Rajendra Singh

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SUMMARY

I'm research oriented, team player, passionate roboticist 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 3+Years

June, 2020-**Present** — **Sr. Software Developer, R&D, UST** — Report
- *Trivandrum, India*
Mentored and lead a team on various State-of-Art Robotics Projects like AMR and UAVs using ROS & PX4.

Jan-June, **2020** — **Motion Planning Engineer, Innvation Labs, Gadgeon** — Report
- *Kochi, India*
Worked on developing a cobot of two panda arm to perform complex manipulation task with task level motion planning using Moveit Task Constructor and ROS framework.

May-July, **2019** — **Computer Vision Researcher, 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 Specialist, 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** — **3D Printing & Designing Intern, 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 & CEO**, 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** at various contests like SIH, Upscale, Eyantra, Kaizen, InterIITs, OpenCV SpatialAI etc., 2017– 22 — Link

PATENTS

Live Hinge 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

- Development of an UAV for Remote Live Streaming on Web Dashboard, i-MACE[1] 2022 — Link
- Design and Development of an Auto-inflatable Airbag as the Failsafe System of UAVs, i-MACE 2022 — Link
- Anti-drone Technology, Presented at Dare-To-Dream 3.0, **DRDO** — Link
- Multi-manipulator shared-space motion planning, Also presented at OpenCV Spatial AI Competion — Link
- SLAM, Swarm Intelligence & Reinforcement Learning — Link
- Developing MoveIt Task Constructor for MoveIt 2, Created for **GSoC**[2] — Link

SKILLS

Endorsements

Algorithms	• SLAM(GMapping, RTABMap, Hector, Cartographer) • Feature Matching(SIFT, SURF) • Q-learning/DQN/TD • Sensor fusion & State Estimators (KF, EKF, UKF PF) • Swarming(PSO, Flocking&Foraging) • Path Planing(A*, RRT) • RTOS scheduling (Round Robin, Preemptive) • Kinematics(DH/Newton/Eular) • Control system(PID) • Tracking(SORT/DeepSort/ByteTrack) • Segmentation(SiamMask, Yolact) • Detection (CNN, Yolo) • VO/VIO(VINS-Fusion, ORB, RATSLAM) • Planner(FastPlanner, EgoPlanner)
Softwares	Gazebo/Ignition, Rviz, V-REP, Simulink, Moveit, QGC, MissionPlanner, Unity, Fusion 360, AWS RoboMaker, RobotStudio, PX4 Autopilot/MavROS/MAVSDK/MAVPROXY
Languages	C++ , Python, MatLab, CMake, makefiles, Bash, XML(URDF/SDF/World), Lua
Hardwares	**Robots:** PlutoX, UARM, Dobot, Holybro X500 V2 **Microprocessor:** Jetson Nano/TX2/Xavier, RaspberryPi's **Microcontroller:** Atmega32/ESP32/Ardunino's/Pyboard/OpenMV/GSM/PIXHAWK/ARDUPILOT **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

Details

▸ **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 (Certificates)
▸ **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

More

- Finalist, OpenCV Spatial AI Contest 2022
- Winner Upscale21, Kerala Startup Mission 2021
- Selected for Finals, Smart India Hackathon – 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[3] Merit Scholarship, Army Welfare Education Society, India 2014

REFERENCES

Recommendations

Mr. Ashok Nair
Director & Head, Innovation Labs
UST Global, Thiruvananthapuram, India
E-Mail: ashok.nair@ust-global.com

Dr. Santhakumar Mohan
Professor of Robotics and Control
Mechanical Engineering, IIT Pkd, India
E-Mail: santhakumar@iitpkd.ac.in

Mr. Girish PR
Chief Technology Officer
GadgEon Smart Systems Pvt Ltd., India
E-Mail: girishkumar.pr@gadgeon.com

i-MACE[1] : International Conference of Innovation in Mechanical & Civil Engineering
GsoC[2] - Google Summer of Code
AWES[3] - Army Welfare Education Scholarship