

Dealing with the new-norm situation



Dr. Karel Sterckx
Center director

Welcome to the latest edition of BU-CROCCS Updates. It shall come as no surprise that the global COVID-19 pandemic also had its impact on the operation of our research center. The biggest impact has been on our internship program. Annually, the center used to welcome about 25 interns from various academic institutes in Asia and Europe. In 2020, we had only two interns and they had to return after just a month without even being able to visit the premises of Bangkok University. Their projects had to be adjusted and they were supervised online

with the assistance of faculty members at their home institute. In 2021, we had no interns though, this year (2022), we are able to welcome at least 8 interns. The hope is that, from next year onwards, the number of interns will be back to what it was before the outbreak of COVID-19. Obviously, the pandemic also affected the way our undergraduate and graduate students carried out their research work and how they were supervised. The majority of this edition is dedicated to that and how the work of our researchers carried on during the lock-down.

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Students talk



When I first stepped onto this campus, I was amazed by the structure of buildings, nestled in a lush green campus and its vibrant atmosphere. I marveled at the architecture and how it blended perfectly with nature. I had a chance to look around the campus for a month or so before my work started. I joined BU-CROCCS (Bangkok University Centre of Research in Optoelectronics, Communications and Computational Systems) as a Doctor of Engineering Research student, Dept. of Electrical and Computer Engineering on January, 2018 under the supervision of Dr. Waleed Mohammed and Dr. Romuald Jolivot.

I still remember, during the first Covid-19 pandemic, March, 2020 when it hit Thailand, all of sudden there was a panic. I was in my final year of Doctor of Engineering. The university, the markets around, and the mode of transportation were all closed down. I, along with my other colleagues, could not go to the university for our research work. We were basically nowhere, and kept us worried about not finishing our work and graduating on time. Moreover, we were also financially getting weaker. But my supervisor helped me and my colleague to overcome the panic we had. Even though we could not conduct our experimental work at the University, we always had an online meeting, discussed our work and set particular goals like writing journal papers, plans for thesis completion and most importantly, we got counseling at times of obstacles and stress. He also provided us with financial support during those times, which I can never forget.

As the Covid-19 pandemic was slowly getting normal with restrictions (starting of May, 2020), I had a chance to work at NECTEC (National Electronics and Computer Technology Center), NSTDA, Thailand through my supervisor. At NECTEC, I could learn a new set of skills apart from what I had and got an opportunity to enhance my knowledge to the next level. Moreover, side by side I could also conduct my remaining research work at NECTEC as it has a collaboration with BU-CROCCS, Bangkok University.

Finally, in October, 2020 when the University opened after a long gap by following new normal protocols, I could successfully defend my doctoral thesis. After that, I worked on finalizing my thesis and gradually it was time for me to head back home. I started searching for flights, but there was literally none as there was a steep rise in Covid-19 cases in my country. There was discussion over news about the international flights ban. I started to panic! After an exhaustive search over the internet, I could finally find only one flight to my country. But again, the flight tickets were very expensive, probably due to last minute search and I was short of cash. Moreover, all the banks were closed at that period and it wasn't possible for me to ask for financial help from home. At that very moment, one of the faculty members, Dr. Poompat from BU-CROCCS helped me to book my flight tickets on time. If he would not have helped me that day, I could have been stuck in Thailand as a strict lockdown was imposed in my country from the next second day onwards. The lockdown was for three and half months and I could not believe that. It was a narrow escape!

After I was home, I worked on my journal paper and finally it got accepted during February, 2021. By that time, I finished all my requirements for graduation (as per university norms) and finally graduated as Doctor of Engineer in July, 2021. These memories are still strong until today and I can never forget this experience I had during my version of so-called "survival during pandemic time" (March, 2020- December, 2020) in Thailand.

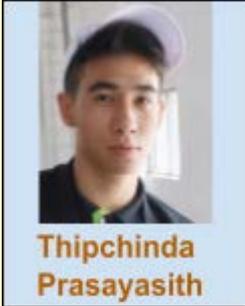
There can be no denying that BU-CROCCS has encouraged me to become more independent, offered me the space to grow, motivated, inspired me in many ways, provided me with outstanding knowledge, prepared me to face many challenges in life and enriched personal confidence. BU-CROCCS is like my second home and to me we are like a family. My supervisors didn't let me fail but kept me on the right path always. On the other hand, the faculty members always go way beyond the call of duty in their dedication to the students at BU-CROCCS. This showed me how much they care about helping their students. I would say that I am proud and I overcame some tough times and also enjoyed some really good ones at BU-CROCCS. It will always be remembered and kept close to my heart.

I take this opportunity to thank my whole family. Last, but not the least, I thank God for being with me throughout my journey and I am glad that I will be forever a part of BU-CROCCS, Bangkok University.



My experience for the past year with BUCROCCS has been great. First, the facility has been equipped with many things that are needed for student projects like optics lab, 3D printer and electronic lab or have cooperation with other laboratories nearby such as the NECTEC lab and SIIT lab for any students who need other equipment not available here. Secondly, the faculty members are all nice and friendly. They are more than welcome to answer any question the students might have, teach, demonstrate and guide the students with great patience even a student like me who doesn't understand much about optics are able to improve several skills under their guidance like understanding optics, basic image processing, Arduino usage and application. I really appreciate them for being there for students' improvement in every step they take.

Lastly, there is also a student's club in BUCROCCS dedicated for student activities to further improve each other. They also host several activities such as their outreach by demonstrating and giving basic understanding of optics knowledge to other schools nearby or hosting seminars by inviting renowned professors from other universities around the world to give the students lectures. Overall, BUCROCCS is a great place to be thanks to all its members and facility for providing me with all of this great experience. I'm glad to be here.



**Thipchinda
Prasayasith**

Over the past few years, we all have been affected by the prevailing COVID-19 pandemic. The outbreak began during my first semester of study in Bangkok University. As the situation got worse, I suddenly had to go back to my country and study online instead of onsite. Although many people will blame online classes as ineffective, for me I think they help us learn things on our own without relying on teachers. Finding information for solving an issue on our own is also a kind of practice and gaining experience before going to work a real job. When I have a problem with my research, every faculty member in BU-CROCCS is ready to give me advice kindly. Here, we treat each other more than student-teacher roles, and treat everyone as a family member. I would like to thank the support of my supervisor. We keep in touch all the time, and meet via Skype several times a week. It helps me progress faster on my research.

Students news

BUCROCCS students completing their graduate studies

In spite of the lock down situation, several of our students managed to successfully complete their graduate studies and earn their degrees. For some, a big part of their work was performed online.



**Kan Kan
Swargiary
(India)
Doctoral
Oct 2020**

defended his doctoral thesis in October 2020. His thesis was titled: *3D printed optical system based on Digital Light Processing technology for sensing applications*, under the supervision of two BUCROCCS members: Dr. Waleed Mohammed and Dr. Romuald Jolivot.



**Eidi M. Atef
(Afghanistan)
Masters
Mars 2020**

defended his master's thesis in Mars 2020. His thesis was titled: *Low cost solar power system with open loop tracking for rural and developing areas*, under the supervision of two BUCROCCS members: Dr. Waleed Mohammed and Dr. Karel Sterckx.



**Sunil Deka
(India)
Doctoral
Oct 2020**

defended his doctoral thesis in November 2020. His thesis was titled: *Metal and nano-particles as inclusion in multilayer thin film anti-reflection coating to provide ultraviolet blocking*, under the supervision of two BUCROCCS members: Dr. Waleed Mohammed and Dr. Romuald Jolivot.



**Hironmay Deb
(India)
Doctoral
Dec 2020**

defended his doctoral thesis in November 2020. His thesis was titled: *Guided Mode Resonance Based Spectroscopy for Sensing Applications*, under the supervision of BUCROCCS member: Dr. Waleed Mohammed.

Next step for BUCROCCS undergraduate researchers

During the period of 2020-2021, two of our undergraduate students have taken major steps towards that direction.



**Ms. Pandhittaya
Noikorn**

In 2020, our former student Ms. Pandhittaya Noikorn has joined the electrical engineering department at the University of Manitoba as a masters' student. She is currently working with Dr. Sherif Sherif.

- Ms. Noikorn was also a one term president of the student's OSA chapter in Bangkok university.
- In 2019 she received the Young Scientist and Technologist Programme (YSTP).



**Ms. Nisakon
Chanthachaem**

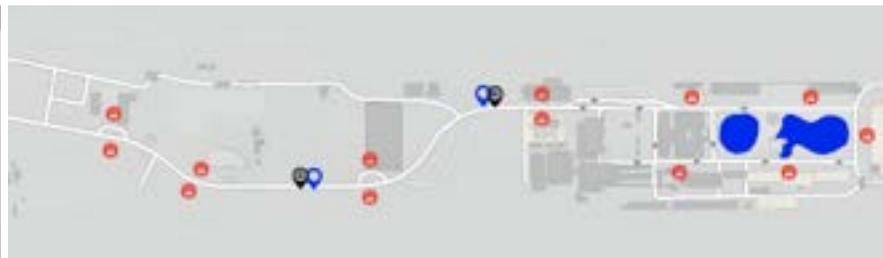
In 2021, our former student Ms. Nisakon Chanthachaem joined Sirindhorn International Institute of Technology at Thammasat University as a masters' student. She is currently working with Dr. Shu Han HSu.

- Ms. Chanthachaem was also a one term president of the student's OSA chapter in Bangkok university.
- In 2019, she completed an online internship program with the University of Manitoba due to the COVID situation.
- In 2020 she received the Young Scientist and Technologist Programme (YSTP).

Our undergraduate researchers activities at the center

Development of an On-Campus Bus Tracking System Using IoT Technologies

From late 2020 to early 2021, BU-CROCCS faculty members together with undergraduate research assistants (Mr. Sahussawat Kittiwatmethi and Miss Kanpitcha Phongsrinilubol) developed an on-campus bus tracking system using IoT technologies. The developed system consists of an Arduino Uno based sensor node connected to a GPS module and a NB-IoT communication module. Bus locations were updated approximately every 5 s to a UDP server located in BU-CROCCS. A Python-based GUI was also created to extract and display real-time locations of two different buses. A successful demonstration was done on two buses during the annual open house event. Further enhancements are expected once students return on campus on a regular basis, for example adding environment sensors to report on-campus PM 2.5 dust levels.



Carrying on research during lock-down

The majority of my research used to concentrate on the hardware development of transceivers for Optical Wireless Communication (OWC). Since this requires the access to laboratory equipment, the attention during the work-from-home period of the pandemic was shifted to the processing of signals, both for OWC and other software defined communication purposes, on Field Programmable Gate Array (FPGA). This hardware implementation could be verified through software simulations.



Dr. Karel Sterckx



Dr. Poompat
Saengudomlert

Off-campus research activities during the work-from-home periods focused on theoretical investigations of wireless and visible light communication systems. Specific topics include probabilistic analysis of grant-free repeated wireless packet transmissions for high reliability, optimization of user grouping for multi-user multi-input multi-output indoor optical wireless transmissions, and analysis of light dimming supports for multi-carrier indoor optical wireless transmissions. One experimental field study on IoT for cattle escape detection was conducted by a supervised master student in Laos. Finally, two mathematics courses (deterministic and probabilistic) were created and delivered for the new undergraduate program on Artificial Intelligence Engineering & Data Science.

During the past two years of pandemic, interaction with graduate students and undergraduate research students could be done only through online platforms. This had a great impact on their progress and research work, especially for those who needed access to the laboratory. For may, we had to count on their previous data or add more theoretical work and calculations to support their findings. We had as well reached to our collaborators, whose laboratories remain open with restrictions, to help with the needed experimental work. In spite of that, we still managed to publish a number of international journal papers as well as online conference presentations. We had as well managed to finish the graduate work and defense for several doctoral and masters students within our program or in co supervision with our collaborating institutes.



Dr. Waleed
Mohammed



Dr. Romuald
Jolivot

Research requires some changes in the way it is usually carried out (doing lab experiments, data analysis) while working-from-home. At the moment, my research involves mostly data analysis. Fortunately, I am collaborating with NECTEC on a project to develop a sensor for the detection of volatile organic compounds (gasses). Our collaborators provided new data continuously since the beginning of the pandemic, hence, work progressed without any substantial obstacles. In addition, a computer programming course was developed and taught for the new undergraduate program on Artificial Intelligence Engineering & Data

Science. Lastly, despite the international travel restrictions, supervision of internships carried-on out with international students managing to “recreate” laboratory setup at home (i.e. creating a reduced-scale warehouse for automatic detection pallet detection).

dddd



Dr. Wisarn
Patchoo



Dr. Pakorn
Ubolkosold

During the lockdowns, my R&D activities were mainly on the software side. The collaboration with the team members was carried out via different online meeting platforms. During that time, we worked on a prototype of a mobile-based image classification system where different neural network architectures and datasets were experimented. Due to the mobility restriction, collecting the image dataset by taking photos from the actual objects owned by different persons was not possible. We were then left with no choice but to develop our custom image scraping tool that could automatically collect the relevant and useful images from the internet. Using the developed tool, we were able to sufficiently collect the training images and build the model with satisfactory prediction accuracy. The trained model was finally deployed on a server providing APIs for the mobile application.

During years of pandemics, researcher mobility becomes restricted, since most of the countries do not allow traveling abroad. In my case, I have been granted by H2020-MSCA-RISE-2020 for a research project named “SwiftV2X” since the year 2020. This project mainly focuses on research collaboration based on researcher exchange. Unavoidably, the project has been postponed for a year due to COVID-19. Fortunately, since December 2021, the project has been restarted under very strict travel control. Additionally, most of the research now is conducted through mathematical models and computer simulation tools, which do not require on-site research facilities and allow anywhere and anytime researching.



Dr.
Chakkaphong
Suthaputchakun

Highlights

Online internship at BUCROCCS

	<p>Mr. Bhubhud Thongrakon</p> <p>Project: <i>Optical properties of polymer waveguides.</i></p>	<p>During the summer of 2020, three undergraduate students from the international school of engineering, Chulalongkorn University have performed their online internship training at BUCROCCS.</p>
	<p>Ms. Kawintida Santavanond</p> <p>Project: <i>Biosensor based on gold nanoparticles</i></p>	<p>The students worked under the supervision of Dr. Wisarn Patchoo and Dr. Waleed Mohammed. Their home institute advisor is Dr. Charusluk Viphavakit.</p>
	<p>Mr. Prattakorn Metem</p> <p>Project: <i>Optical fiber sensors</i></p>	<p>Dr. Viphavakit is a former co-supervised student at BUCROCCS during her masters thesis at AIT. She was also a visiting researcher during her doctoral research work at Frederick University, Cyprus.</p>

Invited Talks

P. Saengudomlert, "Multi-carrier modulation techniques for visible light communications," Keynote Speech for International Conference on Science and Contemporary Technologies (ICSCT), Bangladesh, 5 August 2021 (delivered online).

P. Saengudomlert, "5G and IoT," Webinar jointly organized by Asian Institute of Technology (AIT) and Asia-Pacific Telecommunity (APT), 17 May 2021.

K. Sterckx, "LED Lighting & Visible Light Communication (VLC)" during the Faculty Development Program (FDP) on 'Futuristic Technologies', organized from 19 until 25 January 2022 by and at the by Department of Computer Science and Engineering, DPGITM Gurgaon, India

W. Mohammed, "Thin Film of Nanoparticles for Optical Sensing," 2nd international conference in science and innovative engineering (I-COSINE 2020), Nov 9th , Malacca, Malaysia.

Publications

During 2020-2021 the researchers at the center published 23 papers including 11 international journals, 8 local journals and four conference proceedings.

List of the international journal publications

K. Swargiary, P. Jarutatsanangkoon, P. Suwanich, R. Jolivot and W. S. Mohammed, **Applied Optics**, Vol. 59 No. 1 (2020)

P. Sasithong, L.Q. Quynh, P. Saengudomlert, P. Vanichchanunt, N.H. Hai, and L. Wuttisittikulkij **Optical Switching and Networking**, vol. 36 (2020)

S. Amjad, K. Swargiary, M. Somarapalli, T. Bora, L. Hornyak , W. Mohammed, **Micro & Nano Letters**, Vol. 15 No. 5 (2020)

H.fallah, T. Asadishada, M. Shafieia, B. Shokri, S. Javadianaghezi, W.S. Mohammed, S. M. Hamidia, **Optics Communications**, Vol. 463 No. 2 (2020)

J. Panta, P. Saengudomlert, K.L. Sterckx, A.T. Pham, **IET Optoelectronics**, Vol. 14, No. 4, (2020)

H. Deb, N. Srisuai, R. Jolivot, C. Promptmas, W. Mohammed and S. Boonruang, **Optics and Laser Technology**, Vol. 132, 106517 (2020)

S Deka, W Mohammed, **Journal of Nanophotonics**, Vol. 14 No. 3 (2020)

A. Puckdeevongs, NK Tripathi, A. Witayangkurn, P. Saengudomlert, **Information**, Vol. 11 No. 6 (2020)

K. Sharma, T. Bora, W. Mohammed, **Optics & Laser Technology**, Vol. 134, 106573 (2021)

P. Bumrungkunl, K. Chamnongthai, and W. Patchoo , **Journal of Healthcare Engineering**, Vol. 2021 ID 9528460 (2021)

S. Khan, P. Saengudomlert, A. Taparugssanagorn, **International Journal of Communication Systems**, Vol. 34 No. 3 (2021)