BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Assignment Master's Thesis

Institut:	Institute of Solid Mechanics, Mechatronics and Biomechanics
Student:	**Bc. Artyom Voronin**
Degree programm:	Applied Sciences in Engineering
Branch:	Mechatronics
Supervisor:	**Ing. Martin Brablc**
Academic year:	2020/21

As provided for by the Act No. 111/98 Coll. on higher education institutions and the BUT Study and Examination Regulations, the director of the Institute hereby assigns the following topic of Master's Thesis:

Predictive maintenance of pneumatic pistons

Brief Description:

With the ever–increasing degree of automation in the industry, a widespread effort to measure, record, and exploit information and signals related to the state of a given machine and its production quality, is becoming more relevant. Predictive Maintenance (PM) is a relatively new method, which builds on and further expands the ideas of the already established Fault Detection and Analysis (FDA). The purpose of this work is to demonstrate various approaches to Predictive Maintenance (e.g., signal–based and model–based) using the Matlab/Simulink software tools on a double–acting pneumatic piston as a case–study.

Master's Thesis goals:

1. Conduct research in the area of Predictive Maintenance, Fault Detection and Analysis, and related approaches and try to define their similarities and differences. Provide a practical demonstration for each of the approaches.
2. Create a simulation model of the demonstration device, including models of the sensors. Test different methods to create the model (e.g., software simulation, physical properties, black–box identification, etc.) and identify the models with real data.
3. Apply Predictive Maintenance techniques to a test dataset without using a simulation model.
4. Apply Predictive Maintenance techniques to a test dataset using a simulation model.
5. Evaluate the suitability of each approach for the application of PM and FDA.

Recommended bibliography:

PRITCHARD, Philip J. Introduction to Fluid Mechanics, 9th edition, Wiley, ISBN 978-1118921876.

NELLES, Oliver. Nonlinear system identification: from classical approaches to neural networks and fuzzy models. Berlin: Springer, 2011. ISBN 978-364-2086-748.

LJUNG, Lennart. System identification: theory for the user. 2nd ed. Upper Saddle River, NJ: Prentice Hall PTR, 1999. ISBN 978-0136566953.

VALÁŠEK, Michael. Mechatronika. Dot. 1. vyd. Praha: České vysoké učení technické, 1996. ISBN 80-010-1276-X.

NOSKIEVIČ, Petr. Modelování a identifikace systémů. Ostrava: Montanex, 1999. ISBN 80-722-50-0-2.

Deadline for submission Master's Thesis is given by the Schedule of the Academic year 2020/21

In Brno,

L. S.

prof. Ing. Jindřich Petruška, CSc.
Director of the Institute

doc. Ing. Jaroslav Katolický, Ph.D.
FME dean