Curriculum Vitae/Resume (DongGun Lee)

Ph.D in physics from Korea University
Senior researcher from LG innotek
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EDUCATION

Doctor of Philosophy in Physics   Mar.2016-Feb.2022
Korea University, Republic of Korea
Dissertation Title: "Large-scale electromagnetic simulation with parallel PSTD-FDTD algorithm"
Adviser: Professor Q-Han Park (qpark@korea.ac.kr)

Bachelor of Physics   Mar.2010-Feb.2016
Korea University, Republic of Korea

RESEARCH AREA

Computer Physics, Electrodynamics, Numerical algorithm and simulation, Finite-Difference Time-Domain method, Pseudo-spectral method, High-performance computing, Parallel computing, GPU acceleration, Photonics, Nano-Optics, Photonic crystal, Fiber optics, Computer Vision, SPAD, LiDAR technology, Microcontroller, FPGA.

PUBLICATIONS

SCI Journal
- Lee, D. G., Kim, T. H., & Park, Q. H. (2021). Performance analysis of parallelized PSTD-FDTD method for large-scale electromagnetic simulation. *Computer Physics Communications*, 259, 107631. https://doi.org/10.1016/j.cpc.2020.107631

SKILLS AND TECHNIQUE

Electromagnetic simulations (FDTD/PSTD method: home-made, written in Python and C, distributed via Github), Numerical algorithms (Finite-difference method, FFT, Levenberg-Marquardt algorithm, PCA), Spectrum analysis (FFTW3), Programming Languages (Python, C, MATLAB, Julia, HTML5, CSS), Parallel computing (OpenMP, OpenMPI), Beowulf/COW Linux cluster server building and management (Debian/Ubuntu), GPU acceleration (cupy, pycuda, CUDA C), Photonic bandstructure analysis (MPB, Harminv) Optical software package (MEEP, Lumerical), Projective geometry (OpenCV), LiDAR control using Robot Operating System (ROS), Neural Network (Keras, PyTorch, Tensorflow), MCU/FPGA Embedded system building (Verilog).

RESEARCH EXPERIENCE

LG INNOTEK optical solution research center,   Mar.2022-Present
Senior Researcher
- Currently, participating in development of the FPGA embedded system to accelerate the frame grabber of the automotive LiDAR.
- Participated the project that succeeded in developing the automotive LiDAR with Sony IMX459 sensor.
- Demonstrated the theoretical feasibility of using the step-index/single mode fiber to measure the long distance automotive LiDAR in limited experiment space.
- Conducted the experiments to improve the accuracy of the 3D point cloud obtained from the automotive LiDAR by analyzing the error source of SPAD sensor and the projective geometry.
- Developed the algorithm to calibrate the lens distortion of the automotive LiDAR using OpenCV and PCA.

Nano-optics Laboratory   Mar.2016-Feb.2022
Full-time Ph.D. Candidate
- Developed the finite-difference time-domain (FDTD) algorithm suitable for the electromagnetic simulation on the parallel computing environment.

- Developed a new algorithm, a hybrid PSTD-FDTD (HPF) method by incorporating the PSTD and FDTD method, for the large-scale electromagnetic simulation on the paralllel computing environment.
- Constructed the high-performance parallel computing environment equipped with OpenMP, OpenMPI and Nvidia GPUs using Debian/Ubuntu Server.
- Developed the library that provides functions for the acceleration of the large-scale FDTD/PSTD/HPF simulation on the distributed-memory system using OpenMP, OpenMPI and Nvidia GPU.
- Developed the time-domain numerical methods for the analysis of photonic band structure of the twisted photonic crystal.
- Developed the algorithm to localize the defects of the patterned semiconductor by using the FFT and phase-shifting method.
- Developed the algorithm to increase the resolution of the on-chip spectrometer by using the pseudo-inverse method.
- Built the web page for Nano-optics laboratory using HTML5 and CSS, http://nol.korea.ac.kr/

CONFERENCES **International**
- The 5th A3 (China-Japan-Korea) Metamaterials Symposium (June 26-29, 2021, Nanjing, China), Virtual Conference, "Numerical solver for Largescale electromagnetic problems in nanophotonics", Poster.
- The 2nd International Workshop on Quantum and Topological Nanophotonics (QTN, 5-7 April 2018), "The Parallel Hybrid PSTD-FDTD methods for a large-scale electromagnetic simulation", Poster.

Domestic
- Optics and Photonics Congress 2018 (Busan BEXCO, Korea, 27-29 August 2018), "Accelerating large-scale electromagnetic simulations by parallelizing the hybrid PSTD-FDTD method", Poster.
- 2021 KPS Spring Meeting (The Korean Physical Society, April 21-23, 2021), Virtual Conference, "Large scale simulation of nanophotonics: performance analysis of the parallelized Hybrid PSTD-FDTD method", Poster.
- Optics and Photonics Congress 2021 (ICC Jeju, Korea, 4-7 July 2021), "Large-scale Electromagnetic simulation in nanophotonics", Poster.

PATENTS **International**
- SAMSUNG ELECTRONICS CO., LTD., Korea University Research and Business Foundation, "Method and system for inspecting semiconductor wafer and method of fabricating semiconductor device using the same" *under review*
- SAMSUNG ELECTRONICS CO., LTD., Korea University Research and Business Foundation 2019, "Spectrum analyzer and method of analyzing spectrum", 1020190093361

Domestic
- SAMSUNG ELECTRONICS CO., LTD., Korea University Research and Business Foundation, "Spectrum analyzer and method of analyzing spectrum", KR 10-2021-0016140 A

HONORS AND AWARDS

STAR Scholarship Department of physics, Korea University.	Mar.2014-Feb.2015
Teaching Assistant Scholarship Department of physics, Korea University.	Mar.2016-Feb.2019
Research Assistant Scholarship Department of physics, Korea University.	Sep.2016-Aug.2017
Brain Korea 21 Scholarship Department of physics, Korea University.	Mar.2016-Feb.2019

WORK EXPERIENCE

Nano-optics lab

Part-time lecturer	Sep.2019-Aug.2020

- Lectured the basic Deep Neural Network algorithm which is promising in physics.

Part-time lecturer	Mar.2018-Feb.2019
Teaching Assistance	Mar.2016-Feb.2018
Research Internship	Feb.2014-Feb.2016

- Conducted an experiment of the scattering effect by the gold particle on top of the graphene.

Republic of Korea Army

The Military Service. (Sergeant)   Feb.2011-Nov.2012