

Prateek Arora

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Research Interests: SLAM, Multi-view geometry, 3D Mapping, Localization, Robotics and Artificial Intelligence.

EDUCATION

- **University of Maryland, College Park, MD** GPA: (3.855/4)
Master of Engineering in Robotics Aug 2018 – Present
- **GGSIPU University, New Delhi, India** Percentage: (68.46%)
Bachelors in Electrical and Electronics Engineering Jul 2012–2016

EXPERIENCE

Graduate Teaching Assistant with Prof. Mohammed Samer Charifa
ENPM673 (Perception for Autonomous Robot), University of Maryland Jan 2020 – Present

Graduate Research Assistant with Prof. Yiannis Aloimonos
Perception and Robotics group, University of Maryland Aug 2018 – Dec 2019

- Designed a **hardware sensor and compute suite** capable of estimating **Visual Inertial Odometry**, compact and light enough to be mounted on ano-sized quadrotor (130 mm). The suite consists of a global shutter camera, an inertial measurement unit and time-of-flight sensors, a microcontroller and a microprocessor.
- Implemented trajectory tracking on quadrotor (equipped with pixhawk and odroid) using cascaded proportional-integral-derivative controller on position and velocity.

Research Associate with Profs. P.B. Sujit and Sanjit Kaul
Indraprastha Institute of Information Technology (IIIT), Delhi, India Jul 2017 - Jul 2018

- Worked on traffic light detection in Indian traffic environment and system integration of software stack (**ROS based**) of the **self driving car** at IIIT-D named [Swarath](#).
- Developed lane cost algorithm to replace binary cost map and integrated it with Open Motion Planning Library.

Research Assistant with Prof. Gargi Mishra
Guru Gobind Singh Indraprastha University, India Aug 2014 - Jan 2016

- Worked on Eye controlled robot, a system that tracks the movement of iris using harr-like features to control a differential drive robot. The results were published in IEEE INDICON.

COURSE PROJECTS

ENAE788M - Hands On Autonomous Aerial Robotics

- **Attitude Estimation:** Implemented *Madgwick* and *Unscented Kalman Filter* to estimate orientation of a 6-DoF IMU and compared the results with ground-truth vicon data.
- **Stereo Visual Odometry:** Estimated 3D trajectory of a quadrotor equipped with a stereo camera using the optical flow equation
- **Flying through gaps:** Implemented *Gaussian Mixture Model* to detect colored windows and used it as a feedback to autonomously navigate a drone through it.
- **Pose estimation of fiducial marker:** 3D pose estimation of CCTag marker in real-time in order to land a quadrotor on it.
- **Wall avoidance using optical flow:** Compared traditional optical flow algorithm and Spatial Pyramid network to compute dense optical flow for real time obstacle (wall in our case) avoidance on micro UAVs.

CMSC 733 - Computer Processing of Pictorial Information

- **Deep Homography Net, [Supervised](#) and [Unsupervised](#):** Implemented deep CNN to learn homography between two images using TensorFlow.
- **Structure from Motion (SFM):** Reconstructed 3D scene and simultaneously computed camera pose using multiple views from a single camera.
- **SFM using Deep learning:** Improved accuracy of an unsupervised learning framework for monocular structure from motion (paper: [SFM-Learner](#))
- **Face swap:** Implemented an end-to-end pipeline to swap faces in a video (just like Snapchat's face swap filter) using both *Delaunay Triangulation* and *Thin Plate Spline*.
- **Video SnapCut:** Implemented *tracking of a deformable object* in a video (given initial object boundary) using set of local classifiers (a feature available in *Adobe After Effects*).
- **Boundary detection using Pb-Lite:** Boundary detection in image using a modified *Probability of Boundary* method. The probability is measured by computing changes in texture and brightness in the local neighborhood.

PUBLICATIONS

- **Mobile Surveillance Spheroid Robot with Static Equilibrium Camera, Leaping Mechanism and KLT algorithm based Detection with Tracking:** Shamsheer Verma, Chahat Deep Singh, Sarthak Mittal, **Prateek Arora** and Arvind Rehalia. International Journal of Control Theory and Applications, 09(41) 2016, 473-488. ISSN: 0974-5572.
- **Control of wheelchair dummy for differently abled patients via iris movement using image processing in MATLAB:** **Prateek Arora**, Anshul Sharma, Anmoal Singh Soni, Aman Garg, IEEE INDICON 2015, doi: 10.1109/INDICON.2015.7443610

SKILLS

Computer Languages: Python, Matlab, C++, \LaTeX

Operating System: Linux, Windows

Softwares/Libraries: Tensorflow, Numpy, git, Matplotlib, Jupyter, Eagle, Inventor

REFERENCES

Yiannis Aloimonos
Professor,
University of Maryland

Dr. P.B. Sujit,
Associate Professor,
IIIT-Delhi

Dr Gargi Mishra,
Asst Prof.
GGSIPU