

Bharat Mathur

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Work Experience

Globus Medical Inc.

Software Engineer – Imaging, Navigation, and Robotics

Massachusetts, USA

August 2019 - Present

Medical Robotics & Equipment Lab, University of Maryland

Research Assistant to Prof. Axel Krieger

College Park, USA

November 2017 – May 2019

Education

University of Maryland

M.Eng. Robotics

College Park, USA

August 2017 - May 2019

SRM University

B.Tech Mechatronics Engineering

Kattankulathur, India

July 2013 - May 2017

Graduate Research Projects

Semi-Autonomous Robotic System for Remote Trauma Assessment

ROS, C++, OROCOS KDL, GAZEBO, MOVEIT!, MATLAB

Medical Robotics & Equipment Lab

December 2017 - May 2019

- Developed a haptic feedback enabled tele-manipulation system for a *KUKA IIWA* arm using a *Geomagic Touch* to perform a semi-autonomous ultrasound based FAST scan for detection of hemorrhages on trauma patients

Human Activity Recognition using CNN on Inertial Data

KERAS, PYTHON

CMSC 422: Machine Learning

November 2018 - December 2018

- Programmed a Convolutional Neural Network to recognize physical activities using data from on-body Inertial Measurement Sensors.

Dynamic Path Planning For Hospital Environment

PYTHON, V-REP, LIDAR

ENPM 661: Planning for Autonomous Robots

March 2018 - May 2018

- Developed and simulated a hierarchically nested path planning algorithm for autonomous patient transport vehicles in hospital environments capable of avoiding static and dynamic obstacles, dynamic re-planning, and dividing corridors into designated lanes.

Attitude Control of a Quadrotor Using Reinforcement Learning

ARDUINO, REINFORCEMENT LEARNING

ENPM 808F: Robot Learning

November 2017 - December 2017

- Demonstrated reinforcement learning based PID controller tuning for half a quadrotor on a custom-fabricated test rig.

Tic-Tac-Toe game using Q-learning

MATLAB, Q-LEARNING

ENPM 808F: Robot Learning

October 2017 - November 2017

- Developed a Q-learning based agent to play Tic-Tac-Toe with itself

Modelling and Simulation of a 6 – DOF Industrial Manipulator

MATLAB, SIMULINK

ENPM 662: Robot Modelling

November 2017 - December 2017

- Simulated a 6-DOF manipulator's kinematics using *Simulink*

Highway Lane Detection

MATLAB

ENPM 673: Perception for Autonomous Robots

March 2018 - April 2018

- An algorithm to detect straight and curved lanes on a highway to be used as a sub-system for driverless vehicles.

Undergraduate Research Projects

I worked as a Control and Embedded Systems Engineer (July 2013 – October 2014) and Team Leader (November 2014-June 2017) at SRM-UAV (www.srmuav.com), SRM University's Unmanned Aerial Systems research team.

Modelling, Simulation, Control, and Development of a Tilt Rotor UAV

Bachelor's Thesis Project, May 2017

- Pioneered a novel tilt rotor aircraft of co-axial Tricopter (Y6) configuration with wing rotor pairs mounted on 1-DOF mounts each, and tail rotor pairs on a 2-DOF mount.

Control of a UAV and its Payload using Head Motion

Academic Minor Project, May 2016

- Developed a hands-free system to control a quad-rotor and its gimbal-mounted camera (payload) using a headset equipped with an IMU to provide an augmented flying experience for military applications.

Inspection of Wind Turbine Blades using Unmanned Aerial Vehicles

SRM-UAV, December 2015

- Formulated a rotary-wing aircraft system to identify fractures and other mechanical failures in wind turbine blades

Multi-Rotor aircraft with facial recognition system

SRM-UAV, November 2014

- Integrated a quad-rotor with a facial recognition system to identify missing personnel and for military applications

Hybrid Quadrotor UAV

SRM-UAV, November 2014

- Created a hybrid UAV which combines the advantages of a rotary-wing with those of a fixed-wing aircraft. It is capable of taking off and landing from almost any location without the need for a runway.

Palm-Sized Micro-Copter

SRM-UAV, May 2015

- Developed a palm sized quad-rotor weighing 48 grams for reconnaissance applications

Fully autonomous fixed wing UAV

SRM-UAV, November 2013

- Built a fixed-wing aircraft capable of fully autonomous take-off, waypoint navigation, and landing

Skills

- Extensive background in Unmanned Aerial Vehicles (Fixed, Rotary, Hybrid, and Tilt Rotors) and systems, Human-Robot Interaction, and Manipulators.
- Solid background in Kinematics and Dynamics, Robot Control, Path Planning algorithms (A*, Dijkstra, RRT and others.), Tactile Sensing, Haptics, Calibration, IMU processing, multisensory integration. Familiar with machine learning techniques (Reinforcement Learning, CNN, SVMs, etc.)
- Proficient in C++, NI LabVIEW, LaTeX, Siemens Logo!, and Arduino; Familiar with Python, and HTML5
- Proficient in robotics frameworks and simulators: Robot Operating System (ROS), URDF, RViz, Gazebo, MoveIt!, and OMPL, V-REP, Orocos KDL. Familiar with Eigen, OpenCV, and Boost.
- Comfortable with version control (Git), continuous integration (TRAVIS CI), debugging (GDB), unit testing (GTEST), code coverage testing (Coveralls, Icov), memory profiling (Valgrind), documentation (Doxygen), project tracking (Jira), and Google's C++ style guide.
- Familiar with machine learning frameworks Keras, and TensorFlow
- Fluent at cross-platform development using Qt and User Interface design with Qt Modeling Language (QML)
- Basic knowledge of mechanical engineering tools: SolidWorks, FluidSim, seeNC Turn, and seeNC Mill

Internships

Trossen Robotics

Robotics Software Consultant

Chicago, USA

March 2019 – May 2015

ABB India Pvt. Ltd Student Internship Program at ABB Robotics

GLUING AND ASSEMBLY CELL FOR CJ POLYTECHNIC PVT. LTD.

Bangalore, India

June 2015 – August 2015

ABB India Pvt. Ltd

MIG WELDING APPLICATIONS OF ROBOTICS

Faridabad, India

June 2014 – July 2014

Awards & Honors

19th IEEE International Conference on Bioinformatics and Bioengineering

BEST PAPER AWARD

Athens, Greece

October 2019

Students Unmanned Aerial Systems Competition 2017 by AUVSI

FLIGHT READINESS REVIEW RANK 11 AND WORLD RANK 27 (SRM-UAV)

Maryland, USA

June 2017

Medical Express Challenge 2016

WORLD RANK 22 (SRM-UAV)

Canberra, Australia

September 2016

Students Unmanned Aerial Systems Competition 2015 by AUVSI

WORLD RANK 38 WITH CASH AWARD OF \$200 (SRM-UAV)

Maryland, USA

June 2015

Patents

- Fleiter, T., Krieger, A., Saeidi, H., Mathur, B., Schaffer, S., Topiwala, A., Kam, M." *System and Methods for Remote Trauma Assessment*". (Patent Pending) U.S. Application No.: 16/714,134

Publications

- Mathur, B., Topiwala, A., Saeidi, H., Fleiter, T. & Krieger, A. Evaluation of Control Strategies for a Tele-manipulated Robotic System for Remote Trauma Assessment, 2019 Proceedings of the Conference on Control and its Applications. 2019, 7-14.
- Mathur, B., Topiwala, A., Schaffer S., Kam M., Saeidi, H., Fleiter, T. & Krieger, A. A Semi-Autonomous Robotic System for Remote Trauma Assessment, 2019 IEEE 19th International Conference on Bioinformatics and Bioengineering (BIBE), Athens, Greece, 2019, pp. 649-656.