PALLAV KOTHARI

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EDUCATION

Master of Science- Electrical Engineering (Robotics) ***Sept 2016 - Aug 2019***
University of Michigan
Relevant Courses: Computer Vision, Intelligent Systems, Robot Modeling & Control, Aerospace System Design, Active Automotive Safety Systems
Scholarships: College of Engineering and Computer Science Graduate Student Scholarship

Bachelor of Technology- Electronics & Communication Engineering ***Sept 2011 - May 2015***
Amity University Rajasthan, INDIA
Relevant Courses: Digital Circuits and Systems, Analog Electronics, Digital Signal Processing, Data Communication and Networking, Radar and Satellite Communication
Scholarships: Scholarship for Meritorious Students (2011 – 2013)

WORK EXPERIENCE

Research Engineer – Distributed Aerospace Systems and Controls Lab | UMICH ***Jan 2020 – Present***
- Implemented Quadratic-Programming Control algorithms for Multi-Agent hardware robotic systems
- Developed Multi-Agent algorithm simulations in a Linux using C++, Python, and Robot Operating System (ROS)
- Developed hardware solutions for collaborative Unmanned Aerial Vehicle (UAV) and Unmanned Ground Vehicle (UGV)
- Implemented Multi-Quadrotor collision avoidance simulations in AirSim/ROS Environment
- Keywords – Swarm, Gazebo, ROS, RViz, Quadratic Programming, DJI-M100, AION R1 rovers, Hector Quad, RotorS, AirSim

Student Researcher – University of Michigan – Dearborn, USA ***Jan 2019 – Apr 2019***
- Worked on devising a path planning algorithm for 6 six-DOF robot arms in industrial application
- Used ROS utilities/tools for designing controls and Gazebo, Rviz and MoveIt as visualization tools
- Designed controllers to mobilize robot arms while specifying kinematic and dynamic properties
- Keywords – Rviz, MoveIt, ROS, path planning, Gazebo, IRB1200, Python, C++

Software Engineer – Capgemini India, Pune, Maharashtra, INDIA ***Dec 2015 - Jun 2016***
- Worked as Front-End Developer for client AIG, developing User Interface for their web tool
- Used Hybrid Languages such as HTML5, AngularJS, JavaScript and CSS3 for development
- Keywords – Web development, Front-End development, HTML5, CSS3, AngularJS

Student Researcher – Beijing Institute of technology, Beijing, CHINA ***Jul 2013 - Sept 2013***
- Employed Computer Vision and Machine Learning Technology for duplicating Human actions
- Detected human motion in videos, dividing in equal frames using Bag of Words & Sliding Window Technique
- Duplicating human actions in computer world using Dynamic time warping and Interest Points
- Keywords – Computer vision, Machine learning, bag of words, Dynamic time warping, OpenCV

Summer Intern - I3 Indya technologies, Delhi, INDIA ***Jun 2012 - Jul 2012***
- Developed Mobile controlled robots using DTMF technology via Global Telecommunication network
- Developed Leader-Follower algorithm for 2 RF controlled robotic platform powered by ATMEGA16
- Accomplished Line following, Temperature control & Collision Avoidance for Robotic Embedded Systems
- Developed Pinball game on LCD, played via RF sensors programmed in AVR studio
- Keywords – ATMEGA16, ATMEL, AVRStudio, Embedded C, DTMF, LCD, RF sensors

TECHNICAL SKILLS

Software: Python, C++, AirSim, Gazebo, ROS, Rviz, MoveIt, MATLAB, JavaScript, HTML5/CSS3, Git, OpenCV, AVR studio
Hardware: TurtleBot, DJI-M100, AION Rovers, Crazyflies, ATMEGA16, IRB1200, Kinect Camera, Raspberry Pi4, BeagleBone

PROJECT EXPERIENCE

Multi-Sensory Feedback Control for 2-Wheel Balance Robot using Cascaded PID Controller –

- Implemented a gyro-odometery based dead-reckoning navigation system
- Implemented pitch, yaw, & velocity control for holding a set point, moving in straight line and moving in a square of 1m side
- Could absorb contact and external force and return to original position in balanced state

6 DOF Quadrotor Autonomous Control with Delta Arm using 2 sets of State Machines –

- Aerial manipulation with a quadrotor equipped with 3 DOF delta arm at bottom for picking and placing block objects
- P-D controller for thrust/roll/pitch control & P controller for yaw control. Inverse kinematics model for delta arm was used
- One state machine for pick-place task, one for flight control to a set point. 2 flags for pick up & reached states were used

JPL (NASA) Science and Payload team - Deimos Object Retrieval Instrument (DORI) space mission –

- Led Science and Payload team of 7 engineers responsible for designing scientific instrumentation for the mission
- Characterized surface features, shape, structure and composition of Deimos (MARS moon) using 5 science instruments
- Objectives included collection of 60gm regolith from 2 sites, and stereoscopic imaging of 80% surface in 1m/px resolution.
- Customized AFC (camera system), ALICE (spectrometer), LIDAR, BRUCE (sample collector) & RDS (for gravity measurement)
- Achieved mission objectives with 20% cost buffer on mission allotted cost of $50 million

Vehicle Collision Avoidance System –

- Used SIFT detector and Brute force matcher for feature detection and minimizing window size to eliminate noise
- Haar cascade classifiers (Viola Jones) were used for car detection & were trained using 526 representative data images
- Used contour plotting to reveal car's bumper as a feature and size variation was used to derive speed estimation
- Achieved 83% success rate for speed estimation. Anomalies included weather conditions, and background conditions

Multi-process, Multi-threaded System for 6 DOF Robotics Arm -

- Designed 3 different inverse kinematics modes to make the most use of the gripper to augment the robot's workspace
- Implemented Forward Kinematics and Inverse Kinematics using DH Convention
- Used overhead Kinect camera and Open CV for blob detection and finding their location with respect to the arm

Cognitive Robotics using ATMEGA16 Microcontroller –

- Developed 2 robots which map the surrounding landscape with RF sensors & transmit data on dedicated radio frequency.
- Performed Collaboration tasks like imitation, circular movements and parallel drive for weight distribution.

AFFILIATIONS

- Founder & President of Literature club – Pendragons (2012-2015) and Editor-In Chief for University's E-magazine "Amidoor"
- Served as Festival Ambassador in World's Largest Literary festival, "JLF - 2015" and as Venue Manager in "JLF -2014"
- Represented INDIA in 21st World Scouting Jamboree, London, UK. Awarded by Government of INDIA for the same
- Held Position of Zonal Coordinator - West Zone in INDIA's biggest Robotics Competition – ROBOTRYST (2014).
- Completed certification in Embedded Systems and Robotics from I3 Indya Technologies, New Delhi (2012).
- Runner up in Spanish Language Drama at Amity Leadership Festival, Amity University Rajasthan, INDIA.
- Winner of High School Mathematics Project challenge as well as got distinction in 9th National Science Olympiad.
- Completed level 1 Instrumental degree in classical violin by Pracheen Kala Kendra.
- Nationally recognized for Painting and was awarded Avindra Nath Tagore, and First All India Art Competition Certificate.