Mugesh Gnanasekar

1855 Pointe Crossing Street, Ann Arbor,MI-48105 • **E: mshanmug@mtu.edu • M**: **906-370-8658**

www.linkedin.com/pub/mugesh-shanmugam-pillai-gnanasekar/97/55/904

https://github.com/Mugesh-Gnanasekar

OBJECTIVE

To apply for the position '**Engineering Internship'** for **Fall 2015** in your esteemed company.

EDUCATION

Michigan Technological University *Sept 2014 to Dec 2015 (Expected)*

MS Mechanical Engineering • **GPA**: **3.75/4.0 • Control System Specialization**

College of Engineering, Guindy, Anna University, **India** *August 2010 to May 2014*

B.E. Mechanical Engineering • **CGPA: 8.75/10 • First Class with Distinction**

TECHNICAL SKILLS

C++ • Python • MATLAB • Simulink • LabVIEW • Real Time Linux • Unmanned Aerial Vehicles(UAV) • Beagle Bone Black Raspberry Pie • Mathematical Modelling and Simulation • Arduino Programming • GitHub • Tortoise SVN • CATIA • Solid works

INTERNSHIP EXPERIENCE *May to Aug 2015*

Presently working as ***Simulation Modeling Intern*** at ***Applied Dynamics International(ADI),*** Ann Arbor, Michigan

- Working on their proprietary '***iAircraft***' simulation software containing 'Simulink block library' for full aircraft modelling.
- Specifically working on developing custom made 'Simulink blocks' using S-functions for the 'Aerodynamics'.
- Working on simulation of ***'Air Data computer'*** and ***'Doppler Radar'*** for providing accurate data to the NAV system.
- Creating a complete ***GUI*** application using ***Python(Tkinter)*** to interact with "Digital DATCOM" which is a Fortran code developed by USAF for generating aerodynamic coefficients for user-given aircraft configuration when experimental data is not available.
- Parsing the coefficients from the inflexible 'output text file' from DATCOM and creating a 'csv file' using Python and plotting using matplotlib.

Engineering Intern in IC Engines Laboratory, ***Indian Institute of Technology, Madras*** under Dr.Ramesh: *May to August 2013*

- Designed an automated ***fuel flow measuring system*** using IR sensors and acquired the sensor signal using ***LabVIEW Daq-Mx*** and sensor signal conditioning is dong using LabVIEW signal conditioning functions and designed a virtual instrument using ***LabVIEW*** to accurately calculate the flow rate of the fuel into the engine.
- Created profile of CAM using Pro-E for an Compressed Air Engine with modified cylinder head and valve timing.
- Assisted a Ph.D. scholar in designing the ***experimental setup*** for his experiment on '***Port injection of Liquid phase LPG***'.

RESEARCH WORK IN NON-LINEAR AND AUTONOMOUS SYSTEMS LAB, MICHIGAN TECH *Nov,2014 – May,2015*

AUTONOMOUS CONTROL OF HEXACOPTER USING BEAGLEBONE BLACK AND PIXHAWK FLIGHT CONTROLLER

- Assembled a Flame wheel F550 ***hexacopter*** with ***Pixhawk*** Flight Controller and ***Beaglebone black*** (ARM micro-controller) attached.
- Developed **C++ Firmware** to establish serial communication over ***UART*** interface between the Pixhawk and Beaglebone black.
- Developed **C++ Firmware** to achieve 'off-board' control over the Pixhawk using Beaglebone black and access all of its sensor data including accelerometer, gyro meter, barometer etc. using ***MAVlink*** messages
- Using the sensor readings, developed C++ code to achieve the required maneuvers by the hexacopter by streaming continuous data of set-points to the Pixhawk which in-turn controls the PWM signals sent to the rotors and achieve the required aerial motion.

DEVELOPMENT OF 3D PATH TRACKING SYSTEM FOR A HEXACOPTER USING EXTENDED KALMAN FILTER

- Developed a ***State Space Model*** of the Hexacopter using ***Newton-Euler*** Equations of motion for rigid body due to external forces & torques in body frame.
- Developed Rotation transformation matrix to transform from the body frame to the Earth frame in which the user gives the input.
- Designed a ***Kalman Filter*** which will integrate the position data from both ***GPS*** and ***Accelerometer*** within Pixhawk and give an accurate estimate of the current position of the hexacopter.
- This estimation is used in the Beaglebone black as the position of the hexacopter in real time and the PID control algorithm will find the difference between the given position and the estimated positon and stream the set-points to the Pixhawk flight controller and the estimation is plotted in the inertial frame to provide ***3-D tracking*** of the UAV.

OTHER ACADEMIC PROJECTS

SELF INFLATING TIRE SYSTEM FOR FOUR WHEELERS USING ARDUINO UNO

- Designed and fabricated the ***Rotary joint*** with air seals that connects the hose from the external compressor which pumps the air into the wheel.
- Mounted a pressure sensor on the mouth of the wheel which detects the pressure value and sends the value to the ***Arduino*** Uno which displays the value to the user and asks for the correct pressure value in psi.
- Once the pressure value is entered the Arduino sends commands to actuate the ***compressor*** which start pumping in the air which goes through the rotary joint which avoids the tangling of hoses. This happens until the desired pressure value is reached and once the pressure value is achieved, the Arduino switches of the compressor.

MOTION CONTROL OF A CART USING 'PID' CONTROLLER IMPLEMENTED IN MATLAB/SIMULINK

- Theoretically calculated all the control parameters (controller gain) for the second order system (motion of cart) using the given performance requirements like overshoot, rise time needed etc.
- The 'CART' system has one actuator (DC motor) which creates the motion and a sensor (position encoder) which gives the position of cart which is fed back to the input for achieving 'Closed loop control' and connected to the computer using Multi-IO ports and ***QUARC*** real time software control is used along with ***Simulink*** to achieve the motion control.
- The controller parameters found theoretically before is implemented in Simulink and the cart's actual motion from the calibrated position encoder is 'fed-back' and the ***PID gain*** values are tuned manually to achieve closed loop motion control of the cart.

TEMPERATURE CONTROL SYSTEM USING LABVIEW

- The experimental set up consists of a Thermocouple to measure the temperature of the hot water in a beaker and the sensor output is acquired using **PCI 6024 E** and the voltage output is converted into actual temperature by calibrating the sensor.
- The VI in LabVIEW will check the continuous samples of voltage and when the temperature goes down the required value, it will switch on the heating coil using a solid state relay which will increase the temperature.
- Once the required temperature is achieved the heating coil is switched off using the relay.

LOAD MEASUREMENT USING STRAIN GAUGE TANSDUCER AND SIGNAL CONDITIONING IN LABVIEW

- Two strain gauges are placed on top of a cantilever beam and two on the bottom and all Four strain gauges are connected in a 'Wheatstone bridge'.
- When there is a load applied on the cantilever beam, the strain gauges expand/contract producing change in the resistance values which in-turn causes changes in the output voltage in the Wheatstone bridge.
- This analog voltage is acquired using **PCI 6024 E** and appropriate signal conditioning is applied and smooth sensor values are obtained.
- Then the sensor is calibrated with no load and known load and it is made ready to measure unknown load by creating a Virtual instrument in LabVIEW.