CHANKYO KIM

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Research Interests

Planning and Control under Uncertainty, Learning for Human-Mobile System Interaction, Large-scale Optimization for Connected Systems

Education

University of Michigan - Ann Arbor *MI, USA* Sep. 2022 – Present
- M.S.c, Mechanical Engineering
- Overall GPA - 4.0/4.0

Seoul National University (SNU) *Seoul, Republic of Korea* Mar. 2015 – Aug. 2022
- Bachelor of Science, Dept. of Mechanical and Aerospace Engineering
- Interdisciplinary Major in Artificial Intelligence
- Overall GPA - 4.26/4.5, 3rd out of graduating students in the department

Hansung Science High School *Seoul, Republic of Korea* Mar. 2013 – Feb. 2015
- Early Graduation with Honors

Research Experiences

Univeristy of Michigan - Ann Arbor Jan. 2023 – Jun. 2023
Adviser : Prof. Ram Vasudevan
- Developing contact solver in the closed-loop constraint bipedal robot ("Digit").
- Developed new simulation environment and accurate closed-loop constrained robot model for accurate contact calculation (MuJoCo, Matlab to PyBullet)

Bear Robotics Research Laboratory March. 2022 – June. 2022
Adviser : Prof. John Ha
- Developed backend graph optimization algorithm for 2D/3D SLAM algorithm with BEV(Bird's Eye View) and LiDAR data to achieve more accurate mapping quality with less mapping effort.

Visual Information Processing Laboratory, SNU Aug. 2021 – March. 2022
Adviser : Prof. Joonseok Lee
- Developed modified few-shot learning algorithm of human pose estimation from collected human key point data.
- Generated human pose dataset for domain generalization in various viewpoints, resolution, and luminous intensity.

Clean Energy and Heat Optimization Laboratory, SNU Mar. 2021 – Aug. 2021
Advisor: Prof. Sangwook Park
- Designed a new power optimization method using large data set of power generation and management system.
- Wrote paper about optimization in intelligent renewable power

Biorobotics Laboratory, SNU Mar. 2020 – Sep. 2020
Advisor: Prof. Kyujin Cho, *Undergraduate Research Internship, UROP*
- Developed wearable master system with novel Tendon-clutching Mechanism and Model Predictive Control.

Publications

Published an academic book about basic perception, planning, control for undergraduate students led by PhD with support of MIT and Seoul National University

- **C. Kim**, et al., *Kang.H**, Introduction of Python and Autonomous Robot System with MIT Race Car, *Hongreung Publishing Company*, 2022. [link]

- **C. Kim**, et al., *Kang.H**, Introduction of Calculus and Artificial Intelligence wth Advanced Python, *Hongreung Publishing Company*, 2022. [link]
- J.H. Im, **C. Kim**, et al., *Kang.H**, Introduction of Natural Language Processing and Data Analysis, *Hongreung Publishing Company*, 2022. [link]

Y. Choi, **C. Kim**, Y. Hwang, C. Park, *J.Lee**, Domain generalization in a few human pose estimation data via meta-learning, Manuscript in preparation. [pdf]

Jung, D. H., **C.K. Kim**, Oh, K. H., Lee, D. H., Kim, M., Shin, J. H., *Son, J.E.**, Analyses of CO2 Concentration and Balance in a Closed Production System for King Oyster Mushroom and Lettuce., Horticultural Science and Technology. [link]

Projects

Noise Adaptive I-EKF Real-Time Semantic Bird's Eye View Mapping
- Train Noise Parameter Adapter in Invariant Extended Kalman Filter (I-EKF) for State Estimation / Use learned I-EKF state estimation with semantic bird's eye view mapping algorithm (MotionNet) to generate Global Bird's Eye View Map
- Advisor : Prof. Maani Ghaffari

Predictive Trajectory Optimization in Vehicle-to-Vehicle (V2V) Connected Mobile Systems
- Propose advanced intelligent driver model and trajectory optimization in connected mobile systems
- Reduced energy consumption satisfying safety boundary in 4, 6 connected vehicle system
- Advisor : Prof. Gabor Orosz

Investigation of Policy Optimization Reinforcement Learning Algorithm in Multi-agent Environment
- Designed 4 multi-agent game simulation and analyzed the impact of hyper parameter in PPO, TRPO and compared with Double DQN and Montle Carlo Tree Search model
- Advisor : Prof. Honglak Lee

graduate courses

Mobile Robotics	(grade : A)
Connected Vehicles	(grade : A)
Machine Learning CSE	(grade : A)
Mechanical System Modeling and Control	(grade : A+)
Convex Optimization	(grade : A)

Books

Full-donation project for next generation student with financial difficulty in South Korea (21 authors).

- **C. Kim**, et al., Why Engineering, *MegaStudy Books*, Jan. 2022. [link]

Teaching Experiences

Theory and Lab of IoT, AI, and Big Data, *Department of Computer Science*, SNU,	Fall. 2021
Advanced Physics, *Department of Physics & Astronomy*, SNU, ***Best Teach Award***	Fall. 2021
Physics, *Department of Physics & Astronomy*, SNU	Fall. 2019

Extra Curricular

OUTTA (AI Education Foundation) | *Non-Profit Organization for AI education* Mar. 2020 – June. 2022
- Serve as Founder of AI Education Foundation for next generations
- Organize the "The 1st Autonomous Driving Mini Car Coding and Contest" (launched 2021, 2022, 2023)

SNU-XCORPS | *SNU research program* Spring – Fall. 2021
- Research program under National Research Foundation of Korea funded by the Korean government

STEM | *Honor Society of Seoul National University, College of Engineering* Mar. 2020 – June. 2021
- Serve as 10th Vice Chairman

- Launch seminar: Optimization in Autonomous Vehicle Driving / AI algorithm inspired by how human learns: Introduction of Reinforcement Learning

Awards and Scholarships

Sinyang Eminence Scholarship, Sinyang Foundation 2020 – 2022
- Full Tuition for Academic Excellence
- Full Tuition for Academic Excellence

Certificate of Appreciation, Dean of the College of Engineering, SNU July. 2021
- Acknowledgement of genuine efforts at the forefront of Robotics Education in Korea

Undergraduate Research Fellowship, Practical Problem Research Group, Korea July. 2021
- $7,000/year research fellowship for promising undergraduate stduents

2020 Human-Robot Interaction Robot Design Competition, Seoul National University July. 2020
- The Grand Prize

Samsung Humantech Paper Award, Samsung Feb. 2014
- The Bronze Prize

Korea Mathematical Olympiad, Korean Mathematical Society 2011
- Silver Medal

Korea Physics Olympiad, The Korean Physical Society 2011
- Silver Medal

2021

Technical Skills

Languages : Python (Advanced) , Matlab (Advanced) , C++ , Solidworks
Library and Platform (Advanced) : PyTorch , Physic Engines (PyBullet , MuJoCo) , OpenAI Gym, ROS