# KRUNAL CHANDE


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| **Website** | http://www.krunalchande.com | **Address** |
| **Phone Number** | +1 (404)940-6785 | 1068 Westshire Pl, Apt D |
| **Email Address** | krunalchande@gatech.edu | Atlanta, GA - 30318 |


## EDUCATION

**Georgia Institute of Technology (Georgia Tech), Atlanta** *Aug 2013 - May 2015*
M.S. in Electrical & Computer Engineering GPA - 3.77

**Dwarkadas J. Sanghvi College of Engineering** *Aug 2009 - May 2013*
B.S. in Electronics Engineering Equivalent GPA - 3.7

## RESEARCH EXPERIENCE

**Visual-Inertial Sensor Fusion** Aug 2014 - Present
*Research Assistant - Prof. Frank Dellaert - Dr. Luca Carlone* *Borg Lab, Georgia Tech*

- Designed a Quadrotor State-Estimation System by fusing intermittent data from an Accelerometer, Gyroscope, a range sensor and Camera.
- Incorporated information about Quadrotor's dynamics to improve accuracy.
- Achieved position accuracy of 5-7cm and orientation of 1 deg.
- Submitted a paper, currently in review, for ICRA 2015 as the lead author.

**Attitude Heading Reference System** May 2014 - Jul 2014
*Research Assistant - Prof. Frank Dellaert* *Borg Lab, Georgia Tech*

- Made a state estimation system, in an Extended Kalman Filter framework.
- Carefully modelled noise parameters of accelerometers and gyroscopes for high accuracy.
- Achieved stable flight on Quadrotor using this estimator

**Nonlinear Control System for Quadrotors** Jan 2014 - Apr 2014
*Research Assistant - Prof. Frank Dellaert* *Borg Lab, Georgia Tech*

- Built on existing infrastructure to fly a Quadrotor using Nonlinear Controller parameterized by the elements of matrix lie group SO(3).
- Re-wrote depcrecated code and set up Robot Operating System (ROS) infrastructure for data-logging and fine-tuning controller in real time.

## PROJECTS

**Optic Flow based Ground Plane Segmentation** Nov 2014

- Segmented out ground planes from obstacles using Optic Flow for a ground based robot.
- Created optic flow subspaces for rotation and translation by analytic and observation-based methods
- Estimated egomotion from observed flow using RANSAC
- System tested in simulation using Gazebo and on a Segway RMP 200 based platform.

**Traffic Sign Recognition** Apr 2014

· Classified various traffic signs using a combination of image processing and pattern recognition.
· Achieved near real-time performance of 10 *FPS*.
· Achieved detection rate of 98.5 % as a result of incorporation of information about object structure and color before classifying.

**Path Planning in Adverserial Environments** Nov 2013

· Developed a risk-based path planner, avoiding dangers and balancing risk with travel time.

**Motion planning and control of robotic arm** Oct 2013

· Implemented control of a Robotic Arm in an obstacle ridden workspace by generating a Rapidly Exploring Random Tree (RRT) and it's variants in configuration space
· Added constraints on the end effector to model more real world scenarios, implemented Jacobian Control to deal with them.

**Color Transfer between Images** Oct 2013

· Using statistical analysis, we transferred color from a source to a target image
· Applications in Automated Analysis used for making images invariant to lighting conditions and to improve aesthetic appeal.

**Data Acquisition System(DAQ)** Mar 2013

· Made a low-cost, high-speed DAQ using ARM7 LPC2148 as an alternative to NI DAQ
· Created a supporting GUI for visualization and ease of use.
· Specially engineered a PCB to achieve true 12-bit accuracy of Analog to Digital Conversion

## TECHNICAL STRENGTHS

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| **Operating Systems** | Linux, Windows |
| **Computer Languages** | C++. Python, Matlab, CUDA, VHDL Real-Time C++ ($\mu$Cos-2) |
| **Tools** | Git, OpenGL, Robot Operating System(ROS), LaTeX, Arduino<br>Unity Game Engine, NaturalPoint Optitrack (Motion Capture System)<br>Eagle, Orcad |
| **Libraries** | OpenCV, PThreads, MPI, GMP, GTSAM |
| **Other Skills** | PCB Fabrication, Circuit Board Design |

## EXTRA-CURRICULARS

**National Service Scheme(NSS)** Aug 2010- Aug 2012
*Social Service*

· Worked 2 years as a part of NSS, doing social work in Mumbai and villages in it's vicinity.

**Technical Head - IEEE Student Chapter** Aug 2011- Aug 2012

· Conducted workshops and seminars on Robotics and State-Estimation.

**Tutor - Basic Electrical Circuits** Aug 2012- Dec 2012

· Working for *The Learning Program*, taught a semester long course on Basic Electrical Circuits to a class of 15 students