Anurag Agrawal

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EDUCATION

2013-2018 | **Indian Institute of Technology, Bombay, India**
Dual Degree (B.Tech + M.Tech) in Electrical Engineering
Specialization: Communication & Signal Processing
Minor: Systems & Controls
CPI: 8.63

SKILLS

Programming : C/ C++, Python, Verilog, VHDL, System Verilog, LATEX, CSS, HTML
Software : ROS, MATLAB, LabView, Simulink, Scilab, MS Office, QuestaSim, Xilinx

EXPERIENCE

JUL'18 - PRESENT | **Scientist – R&D** ***SAC, ISRO**, Ahmedabad*

- Development of FPGA Based IP for Quantum Key Distribution for space communication
- Development & Verification of FPGA Designs in System Verilog, VHDL with random constrained data, assertions, closed loop verification & hardware software co-simulation approaches
- Prototype Development with Image Data Acquisition, Image Processing and Target Tracking Control in LabView on FlexRIO for Optical Communication Terminals
- Filter Design Simulation for SEU and failure analysis using Xilinx, Simulink, and MATLAB

MAY'17 - JUL'18 | **Railway Timetable Optimization** ***Prof. Madhu Belur & Prof. Narayan Rangaraj**, IIT Bombay*

Python Tool with Gurobi Solver to generate an optimal rail timetable satisfying user's constraints

- Problem formulation involves headway, dwell, traversal, service distribution, turnaround, rake-linking & platform allocation constraints and objective functions for timetable generation
- Timetable includes service timings, rake-rake & rake-service mappings, occupancy charts
- Case Study on Mumbai Harbour – Trans Harbour Line and realized the current operational number of service wih 3 less rakes, satisfying all practical constraints

MAY'16 - JUL'16 | **Spatial Competency for Robots** ***Prof. Kamal Gupta**, Simon Fraser University, Canada*

Workhorse for this purpose is 3 fingered Schunk Dexterous Hand [SDH] with tactile sensors on its fingers.

- Simulated robot description files to load models in RVIZ & execute ROS nodes to control the bot links
- Implemented a ROS node for safe grasp under pose uncertainty with user-defined hand pre shapes
- Grasp execution includes finger halt, collision detection, proportional controller, proximal–distal link coupler, SDH motion and tactile reading manipulation

INTERNSHIPS

NOV'17 - DEC'17 | **Observer Design and Controls** ***KPIT Technologies**, Pune*

Battery Observer Design to analyse concerned electrical and thermal characteristics

- Designed a thermoelectric battery model from a given single cell electrochemical model
- Analysed the observability and implemented Extended Kalman Observer to extract relevant parameters

NOV'15 - DEC'15 | **MOPTro Deployment & Order Distribution** ***Greendzine Technologies,*** *Bangalore*

MOPTro - An Order Picking Trolley, mounted with an android based system that optimizes in-warehouse routing

- Developed a JAVA GUI application to deploy optimum MOPTros for simulated order flow
- Designed an algorithm to fairly allocate any given set of orders based on user-defined priorities

MAY'14 - JUL'14 | **Self-Balancing Bike Bot** ***Tech Club****, IIT Bombay*

A two-wheel vehicle prototype that self-stabilizes to its upright position, *(showcased in Tech R&D Expo IITB)*

- Used Flywheel mechanism to stabilize the bot while in motion or even at standstill
- Employed MATLAB simulation for analysing the design and actuator parameters
- Implemented PID Algorithm on ARDUINO along with use of IMU sensor for angle readings

PROJECTS

AUTUMN 2015 | **Adaptive Path Planning** ***Prof. Leena Vacchani & Prof. Arpita Sinha****, IIT Bombay*

- Implemented an algorithm to calculate the robot's current position using the triangulation technique
- Deployed kalman filtering technique for the pose estimation given the data is Gaussian noised
- Avoid the moving obstacles - whose real time positions are known - using collision cone approach

AUTUMN 2016 | **3D-Overhead Crane** ***Prof. Leena Vacchani,*** *IIT Bombay*

- Setup UART Communication between FPGA – Xbee1 and Xbee2-Raspberry Pi where Xbees are wirelessly connected and estimated motor's speed vs PWM characteristics via multiple approaches
- Implemented PID algorithm in MATLAB to guide the modelled crane to a specified location

AUTUMN 2016 | **Toonification** ***Prof. Suyash P. Awate,*** *IIT Bombay*

- Implemented contour detection, colour smoothing & colour quantization with edge preservation
- Frame by Frame and Spatial-Temporal Coherence approach for video toonification

AUTUMN 2015 | **Ultrasonic Local Positioning System** ***Prof. Shalabh Gupta****, IIT Bombay*

A short range trilateration system that uses 40 KHz Ultrasonic signal delay from transmitters to receiver node

- Used amplifiers, comparators and downconverters to amplify the signal & its reach, eliminate noise, and scale down the voltage amplitude for microcontroller input
- Receiver module sends out code words via Xbee (UART Communication with microcontroller) which cause the corresponding transmitter to emit the ultrasonic pulse and start the delay timer
- Signal triggers input capture, causing the receiver to record the time delay

EXTRA CURRICULAR ACTIVITES

YEAR 2017- 18 | **Company Coordinator** ***Placement Cell,*** *IIT Bombay*

- Worked with 50+ members responsible for coordinating organizations for recruitment of 1600+ students
- Identified potential recruiters & developed professional acquaintance with HR of various organizations
- Coordinated with PMs and DPCs in conducting preparatory events such as tests and buddy talks

YEAR 2015- 16 | **Hostel Technical Councillor** ***Hostel 3,*** *IIT Bombay*

- Worked with 25+ members to ideate inter hostel technical general championships and sessions
- Led the hostel tech team and Overall Runner up in annual technical general championships

Awarded the Hostel Technical Person *of the year* title *for seamless contribution to the technical scenario*

INTEREST

Robotics, Systems and Control, Image Processing, Communication, Hardware Design