ARUN MADHUSUDHANAN

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Availability: May to December 2023

Education

Northeastern University, Boston, USA Expected May 2024

Master of Science in Robotics | GPA 4.0/4.0

Relevant Coursework: Computer Vision, Robotics Sensing and Navigation, Robot Mechanics and Control

National Institute of Technology (NIT), Calicut, India June 2018

Bachelor of Technology in Mechanical Engineering | GPA 8.89/10

Relevant Coursework: Solid Mechanics, Control Systems, Mechanics & Dynamics of Machinery

Technical Skills

Languages: C++, Python
Software Tools: MATLAB, ROS, OpenCV, Git, Linux, VS Code, Solidworks, ANSYS, Abaqus
Hardware Tools: ZED Stereo Camera, Arduino, ZED-F9P (RTK-GPS), VN-100 IMU

Projects

3D Object Classification from Partial Point Clouds | Northeastern University Mar 2023 - April 2023

- Developed a 3D object classification system utilizing deep learning methods to classify objects from partial point clouds.
- Utilized the GRNet neural network architecture to complete the partial point clouds, which are then processed by PointNet neural network architecture for object classification.
- Conducted performance evaluation and comparison between the proposed method and PointNet++ on the ShapeNet Dataset, demonstrating the superiority of our system with an accuracy of 93.8% compared to PointNet++'s 70%.

Optical Flow Estimation and Facial motion tracking | Northeastern University Mar 2023 - April 2023

- Implemented Farneback and FlowNet 2.0 methods to estimate dense optical flow using classical computer vision and deep learning approaches, respectively.
- Evaluated the performance of these methods using L1 error, average endpoint error, and average angular error metrics.
- Conducted a comparative analysis of Farneback and FlowNet 2.0 in facial motion tracking by measuring the percentage overlap of predicted bounding boxes using optical flow and Harr-Cascade classifier method.

Robust Sensor Fusion System for State Estimation | Northeastern University Nov 2022 - Dec 2022

- Implemented a RTK-GPS system using ROS and an NTRIP Client to improve accuracy of global positioning.
- Performed dead reckoning using live data from a VectorNav VN100 IMU and RTK GPS.
- Coupled an IMU with a ZED camera to implement ORB SLAM3, a state-of-the-art visual-inertial SLAM, and analyzed its performance in various environments including outdoors, indoors, and semi-outdoors.
- Compared the performance of RTK-GPS trajectory, Visual Inertial (VI) odometery and GPS coupled VI SLAM during indoor-outdoor transitions on MATLAB.

Exoskeleton Arm For Rehabilitation Of Stroke Patients | NIT Calicut March 2018

- Developed an upper-arm exoskeleton composed of a three DOF shoulder, two DOF elbow and a two DOF finger system.
- Designed using Solidworks and Ansys based on results from experimental study of joint movements on a healthy person.
- Performed Kinematics, Dynamics and Workspace calculations of Exoskeleton using MATLAB to optimize design.
- Implemented Master - Slave approach for the control of Exoskeleton.

Experience

Wells Engineer | ExxonMobil,India July 2018 – July 2022

- Supported business divisions across the world by delivering fit for purpose and cost effective tubular designs for 15+ fields and 60+ wells. Onboarded and mentored Wells Engineers into technical projects and provided continuous guidance
- Stewarded and improved the tubular connection workflow for business divisions across the world in accordance with API 5C5, resulting in $100k immediate savings and long-term synergistic benefits
- Led a study that resulted in an organizational change to the tubular design process resulting in $130k immediate savings and considerable synergistic savings through process simplification, greater standardization, and inventory transferability

Publications

- "Exoskeletal Development of a Hand Complex for Rehabilitation Activities", 2021 International Conference on Intelligent Technologies (CONIT 2021), IEEE, pp. 1-5
- "Design, modelling and fabrication of railway track cleaning bot", ELSEVIER Procedia Computer Science, Volume 133, Pages 526-536, International Conference on Robotics and Smart Manufacturing (RoSMa2018). Received best paper award at conference