Shubham Takbhate

College Park, MD

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Education

University of Maryland *College Park, MD*

Master of Engineering in Robotics | GPA:3.55/4 *Aug 2021 - May 2023(expected)*

- **Courses:** Computer Vision, Deep learning, Robotic Software systems, Robot control, Robot Planning, Robot Modeling

MIT Academy of Engineering *Pune, India*

B-Tech in Mechanical engineering *May 2016 - May 2020*

- Co-founder and Team captain of the Aerial Robotics team
- Secured 17th position in National level SAE Aero-design challenge

Skills

Programming	C++, Python, MATLAB, Bash, CMake, LaTex
Libraries and Tools	Google Cartographer, Git, Linux, OpenCV, OpenMVG, ORB-SLAM, PyTorch, ROS, ROS2, TensorFlow
Deep Learning Architectures	VGG16, Resnet34, DeepSFM, NeRF, YOLO, RNN
Controllers	Arduino, Raspberry Pi, Pixhawk, Ardupilot

Work Experience

Rigbetel Labs *Pune, India*

ROS developer Intern *June 2021 - July 2021*

- Created a cutting-edge differential drive robot utilizing Robot Operating System, Raspberry Pi controller, and LIDAR sensor for advanced mapping capabilities.
- Designed behaviors for Tortoisebot using FlexBe Behavior Engine and tested this behavior in a simulated environment as well as in a real-world environment
- Implemented SLAM on the differential drive robot using the Google cartographer system.

Projects

Academic Projects

- **Two-axis camera gimbal:** Designed a camera stabilizer equipped with an IMU sensor and Raspberry Pi
- **Automatic Image Captioning:** Used Recuring Neural Networks to generate text captions of images
- **Camera Calibration:** Calibrated DJI Tello camera using Zhang's method to remove video distortion
- **Lane Detection and Turn Prediction:** Utilized a curve fitting approach to detect lanes and accurately estimate road curvature.
- **Precise drone landing:** Used Aruco markers to Autonomously land the drone precisely at a particular docking station
- **Semantic segmentation using encoders:** Used VGG16 as an encoder along with the FCN32 as a decoder to perform a semantic segmentation task on the VOC data sets
- **Simple Linear Iterative Clustering:** Implemented a simple super-pixel algorithm that clusters pixels in the five-dimensional color and pixel coordinate space
- **Robotic Urban Search and Rescue:** Designed an autonomous controller capable of performing search and rescue operations, thoroughly tested in a realistic simulation environment.
- **Monocular SLAM:** Implemented Monocular slam on DJI Tello drone using ORB-SLAM3 library successfully created 3D clouds points and tracked the camera position of the drone
- **Structure from motion:** Used Lucas–Kanade feature tracker to track identical 2D key points across multiple images of a building used 2D key points to Reconstruct a 3D scene and simultaneously obtain the camera pose from a given set of images using tracked features
- **Real-time highway traffic speed measurement:** Improved the video footage quality using histogram equalization and computed the speed in real-time of individual vehicles in highway traffic footage
- **Octave-convolution-based Depth Estimation:** Used octave convolution to extract high and low spatial frequency features from an image and then used depth regression techniques with a Huber loss function to estimate accurate depth maps
- **Underwater Image Enhancement:** Conducted a thorough investigation into GAN-based models for underwater image enhancement, and successfully enhanced their output through different data preprocessing techniques
- **Quadrotor based First-aid kit delivery system:** Designed a quadrotor capable of carrying emergency medical supplies in case of a medical emergency using the Ardupilot controller
- **Implementation of Path Planning Algorithm on a Mobile Robot:** Implemented various path planning algorithms such as BFS, Dijkstra's, A*, RRT, RRT* on a Mobile Robot in a simulated environment
- **PID controller for Quadrotor:** Developed a closed loop PID controller to achieve optimal stabilization of a Quadrotor across all three axes within a simulated environment.

Other Projects

- **Fixed-wing UAV Design:** Developed a fixed-wing aircraft capable of flying with a total take-off weight of 22lb/10kg
- **Gesture-based control of DJI Tello drone:** Used Google MediaPipe Gesture Recognizer to control DJI Tello drone with distinct hand gestures