavior. Finally, the obtained algorithms are implemented in dSPACE, which is the control unit for induction motor drive in laboratory. The results are presented in charts for different drive conditions.

I have following question:

What would you propose to obtain better estimation of speed in low speed region of electric drive?

I evaluate handed thesis with classification grade **B - very good**.

Date: **7.6.2019**

Signature: