Saptadeep Debnath

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Education

- **University of Michigan** — Ann Arbor, MI, USA
  Master of Science in Electrical and Computer Engineering (Robotics specialization) — *Sept 2019 - Dec 2020*
  GPA: 3.70/4.0
  Courses: Robotic Systems lab, Mechatronic Systems Design, Mobile Robotics, Robot Kinematics and Dynamics, Linear System Theory, Math for Robotics, Linear Feedback Control, Foundations of Computer Vision, AI Foundations
- **BITS, Pilani – Dubai Campus** — Dubai, UAE
  Bachelor of Engineering in Electronics and Communication Engineering — *Sept 2014 - May 2018*
  GPA: 8.70/10.0
  Courses: Modern Control System, Computer-based Control Systems, Artificial Intelligence, Digital Image Processing
  Leadership Experience: Team Lead for IFOR - UAV Research Group BITS Pilani, Dubai (Dec 2016 – May 2018)

Skills Summary

- **Concentration Areas**: Robotics, Control Systems, Robot Localization and Mapping, Control Software Development
- **Progamming Languages**: Python, C, C++, JavaScript, HTML, Bash
- **Tools and Technologies**: Robotic Operating System (ROS), OpenCV, LabVIEW, MATLAB

Research Experience

- **Fulda University of Applied Sciences** — Fulda, Germany
  Research Intern - Bachelor's Thesis — *Feb 2018 - July 2018*
  - Investigated performance measures of an LSTM network by manipulating the training and testing datasets.
  - Achieved a 98% accuracy in detecting hand gestures.
  - Built a ROS pipeline to teleoperate a robot using real-time free hand gestures utilizing the LSTM network.
- **Malaviya National Institute of Technology (MNIT)** — Jaipur, India
  Summer Intern — *May 2016 - July 2016*
  - Surveyed and compared different background subtraction methods in videos.
  - Produced results by using techniques like LBP and SILTP for background subtraction in videos.

Academic Projects

- **Object Tracking for Safety**: Engineered an object tracking module to detect and draw conclusions about the distance of the moving object from the camera; issue warning based on the proximity of the object to the camera. Tech: YOLO, DeepSORT, RGB-D (November '20) (link)
- **Slam and Path Planning implementation on MBot**: Explored and implemented various mapping, path planning and motion control algorithms on a simulation model for a differential drive robot Tech: C++, IMU, 2D lidar, SLAM, A-star, path planning (April '20) (link)
- **Invariant Extended Kalman Filtering for Robot Localization using IMU and GPS**: Developed an Invariant EKF based localization system and compared it against an Extended Kalman Filter based localization system and a GPS-alone dataset. Tech: MATLAB, invariant extended kalman filtering, IMU, GPS (April '20) (link)
- **6-DOF Serial Link Robotic Manipulator**: Produced a codebase in Python to drive serially connected motors autonomously, employing object detection using a kinect camera suite for pick-n-place operation. Tech: Python, manipulator modelling, objection detection, OpenCV, path planning-smoothing, state machines (March '20) (link)
- **Mobile Inverted Pendulum System**: Designed a cascaded control architecture to balance a two-wheeled robot and to autonomously drive in pre-defined trajectories. Tech: C, inverted pendulum, trajectory following, IMU, PID, Beaglebone, Robot Control Library (February '20) (link)
- **Hand Gesture Control of a Robot using Intelligent Techniques**: Created a ROS pipeline to translate free hand gestures to motion instructions on TurtleBot running on Intel Atom. Tech: ROS, C++, Python, RNN, LSTM, TensorFlow, SLAM, TurtleBot (July '18) (link)
- **Non-Linear Modelling and Simulation of Unmanned Aerial Vehicle**: Proposed a PID controller for controlling the attitude and position of the nonlinear model of a UAV. Tech: MATLAB, PID, Non-Linear model, UAV (December '17)
- **Indoor Localization of an Unmanned Aerial Vehicle**: Created a sensor fusion module for a UAV spatially aware in an indoor environment devoid of GPS and SLAM algorithms. Tech: 1D LIDAR, Optical Flow, Pixhawk, UAV (May '17)

Publications

- **Technical paper - Design and Development of a Non-Linear Controller for Quadrotor type Unmanned Aerial Vehicle**: IEEE International Conference on Inventive Computation Technologies. Authors: Saptadeep Debnath and Mary Lourde R (Coimbatore, India - November '18)
- **Technical paper - Image based Biomechanical Case study of an International Archer**: International Conference on Sports Engineering. Authors: Saptadeep Debnath and Subir Debnath (Jaipur, India - October '17)
- **Technical paper - Visual Odometry Data Fusion for Indoor Localization of an Unmanned Aerial Vehicle**: IEEE International Conference on Power, Control, Signal & Instrumentation Engineering. Authors: Saptadeep Debnath and Jagadish Nayak (Chennai, India - September '17)