Rajendra Singh

Fourth year
Computer Science and Engineering
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SUMMARY

◆ **Domain**	:	Robotics and Computer Vision
◆ **Internships**	:	Gadgeon, UST Global, Researshala and IIT Madras.
◆ **Projects**	:	SLAM , Manipulators, Reinforcement Learning based UAV controller, Swarm etc
◆ **Position**	:	Former Head, Robotics club, IIT Palakkad
◆ **Achievements**	:	KVPY fellowship, AWES Scholarship
◆ **Contributions to**	:	ros, ros2, moveit, moveit2, moveit_task_constructor, moveit_tutorials etc.
◆ **About**	:	I have a passionate interest in vision-based robotics. I'm research oriented, team player and looking forward to collaborate with enthusiastic team or startup researching in this domain.

EDUCATION

Program	Institution	%/CGPA	Year
• **B. Tech (Present)**	Indian Institute of Technology(IIT), Palakkad	7.39	2016 - 20
• **XII**	Delhi Public School(DPS), Udaipur	89%	2015 - 16
• **X**	Delhi Rajasthan Public School, Rajsamand	96%	2013 - 14

TECHNICAL SKILLS

Area	Skills
▸ **Robotics**	• SLAM(2D gmapping/3D RtabMap) • Perception(Feature matching, Semantic segmentation, Object detection) • Motion and Path planning • Sensor fusion(Kalman, Particle filter) • Swarm behaviour and algorithms • Robot kinematics and dynamics(DH/Newton/Eular/Lagrangian method) • Feedback control system • Embedded System(ARM, RTOS, FPGA)
▸ **Reinforcement Learning**	Q-learning, Sarsa, Monte Carlo, TD, Multi-armed bandit, DQN, Genetic algorithm
▸ **Machine Learning**	Linear and Logistic Regression, Neural Networks(convolutional, recurrent),
▸ **Languages**	C, C++ , Python
▸ **Software/Tools**	ROS 1/2, Moveit, Gazebo, V-REP, Matlab, Fusion 360, Keil, Atmel studio 6, OpenCV, OpenGL
▸ **Hardware**	Rplidar A2M8, Realsense D435, Nvidia Jetson(Tx2, nano), Raspi3B+, GstarIV GPS, Zybo-zyng FPGA, KL25Z arm cortex-M0+ , Atmega16/32/2560, NodeMCU, GSM, Pyboard, OpenMV, PlutoX
▸ **Other**	Open Source Development, Shell scripting, Latex, Review and research paper, Knowledge of patents

WORK EXPERIENCES

January-June, 2020 — **Robotics Research Intern, Gadgeon Smart Systems**
- *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 and Sensor Fusion Intern, UST Global**
- *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 — **Research Intern, Researchshala**
- *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, Centre for Inovation, IIT Madras**
- *Chennai, India*
Studied state of art 3D printing technology and then built **Prusa i3 3D printer** and a robotic arm using this printer.

SEMINAR PRESENTATIONS

June, 2020
- **Task-Level Motion Planning for Multi-manipulator system**
  - *IEEE Computer Society, GEC Palakkad*
  Conducted a seminar on discussing motion planning, moveit, multi-manipulators etc.

August, 2019
- **Visual SLAM on mobile manipulator using a robot operating system**
  - *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**
  - *Open House, Centre for Innovation(**CFI**), IIT Madras*
  Showcased low cost, self-made Prusa-i3 3D printer and its applications.

SELECTED PROJECTS

▸ **Multi-manipulator**	Task-Level Motion Planning for Multi-manipulator system. (See **here**)	January-June, 2020
▸ **Swarm**	Simulating **swarm** behaviour of flocking and foraging in V-REP and Argos simulator	October-December, 2019
▸ **Q-learning**	**Q-learning** based controlled for ARdrone, simulated in gazebo using ROS	August - October, 2019
▸ **Manipulator**	Vision-based **control** and trajectory **planning** of robotic manipulator in point-cloud data	June - July, 2019
▸ **SLAM**	Implemented **SLAM** on **AGV** by sensor fusion of data from 2D lidar and 3D camera	May - June, 2019

To know more about these projects, please visit: **https://iamrajee.github.io/projects/**

COMPETITIONS

▸ **SIH, Hardware**	**Path planning** to fly two drones in a synchronized manner, maintaining same altitude and attitude.	January - June, 2019
▸ **E-yantra**	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	August,18-March, 2019
▸ **Inter-IIT**	Build a model for **Satellite image classification** using just 14 images, IIT Bombay	July - December, 2018
▸ **Inter-IIT**	Built automated **Toilet Cleaning Robot** for cleaning toilet seat and floor, IIT Madras	July - December, 2017

RELEVANT COURSES AND WORKSHOPS

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

POSITION OF RESPONSIBILITY

➢ **Head of Robotics Club, IIT Palakkad** — July 2018 - May 2019
- Taught basics and advanced concept of robotics to a group of 40 students(12 teams).
- Supervised 9 student projects.
- Mentored 2 student projects(Humanoid and Submarine robots).
- Encouraged and motivated student to participate in a regional and national competition.

SCHOLASTIC ACHIEVEMENTS

2017 — Winner, Kaizen Robotics Competition, Lema labs.
2016 — Awarded **KVPY** Fellowship by Department of Science and Technology(**DST**), Govt. of India.
2016 — Qualified **IIT-Jee** Advanced 2016 with a percentile of 99.3 amongst a total of 1.2 million students.
2015 — Best Student of Year Award 2014–15, District Private Education Committee, Rajsamand
2014 — Awarded Merit Scholarship Class X, Army Welfare Education Society(**AWES**).

REFERENCES

- **Mr. Ashok Nair**
  Director Service Delivery
  UST Global, Thiruvananthapuram, India
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- **Mr. Shubham Jain**
  Founder and CEO
  Researshala, Chandigarh, India
  E-Mail: **shubham@researchshala.com**
- **Dr. Santhakumar Mohan**
  Professor of Robotics and Control, Department of Mechanical Engineering, IIT Palakkad
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