PERSONAL INFORMATION

Muhammad Sunny Nazeer

WORK EXPERIENCE

Oct 2016 – Aug 2018

Design Engineer

Omissis

Job Responsibility

- Conceptual design document preparation of manned aircraft to UAV conversion
- Mathematical modelling & simulation of general category aircraft and a UAV in JSBSim (Qt Creator in Linux OS) and MATLAB with visualization in vega prime and X-Plane
- IMU modelling (states and noise) in JSBSim for software in the loop simulation
- Initial design modelling of medium altitude long endurance (MALE) UAV
- Automation of small scale down version of a class-I category trainer aircraft
- Pre-flight testing of the developed hardware in hardware-in-the-loop simulation facility with 3-D turn table

Mar 2016 – Apr 2016

Internee

Omissis

Job Responsibility

- Helping hand in IMU & IAS sensors calibration shop
- Helping hand in flight control system testing shop

Sep 2015 – Oct 2015

Internee

Omissis

Job Responsibility

- PCB designing in Altium Designer in avionics design shop
- Helping hand in radio shop for antenna testing with vector network analyser

EDUCATION AND TRAINING

Sep 2018 – Aug 2020

European Master in Advance Robotics Plus (Erasmus Mundus Consortium Scholarship Holder)

Sep 2018 – Aug 2019

Warsaw University of Technology (WUT), Warsaw (Poland) – First Year of Master (80/100)

MS M1 Projects

- Image Segmentation of an object in series of images to predict the trajectory of the motion of the subject object
- Calculating the homography based on 4 pairs of points, warping and cropping the image and panorama stitching
- Feature point view detecting, matching and based on this calculating transformation, point cloud generation and refinement using RanSac and Loop closing using g2o
- Blind search strategies for path finding using (BFS, UCS, DFS, DLS and IDS) in AI problem
- A*, IDA*, SMA* with limited memory and RTA* comparison for single path planning problem
- Inference in Bayesian Network using Exact inference by enumeration and Markov Chain Monte Carlo (MCMC) method
- Kalman Filter and Particle Filter implementation for simple AI problems
- Style transfer of famous artists using CNN VGG19 network (Keras Library) using Python
- Obstacle avoidance (Bug & Bug2 comparison) for a differential drive mobile robot simulation using MATLAB and VREP
- Calculation of forward and inverse kinematics solution of a 6-DOF serial manipulator and generation of pick and place trajectory using both cartesian and joint space techniques

Sep 2019 – Present

Ecole Centrale De Nantes (ECN), Nantes (France) – Second Year of Master

MS M2 Projects

- Kinematics & Dynamics computation and simulation of Biglide and five-bar Mechanism in MATLAB and comparison with ADAMS VIEW
- Design of control laws and testing of human motion to humanoid control in simulation environment in MATLAB using modified Hanavan Model
- Task priority definition in visual servoing in simulation in V-rep as well as real Baxter Robot using ROS as middleware (Python based)

- Quadratic Programming based solution in visual servoing (object following) using Baxter Robot
- Affine and metric rectification of 2D geometry in an image using Python
- Fundamental matrix computation using 8-point algorithm & RANSAC and testing the epipole geometry using Python
- 3D reconstruction of a point cloud using disparity map and dense stereo matching using Python
- Augmented reality performance using homography based visual odometry using OpenCV & C++
- Kalman filter modelling and implementation for data processing of a DC motor using MATLAB
- Occupancy grid mapping using Pykitti Package & Iterative Closest Point (ICP) algorithm in Python

Final Year Project in Masters (February 2020 – July, 2020)

- **AI-enabled haptic shared control system for the intuitive and effective control of a team of drones**

The objective of the project is to help the human operator guide the team of drones in a simple and natural way. P. R. Giordano's idea about "Passivity based decentralized shared control strategy" is being employed as a reference for testing, comparison and data generation for Machine Learning algorithms. So, the focus of the project is to develop a control strategy using machine learning techniques to autonomously keep the team together and to make the control strategy flexible in terms of number of drones being used in the team. Two different strategies are being used for the same task (supervised learning and reinforcement learning). Part 1 about training an ANN has been completed and tested and now in progress for multi-agent implementation while second task is in the progress with initial testing with simplified environment is done. The project is done in Paolo Robuffo Giordano's group with Claudio Pacchierotti and Marco Aggravi.

Nov 2012 – Aug 2016

Bachelor of Engineering in Avionics Engineering (CGPA: 3.52 / 4.00)

College of Aeronautical Engineering (CAE), National University of Sciences and Technology (NUST), (Pakistan)

Final Year Project in Bachelor of Engineering

- Design, Simulation and Testing of an Altitude and Attitude Hold Autopilot for Y-12 Aircraft

The aim of the project was to design an altitude and attitude hold autopilot for Y-12 aircraft. Stability and Control derivatives of aircraft were generated using AAA® software based on aircraft geometry. A nonlinear model was generated which was then linearized at trim conditions to serve as plant model for control algorithms. Altitude and attitude hold autopilot algorithms were designed using dynamics inversion feedback linearization method on linear models and were implemented on coupled nonlinear aircraft model. Then, designed algorithms were tested with the flight simulators available in PAC, Kamra which, at later stage, were implemented in hardware during job period.

Semester projects during Bachelor of Engineering

- Fabrication of a fly worthy plane from balsa wood – an Aero-modelling project for **DBFC**
- Control of a small plane using Pixhawk autopilot for **DBFC**
- Development of an autonomous car to avoid obstacles in dynamic environment for **NERC**
- DCM algorithm implementation to calculate angle from Rate Gyro using arduino
- Fusion algorithm implementation to calculate angle from Rate Gyro using arduino
- Design of PID based controller using MATLAB for quadrotor motors control
- LQR and dynamic Inversion based controllers design for RC plane in MATLAB
- Sensors (thermocouple, flow meter, pressure transducer, strain gauge and piezoelectric) implementation using arduino IDE
- Design of antenna for single frequency in HFSS and testing with VNA
- Design of a low pass and high pass filter for given frequency and testing with VNA

Software & Hardware skills

- Working experience on MATLAB, Qt Creator, OOP Python, Altium Designer, Proteus, PSpice.
- PCB designing in altium designer and stuffing by hand and using etching machine

AWARDS AND ACHIEVEMENTS

Honours and Awards

- Received a **Gold Medal** as a team for successfully doing aircraft trials with indigenous FCS during professional life in PAC, Kamra (24 June 2018)
- Received **Silver Medal** for second highest CGPA at CAE, NUST (15 September 2016)
- Won **Best Design Award** for designing conceptual avionics suite of a reconnaissance aircraft in 7th semester (February 2016)
- Awarded Commandant's **Distinguish Badge** for Excellent Academics for 5 semesters consecutively (2012 - 2016)
- Awarded Dean's **Honour Badge** for 3 semesters (2012 - 2016)
- Maintained **NUST Merit Based Scholarship** for 5 semesters (2012 - 2016)
- Received **Punjab Provincial Scholarship** in senior year of High School (March 2011)
- Certificates for successfully passing **Kangaroo Test** and **National Aptitude Test** during High School (July 2009)

Certified Courses through Distant Learning in Coursera

- Reinforcement Learning Specialization (4 courses) from **University of Alberta (Oct, 19 – Feb, 20)**
  These four courses focus only on reinforcement learning for two kinds of problems, Prediction and Control. It gradually builds from very basic ideas to advance techniques like Monte Carlo, Q-learning, Sarsa and expected Sara for both prediction and control problems in episodic and continuous environment.
- Control of Nonlinear Spacecraft Attitude Motion from **University of Colorado (Aug, 17 – Sep, 17)**
  In this course, I learned advanced techniques of control system design. How these are different from one another and complete method of design and analysis of complex control system through "**Lyapunov's Method**". Implementation of this method in designing and minimizing the cost of control used for a general nonlinear spacecraft system.
- Robotics: Aerial Robotics from **University of Pennsylvania (Jul, 17–Aug, 17)**
  In this course, I learned to design and tune a control algorithm for 1D, 2D and 3D motion of a quadrotor with different profiles to follow. Tricks to select the electronic on-board the aerial platform.
- Work Smarter, Not Harder: Time Management for Personal & Professional Productivity from **University of California, Irvine (Sep, 17 – Oct, 17)**
  In this course, I learned differentiation b/w productive and unproductive work, ways to break work into chunks, work/life balance, figuring out most to least productive time of day, etc.
- Innovation & Entrepreneurship – From Design Thinking to Funding **(Oct, 17 – Dec, 17)**
  In this course, there was discussion about the innovation cycle. After hearing this, I talked to my friends to get good ideas. Other discussions such as setting up business model according to the market size, finding the source of funding, etc.

PERSONAL SKILLS

Mother tongue(s): Urdu & English (Official Language)

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	B1

ADDITIONAL INFORMATION

Contests Attended

- National Engineering Robotics Competition (**NERC**) 2014 & 2015 as contestant
- Design Build & Fly Contest (**DBFC**) 2015 & 2016 as contestant
- **IEEE FAST Electrica** 2015 as Math Magician

Other skills (Community work)

- Organized multiple programs for people stuck in my country due to earthquake such as: **Funds Raising** program for rehabilitation, **charity stalls** (canned food, clothes, necessary items of daily use), collection of books, stationery, uniform etc. for educational purpose and arranging "**Iftar Dastarkhwan**" (Dinner for people with Fast) program during Ramadan, etc. (2005 – 2014)
- Active member of "**ucare Foundation**" in Pakistan (2010 – 2015)