Karnik Ram

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Interests

SLAM, 3D Computer Vision, Robot Perception

Education

International Institute of Information Technology, Hyderabad, India (IIIT-H) 2018 - 2021
M.S. by Research in Computer Science & Engineering
Thesis: Robust Plane-based Visual-Inertial Odometry for Dynamic Environments
CGPA: 9.50/10

Anna University, SSN College of Engineering, Chennai, India (SSN-CE) 2013 - 2017
B.Eng. in Electronics & Communication Engineering (ECE)

Publications

RP-VIO: Robust Plane-based Visual-Inertial Odometry for Dynamic Environments
Karnik Ram, Chaitanya Kharyal, Sudarshan S. Harithas, K. Madhava Krishna
In proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, 2021

Learnable Spatio-Temporal Map Embeddings for Deep Inertial Localization
Dennis Melamed, **Karnik Ram**, Vivek Roy, Kris Kitani
In proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, 2022

INFER: Intermediate Representations for Future Prediction
Shashank Srikanth, Junaid Ahmed Ansari, **Karnik Ram**, Sarthak Sharma, J. Krishna Murthy, K. Madhava Krishna
In proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, 2019

CalibNet: Geometrically-Supervised LiDAR-Camera Extrinsic Calibration using 3D Spatial Transformer Networks
Ganesh Iyer, **Karnik Ram**, J. Krishna Murthy, K. Madhava Krishna
In proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, 2018

Work Experience

Research Associate, Robotics Institute, Carnegie Mellon University Aug 2021 - Present
Working on deep inertial-only navigation algorithms for indoor smartphone localization, towards blind person navigation.
Advisor: Prof. Kris Kitani.

Graduate Research Assistant, Robotics Research Center, IIIT Hyderabad Aug 2018 - Aug 2021
Researched algorithms for improving the robustness of visual SLAM algorithms in dynamic environments. In particular, developed and evaluated a visual-inertial odometry algorithm for dynamic environments using only planar features and their induced planar homographies. Also worked on a deep auto-regressive model for the trajectory prediction of vehicles in a dynamic scene.
Advisor: Prof. K. Madhava Krishna. Outcome: 2 research papers and open-source code.

Google Summer of Code Student Developer, Mobile Robot Programming Toolkit Summer 2018
Developed a GUI app for the extrinsic calibration of range sensors. The app includes implementations of algorithms for estimating the extrinsics between RGB-D / LiDAR sensors based on plane-matching and line-matching, within a user-friendly GUI.
Outcome: Open-source code.

Research Intern, Robotics Research Center, IIIT Hyderabad May 2017 - April 2018
Researched algorithms for markerless LiDAR-camera extrinsic calibration for an autonomous car. In particular, we developed and evaluated an approach to estimate the extrinsics using direct photometric error minimization, as well as a geometrically-supervised deep network using spatial transformer networks.
Advisor: Prof. K. Madhava Krishna, J. Krishna Murthy. Outcome: 1 research paper.

Computer Vision Intern, Navstik Autonomous Systems, Pune, India Summer 2016
Worked on person detection algorithms for a drone, and in particular, evaluated the performance of a HOG feature-based detector on an Nvidia Jetson embedded board.

Relevant Coursework

Graduate: Mobile Robotics, Computer Vision, Machine Learning, Topics in Applied Optimization.
Undergraduate: Robotics & Automation, Digital Image Processing, OOP & Data Structures, Computer Architecture, Probability & Random Processes, Embedded & Real Time Systems

Additional Courses

ETH Robotics Summer School, ETH Zürich July 2019
2-week all-expenses-paid summer school, contained lectures and hands-on exercises on autonomous navigation, and talks by renowned researchers. Also worked in a team of six on a semi-autonomous ground robot for search-and-rescue applications. Approx. 50 selected participants from 15 countries.

Teaching

Head Teaching Assistant, Mobile Robotics, IIIT-H Fall 2019
Designed 5 new assignments and 2 exams on topics including single-view geometry, epipolar geometry, stereo reconstruction, bundle adjustment, EKF localization. Responsibilities also included conducting tutorial classes, office hours, and grading. Approx. 80 students.

Teaching Assistant, 3D Computer Vision Workshop, IIIT-H Feb 2020
Conducted a tutorial session on multiple-view geometry concepts including epipolar geometry and bundle adjustment with hands-on exercises for a professional audience from industry. Approx. 80 participants.

Event Coordinator, SSN-ECE Tech Club, SSN-CE Spring, 2017
Taught introductory concepts in robotics and computer vision to approx. 20 sophomores and juniors over a semester. Also organized an Internet-of-Things themed inter-college hackathon for approx. 40 participants.

Awards & Grants

- **Top 2**, out of 134 teams in the ARTPARK Robotics Challenge, IISc 2021
- **ETH Robotics Summer School Travel Grant**, ETH Zürich 2019
- **Research Fellowship**, covered tuition fees and living expenses, IIIT-H 2018-21
- **Best Senior Year Project**, ECE Department, SSN-CE 2017
- **First place**, inter-college image processing based robotics event, Anna University 2016
- **Top 10** out of 144 teams in the "Apps for Chennai Challenge" 2015
- **SSN Trust Funding for Student Projects**, SSN-CE 2014, 2015

Services

- **Lab Systems Administrator** for the compute cluster at RRC, IIIT Hyderabad. 2020-21
- Served as a reviewer in the SLAM track for IROS. 2021, 22
- Served as a co-chair for the VI-SLAM session at IROS. 2021
- Conceived, developed, and maintained **The SSN App**, the official Android app of SSN-CE. 2014-17

Technical Skills

Tools & Libraries: OpenCV, ROS, Ceres Solver, PyTorch, Eigen, Git, AirSim | Familiar: Qt, Android
Programming Languages: C++, Python | Familiar: Java

References

Prof. K. Madhava Krishna, Lab Head at RRC, IIIT Hyderabad
Relation: Master's thesis advisor and course instructor.
Email: mkrishna@iiit.ac.in

Prof. Kris Kitani, Associate Research Professor at RI, CMU
Relation: Research project advisor.
Email: kkitani@cmu.edu

Krishna Murthy Jatavallabhula, PhD Candidate at Mila, Montréal
Relation: Research collaborator and mentor.
Email: krrish94@gmail.com