ZAID TASNEEM

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Research Interests

Computational photography, Time-of-Flight sensing, Optics, Mobile Robotics, Machine learning and Computer Vision.

EDUCATION

Master of Science in Electrical and Computer Engineering *May 2018*
University of Florida, Gainesville, FL, USA
Major: Computer Engineering; Minor: Signals and Systems
Funded by National Science Foundation research grant

Bachelor of Technology in Mechanical Engineering *June 2016*
Indian Institute of Technology, Kanpur (IITK), India

RESEARCH EXPERIENCE

Graduate Research Assistant to Dr. Sanjeev J. Koppal *August '16 - Present*
FOCUS lab, University of Florida, Gainesville, FL, USA
Thesis: "Adaptive Depth Sensing"

Developed a MEMS steerable LiDAR imaging system, including the opto-mechanical design, calibration, imaging pipeline and adaptive control of scan patterns. We were able to demonstrate algorithms to directionally control a time-of-flight (TOF) sensor adaptively i.e. given previous scene measurements the subsequent scan will have more resolution in regions of interest. Traditional LiDARs lack this ability as they have a fixed angular resolution. The novel applications included LiDAR zoom, edge sensing for gradient-based reconstruction for fast scanning and energy efficient LiDAR scanning using Information gain enabled by directionally controlled scanning. We mount the sensor on a ground robot, demonstrating how to reduce robot motion to obtain a desired scanning resolution.

Publications: Directionally Controlled Time-of-Flight Ranging for Mobile Sensing Platforms [PDF]
Robotics: Science and Systems XIV, 2018
Zaid Tasneem, Dingkang Wang, Huikai Xie and Sanjeev J. Koppal

Adaptive Fovea for Scanning Depth Sensors (under expedited review)
IEEE Transactions on Robotics (T-RO)
Zaid Tasneem, Charuvahan Adhivarahan, Dingkang Wang, Huikai Xie, Karthik Dantu, Sanjeev Koppal

An Integrated Forward-View 2-Axis MEMS Scanner for Compact 3D LiDAR (Best Student Paper) [PDF]
International Conference on Nano/Micro Engineered and Molecular Systems (IEEE NEMS), 2018
Dingkang Wang, Stephan Strassle Rojas, Alexander Shuping, Zaid Tasneem, Sanjeev Koppal, Huikai Xie

Research Assistant to Prof. Achim Menges *May '15 – July'15*
Institute for Computational Design, University of Stuttgart, Germany
Project: Large scale fabrication using autonomous quadrotors

Developed the autonomous localization and control framework for a quadrotor in a GPS- denied environment. Implemented sensor fusion based on an Extended Kalman Filter (EKF) in ROS for 6DOF state estimation. Fusion was done on pose estimates from monocular visual odometry algorithm and IMU data from PX4. Integrated ROS localization libraries with DroneKit-Python API running on Raspberry-Pi for control. Also 3D printed the quadrotor and made design decisions on off-the-shelf hardware components for optimal performance to our requirements.

SELECTED PROJECTS

Biometric fusion for Face recognition *January'17 – May'17*
Course project under Dr. D. Woodard, Computer Engineering, University of Florida
Implemented biometric fusion at feature level, score level and decision level. For feature level fusion, we use grayscale images and calculate features using Principal Component Analysis (PCA) and Local Binary Patterns on them.

Multi-person tracking-by-detection using a particle filter *January'16 – May'16*

Course project under Dr. V. Namboodiri, Computer Science, IIT Kanpur

Developed a particle filtering framework for detecting and tracking multiple people in complex scenes. Used a HOG detector while implementing a greedy algorithm to solve for tracker-detector association.

Object Recognition in indoor environment *January'16 – May'16*

Course project under Dr. G. Pandey, Electrical Engineering, IIT Kanpur

Formulated a Deep Learning pipeline for object detection and classification task on the NYUD2 (RGB-D) dataset. Features were learned from the proposals using a pre-trained Caffe CNN model for final classification using SVM.

Boeing Abhyast Phase V- SLAM on MAVs *May '14 – July'14*

Research project under Dr. S. Bhattacharya, Mechanical Engineering, IIT Kanpur

Implemented SLAM using a planar LIDAR and IMU readings on the APM flight stack for indoor exploration. For obstacle avoidance used ultrasonic sensors combined with an Arduino for a feedback loop.

GAIL Natural Gas Pipeline health monitoring robot *August '14 – March'15*

Research Project under Dr. B. Bhattacharya, Department of Mechanical Engineering, IIT Kanpur

Developed a prototype capable of traversing pipelines using natural gas flow along with screw-drive propelled emergency module and a data collection module which housed PVDF sensors to monitor pipe cracks and defects.

Accolades: Winner of "Pitch your Product, E-Summit'13, IIT Kanpur" an entrepreneurial skills competition.

Other Projects: Road Cleaning robot, Tentacle mechanism, Angler Fish

ORGANIZATIONS

Coordinator, Annual Cultural Festival of IIT Kanpur *May '14 – November'14*

Conducted successfully the Regional Prelims of competitions for Antaragni in 7 different cities, supervising a 3-tier team of hospitality, synchronicity, competitions, marketing and coverage. Additionally, supervised a 20 member Organizing Committee in each city comprising of host colleges' students. Raised an amount of 350,000 INR from Sponsors to cover the expenses of the events and delivered on the MoUs with host colleges and sponsors

Member, ABU-Robocon IITK Team *August '13 – March '14*

Developed arduino libraries to enable manual control of an Omni wheel driven bot and an autonomous bot to pole-walk and climb stairs among other task. Worked involved designing framework to control different actuators such as Encoder motors, Pneumatics and Servo motors based on the feedback from the sensors.

Accolades: Awarded Best Innovation in Design and Team ranked among the top 6 participants out of 89 colleges

Other Organizations: Robotics Club, Quiz Club, National Cadet Corps, Humanists on Campus

TECHNICAL SKILLS

Programming*:* C, C++, Java, Python

Software*:* ROS, MATLAB, OpenCV, PCL, Tensorflow, Gazebo, Meshlab, Arduino IDE, Inventor, LATEX, Git, Pytorch

RELEVANT COURSES UNDERTAKEN

Robotics: Probabilistic Mobile Robotics, Robot manipulators, Autonomous Unmanned Aerial Systems

Artificial Intelligence: Deep Learning, Computational photography, Computer Vision & Image Processing, Elements of Machine Intelligence, Biometric Identification, Pattern recognition, Robotics Software Engineer(Udacity)

OTHER INFORMATION

- Best student paper award at IEEE NEMS 2018.
- Invited to give a talk titled "Adaptive TOF Sensing" at Imec, US.
- Secured All India Rank 2724 in IIT-Joint Entrance Examination out of 0.5 million candidates.
- Awarded the Merit-cum-means scholarship at IIT Kanpur from 2012-2016.
- Winner of "Pitch your Product, E-Summit'13, IIT Kanpur" an entrepreneurial skills competition.
- Awarded Best Innovation in Design in ABU ROBOCON National Prelims 2015.
- Awarded the Best Project in the mechanical design course in the whole batch of 400 students.
- Awarded the Second-Best Project in the manufacturing process course in the whole batch of 400 students.
- Secured 3rd position in Wild Soccer, Techriti'14; 2nd position in Wild Soccer, Takneek'12 and Takneek'13.