Rajendra Singh

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SUMMARY

I'm research oriented, team player, passionate roboticst and a dedicated member of the open-source community. My research interest is in 3D-SLAM, Shared-shape motion planning, Swarm Intelligence and Computer Vision.

EDUCATION

Degree	Stream	Institution	%/CGPA	Year
B. Tech	Computer Science and Engineering	IIT, Palakkad	7.39	2016 - 20
XII	Physics, Chemistry & Mathematics	DPS, Udaipur	89%	2015 – 16

SCORES

GRE - 311/340 (Quant 167/170)

IIT JEE - 99.3 Percentile out of 1.2 millon students

EXPERIENCES

June, 2020-**Present** — **Sr. Software Developer, R&D, UST** — Report
- *Trivandrum, India*

Working on State-of-art Robotics Project at Innovation Lab.

Jan-June, **2020** — **Robotics Intern, Innvation Labs, Gadgeon** — Report
- *Kochi, India*

Working toward to develop cobot of two panda arm to perform complex manipulation task with task level motion planning using Moveit and Moveit_task_constructor motion planning framework.

May-July, **2019** — **Computer Vision Intern, Innovation Labs, UST** — Report
- *Trivandrum, India*

Studied various SLAM algorithm and implemented it using ROS by fusing sensor data of lidar and 3d depth camera. Later, I worked on control and planning of robotic manipulator for vision-based pick and place task.

May-July, **2018** — **Deep Learning and Data Science Intern, Researchshala** — Report
- *Chandigarh, India*

Worked on deep learning projects related to transfer learning, topic modelling, web and pdf scraping, extracting and analysing useful information from unstructured data.

May-June, **2017** — **Robotics Intern, 3D Printing Club, Centre for Inovation, IIT Madras** — Report
- *Chennai, India*

Studied state of art 3D printing technology and then built prusa i3 3D printer and a robotic arm using this printer.

RESPONSIBILITY

- **Founder**, Great Eagle Tech, 2021- Present — Link
- **Mentor**, UST-Interns, 2020 – Present — Link
- **Head,** Robotics Club, IIT Palakkad, 2018 – 19 — Link
- **Technical Advisor,** Petrichor, IIT Palakkad, 2018 – 20 — Link
- **Team Lead,** SIH, Upscale, Eyantra, Kaizen, InterIITs, OpenCV SpatialAI etc., 2017– 22 — Link

PATENTS

Live Hindge Design with embedded electronics for ESL Display and Robotics Application. Link

CONFERENCES

June, 2020 — **Task-Level Motion Planning for Multi-manipulator system** — Poster
- *IEEE Computer Society*

Conducted a seminar on discussing motion planning, moveit, multi-manipulators etc.

August, 2019 — **Visual SLAM on mobile manipulator using a robot operating system** — Poster
- *Industry-Academia Conclave, IIT Palakkad*

Presented a poster showcasing the implementation of 3D visual SLAM on an industrial manipulator robot.

October, 2017 — **Low-cost Prusa-i3 3D printer** — Poster
- *Open House, Centre for Innovation(CFI), IIT Madras*

Showcased low cost, self-made Prusa-i3 3D printer and its applications.

RESEARCH

- Anti-drone Technology — Link
- Multi-manipulator shared-space motion planning — Link
- SLAM, Swarm Intelligence & Reinforcement Learning — Link
- Developing MoveIt Task Constructor for MoveIt 2 — Link

SKILLS

Algorithms

- SLAM(GMapping, RTABMap, Hector, Cartographer)
- Sensor fusion & State Estimators (KF, EKF, UKF PF)
- RTOS scheduling (Round Robin, Preemptive)
- Tracking(SORT/DeepSort/ByteTrack)
- VO/VIO(VINS-Fusion, ORB, RATSLAM)
- Feature Matching(SIFT, SURF)
- Swarming(PSO, Flocking&Foraging)
- Kinematics(DH/Newton/Eular)
- Segmentation(SiamMask, Yolact)
- Planner(FastPlanner, EgoPlanner)
- Q-learning/DQN/TD
- Path Planing(A*, RRT)
- Control system(PID)
- Detection (CNN, Yolo)

Simulations

Gazebo/Ignition, Rviz, V-REP, Simulink, Moveit, ARGoS, Unity, Fusion 360, Catkin, AWS RoboMaker, RobotStudio

Languages

C++ , Python, MatLab, Cmake, Bash, XML, Lua, HDL

Hardwares

Robots: PlutoX, UARM, Dobot
Microprocessor: Jetson/RaspberryPi
Microcontroller: Atmega32/ESP32/ArduninoMega/Pyboard/OpenMV/GSM
Softwares: Arduino, Keil uVision, AVR-GCC, Atmel studio 6, Eagle, LTSpice, ZED, QGC, PuTTY, Tinkercad
Sensor: Velodyne VLP16/Rplidar A2M8; Realsense D435/OAK-D-Lite; GstarIV GPS, BNO055 IMU, HC-SR501 PIR

Libraries/Tools

Cuda, CuDNN, STL, Boost, Eigen OpenCV, tf, Keras, nltk, PCL, OpenGL, roscpp, kdl, Bullet, Scikit-learn, Scipy, Matplotlib, tkinter, openAI gym-gazebo, ompl, trajopt, octomap, Git, CI

PROJECTS

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▸ **Drone Flocking**	Simulated multi-drone flocking and 3d localization with by stereo camera detection.	Link	June-Dec, 2021
▸ **UVC Robot**	Worked on Localisation, Mapping and Navigation of autonomus UVC Robot for Hospitals.	Link	Jan-June, 2021
▸ **Multi-manipulator**	Worked on dual 7 DOF arm Task-Level Motion Planning for Multi-manipulator system.	Link	Jan-June, 2020
▸ **Swarm Intelligence**	Simulating swarm behaviour of flocking and foraging in V-REP and Argos simulator	Link	Oct-Dec, 2019
▸ **Q-learning**	Q-learning based controlled for ARdrone, simulated in gazebo using ROS	Link	Aug - Oct, 2019
▸ **Manipulator**	Vision-based control and trajectory planning of robotic manipulator in point-cloud data	Link	June - July, 2019
▸ **SLAM**	Implemented SLAM on AGV by sensor fusion of data from 2D lidar and 3D camera	Link	May - June, 2019
▸ **3D Printer**	First built a prusa i3 3d printer and then a 3d printed robotic arm from our own printer.	Link	May - June, 2017

COURSEWORKS

Area	Courses
▸ **Maths**	Linear algebra, Probability, Stochastic Process and Statistics, Differential Calculus
▸ **CS**	Data Structures and Algorithms, DBMS, OS, Computer networks, Compilers, Parallel programming
▸ **AI**	ML basic(workshop), Principle of machine learning(CS4801), ML by Andrew Ng(CS229), DL(CS5007), RL basic and Advanced
▸ **Robotics**	Robotics manipulation and control, Robotics basics and Advanced, IOT basics, Embedded system, Signal and system, Engineering mechanics, Biomedical and Instrumentation, ROS basics and Advanced, Navigation stack, ROS Manipulation, ROS OpenAI gym

COMPETITIONS

▸ **OpenCV SpatialAI**	**Finalist**	Brain controlled dual arm wheel chair for war amputees.	2022
▸ **Upscale21**	**Winner**	Design algorithms for Multi-drone cordination for search and rescue mission.	2021
▸ **SIH Hardware**	**Finalist**	Path planning to fly two drones in a synchronized manner, maintaining same altitude and attitude.	2019
▸ **Techfest Petrichor**	**Runner Up**	Build a aquatic robot for pirate battle themed Pick & Place and war game.	2018
▸ **E-yantra**	**Finalist**	Simulated thirsty crow story using wheeled robot, Overhead camera, Aruco marker, Blender models, Augment environment using OpenGL, Path planning and Navigation on hexagon grid using IR sensor	2018
▸ **Inter-IIT, Bombay**	**Finalist**	Build a model for Satellite image classification using just 14 images, IIT Bombay	2018
▸ **Kaizen Robotics**	**Winner**	Design most advanced line follower which can pass any hurdle on the path, IIT Madras Research Park	2017
▸ **Makerthon**	**Finalist**	Build IOT based smart farming solution with 36 hour long hakerthon, Lema Labs, Chennai	2017

ACHIEVEMENTS

- Finalist, OpenCV Spatial AI Contest 2022
- Winner Upscale21, Kerala Startup Mission 2021
- Selected for Finals, Smart India Hackerthon – Hardware Edition, Govt. of India 2019
- Finalist, Inter-IIT Tech Meet, IIT Madras 2018
- Awarded KVPY Fellowship by Department of Science and Technology, Govt. of India. 2016
- Best Student of Year Award, Rajsamand District Education Committee 2015
- Awarded AWES Merit Scholarship, Army Welfare Education Society, India 2014

REFERENCES

Mr. Ashok Nair
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UST Global, Thiruvananthapuram, India
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Dr. Santhakumar Mohan
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