

Expert Committee

Assessment of Doctor of Philosophy (PhD) Dissertation for Ing. Dominik Malčík

DATE: June 12, 2020

TO: Mgr. Sylva Sadovská, Head of PhD Study Affairs, BUT FIT, Czech Republic

FR: Prof. Dr. Mohammad Derawi, Committee member, NTNU, Norway

RE: Assessment of PhD Dissertation of Ing. Dominik Malčík

Ing. Dominik Malčík — hereinafter referred to as the Candidate — has submitted his doctoral dissertation entitled:

“ANALYSIS OF ATTACKS ON (MICRO)CHIPS AND DEVELOPMENT OF ENHANCEMENT OF THEIR ROBUSTNESS/SECURITY”

conducted under the supervision of Prof. Martin Drahanský.

I have completed the assessment of competence as a PhD for the candidate. Please find below the detailed assessment. Feel free to contact me if you should need further information

Summary of the thesis:

The doctoral thesis deals with biometric chip security and presents an experimentally proven process for the microscopic analysis of chips, feasible in a low-cost setup. The described process was demonstrated on a chip acquired from the Czech biometric passport—from extracting the chip out of the plastic card up to analysis of the acquired microscopic images. The candidate investigated and evaluated various potentially viable methods for logic element recognition; without the employment of machine-learning. Additionally, hardware-oriented attacks are discussed and followed by proposals for countermeasures leading to the hindering of microscopic analysis.

Preamble

The review is for a PhD evaluation within the domain microchips and biometric security. The assessment and in particular comparison with international peers, is made within the specific scope of the review. The assessment is based on the emailed documentation (from Mgr. Sadovská – dated June 03, 2020) about the professional record of the applicant and follows the criteria for appointment as a PhD.

State-of-the-art dissertation

The topic of the candidate's thesis is appropriate to the particular area of dissertation and is it up-to-date from the viewpoint of the present level of knowledge.

The dissertation is clearly formatted as a monograph and is divided into ten chapters, whereas chapter 2 to chapter 6 mainly sums up the theory and in-depth current state of knowledge within 1) fundamental principles employed in integrated circuits, 2) typical chip components commonly used for building microchips, 3) overview of possible attacks applicable on the chips with emphasis on hardware-oriented invasive attacks, 4) physical aspects of security of chip security and 5) Czech/EU biometric passports. The chapters clearly show that the candidate has included the updated scientific research work into account of the thesis to a very high degree. In the chapters 7, 8 and 9, the thesis is based on the state-of-the-art information to a high degree. Taken into consideration all connection factors between background knowledge and practical work, this thesis work is clearly an up-to-date work and is appropriate to the area of dissertation.

Originality of the work

The work of the candidates' thesis is original and has a great impact contribution to the biometrics area within the topic of iris and retina recognition.

The work done in this PhD is original and of high quality, particularly considering that the microchip security modality chosen for the main path of the PhD (i.e. biometric passport chip security) is currently not yet developed worldwide, with still open research topics. The contributions made in this PhD are of high interest to the scientific community in order to improve the performance and viability of biometric chip security. Thus, the thesis has a great impact contribution of the chip security area within the research topic.

Publication level and personal research erudition?

The core work of candidates' thesis is published at an appropriate level and the list of candidates' publications shows that the candidate is a person with an outstanding research erudition.

The candidates research areas evolve around the area of information security within chip security and biometrics. These two areas are among the hot spots in computer science research today along with the multimodal/hybrid security features for reducing vulnerable attacks in the future. Most of the candidates' papers were published at specialized workshops (as is common for information security and biometrics). The number of publications is appropriate for someone

doing research that requires development work and thus typically takes more time than more theory-focused research. The aforementioned research work has been disseminated in the research literature through 8 technical papers where one paper is still under review. From the eight publications, five are conference papers and three are journal papers; all first-authored. Thus, the core work of the candidates' thesis is published at an appropriate level and published at several good places showing outstanding research erudition

Pedagogical qualification, teaching and counselling

The candidate has taught 5 courses in his PhD period. He has established a track record in developing teaching materials and teaching. The candidate has also established a track record in supervising and mentoring undergraduate and master students.

Scientific management, projects and patents

The candidate has served as a member/project leader in 7 different projects, some are still running whilst others are completed. The candidate has also (with others) developed 2 products under his doctoral period. The candidate has presented materials at difference localization around Europe. Thus, these extra works mentioned above shows the high creativity and deep knowledge of the candidate.

Overall recommendation

Considering the record and professional achievements of the candidate, I agree that the candidate has met the threshold for defending the Doctor of Philosophy (PhD) title and meets the requirements of the proceedings leading to a PhD conferment.

Prof. Dr. Mohammad Derawi
Gjøvik, June 12, 2020