



POSUDEK OPONENTA BAKALÁŘSKÉ PRÁCE

SLOVNÍ HODNOCENÍ

Autor BP: NIKITA KUPRIN

Název BP: **Extension of PLC Simatic S7-1500 with machine vision system**

Oponent BP: ING. RADIM ŠTEFAN

1. Student's approach to the topic of the thesis

Student did sufficient research and tackled all aspects necessary for successful solution. This includes multiple different domains (lighting, computer networks and protocol, heterogenous programming of PLC and vision system, communication certificates). Automation tasks keep getting more and more complex and interconnecting different sub-systems and mastering different means of communication (like OPC UA) becomes important part of an engineer's job.

2. Method of solution

The solution selected was well thought over and implemented. It is elegant as well as using current industry standards and practices. This not only ensures working and future-proof architecture, but also helps other students use and examine different components used in modern manufacturing. Resulting source code (I can mainly comment on LabVIEW part) is very clean. It uses advanced architectures (events, parallel loops etc.) to ensure efficient and scalable performance, while the code remains easy to read and understand.

3. Achieved results, benefits and usage

Unfortunately, I was not able to see the project live in operation, but the video taken looks impressive. Machine vision, pick-and-place systems and robotics are important technologies in the Industry 4.0 and it's important to include them in the engineering curriculum. Resulting setup is a fully functional, yet simple and open teaching station. Due to number hardware and software of components involved, installation of the machine is not trivial, but the manual is explaining every step in detail, including the purpose of each action.

4. Style and form of the thesis

The Bachelor Thesis is well structured and written in excellent English. Typographic and graphical styles are above the standard and contribute to the readability. Many pictures are used to explain and illustrate problems and then their solutions. It's great that LabVIEW codes are not huge and can still be read after placing a block diagram onto a single page. Long pieces of code were offloaded to separate attachments, which is very appropriate.



5. Opponent's comments

I only have minor comments to the thesis:

- a. LabVIEW is a trademark and should be always spelled (capitalized) this way.
- b. It's a shame to display mis-coded Czech characters on some of the LabVIEW front panels. I understand that this was probably introduced by the preceding work of Mr. Just and Czech is not first language of Mr. Kuprin. Still if Czech is used as the language of user interface, it should be implemented properly to give the desired user experience.
- c. Lighting is very important and often under-estimated part of vision systems. It is a complete science and requires lots of experience to create a system reliable under changing ambient conditions. But I fully understand this was not the main topic of this work and equipping the machine with lighting and enclosure to block the background illumination would sacrifice the simplicity and teaching purpose.

6. Questions to the student

- a. What is the FPGA on the myRIO used for and are there any tasks in the machine that could benefit from moving onto FPGA?
- b. Could only one of the control systems (PLC or myRIO) solve the whole application? What are some pro's and con's of using both of them together?

7. Overall assessment

Overall, student achieved the goals of the thesis with an elegant and very well described solution. Machine is working and difficulties (lighting variability) was solved using a practical approach (calibration). Thesis is well written and includes enough explanation and instructions so that the resulting device can be used in teaching future students. Well done!

Prohlášení:

Bakalářská práce splňuje zadání a doporučuji ji k obhajobě.

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Podpis oponenta

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POSUDEK OPONENTA BAKALÁŘSKÉ PRÁCE

NÁVRH KLASIFIKACE

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Jednotlivá hlediska zpracování bakalářské práce navrhuji klasifikovat¹ :

Hlediska hodnocení	A (1) Výborně	B (1,5) Velmi dobře	C (2) Dobře	D (2,5) Uspokojivě	E (3) Dostatečně	F (4) Nedostatečně
Splnění požadavků a cílů	X					
Odborná úroveň práce ²	X					
Pracnost a variantnost řešení ³		X				
Úroveň seznámení se stavem problematiky ⁴	X					
Uspořádání a úprava, jazykové zpracování ⁵	X					

Bakalářskou práci navrhuji klasifikovat známkou⁶:

A (1) Výborně	B (1,5) Velmi dobře	C (2) Dobře	D (2,5) Uspokojivě	E (3) Dostatečně	F (4) Nedostatečně
X					

17.6.2019

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Datum

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Podpis oponenta

¹ Hodnocení označte X v příslušném políčku klasifikačního stupně.

² Hodnocení odborné úrovně práce by mělo zohlednit i množství a vážnost chyb vyskytujících se v práci.

³ Hodnocení pracnosti by mělo zohlednit podrobnost zpracování (např. konstrukční nebo výpočtové) vlastního řešení, více variant vlastního řešení nebo zpracování většího objemu naměřených dat.

⁴ Hodnocení úrovně seznámení se stavem problematiky by mělo zohlednit zaměření řešerše na řešenou problematiku a využití tuzemské a zahraniční literatury a ověřených informačních zdrojů.

⁵ Hodnocení uspořádání a úpravy by mělo zohlednit logiku členění práce do kapitol, grafickou podobu a celkovou úpravu práce, množství pravopisných chyb a celkový styl vyjadřovacího projevu.

⁶ Výslednou klasifikaci stanovte jako aritmetický průměr hodnocení s přihlédnutím k celkové úrovni práce.