

MANOMIT BAL

GitHub: <https://github.com/manomitbal>

LinkedIn: <https://www.linkedin.com/in/manomit-bal-87aab855>

manomitb@buffalo.edu ♦ 585 755 5869

EDUCATION

SUNY University at Buffalo

December 2016

Bachelors in Computer Engineering

Monroe Community College

December 2014

Certificate in Mathematics

Rochester Institute of Technology

June 2013

Associates in Computer Engineering Technology

SKILLS

Languages C, C++, Python, Java

Software/OS ROS Framework, Android-Studio, Multi-Sim, EAGLE PCB Design, Altera Quartus, OpenCV, CMake, Freenect, PCL, Eigen, Boost, MATLAB, GIT, GNU/Linux, L^AT_EX.

PUBLICATIONS

Manomit Bal, Javier Yu, Karthik Dantu "Panoptes : A Cheap, Extensible, Open-source Multi-Camera Tracking System" 16th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN '17)" [Submitted] **February 2017**

RESEARCH AND EXPERIENCE

North Eastern Robotics Colloquium (NERC) V,
Cornell University, Ithaca, NY.

Fall 2016

Poster Demo: Panoptes : Open-source Multi-Camera Tracking System

- Developing an open-source system to localize and track rigid bodies using regular as well as depth cameras.
- This system is motivated by two design goals - (i) ease of setup, and (ii) ability to be agnostic of individual cameras and recognition algorithms.
- The goal of this implementation is to be a poor man's motion capture system that can be quickly set up for experimentation and provide accurate 3-D pose of the rigid body while in the volume of coverage.

Discovery Robotics,
Pittsburgh, PA.

Summer 2016

Robotics Engineering Intern

- Worked on an algorithm pertaining to Real Time Localization in an indoor environment using Ultra Wide Band (UWB) radio transmissions between nodes for procuring a prominent pose of a tag using Extended Kalman Filter.
- Designed and fabricated the PCB for custom sensor nodes enveloping the functionality of the Ultra Wide Band Antenna in EAGLE along with furnishing the firmware and software for interfacing the same.
- Worked on probabilistic LIDAR scan registration using Point Cloud and Octo-map libraries to establish a 3D map of the environment interpreted from LIDAR scans.
- Fixed errors in Path Planning and Navigation by modifying parameters within the Global and Local 2D cost map of the robot.

SUNY University at Buffalo,
Buffalo, NY.

Fall 2015 - Present

Research Assistant

- Visual Odometry for Egomotion Estimation.
 - Successfully quantified drift occurring between frames from key features (Harris Corner/SIFT) to determine Optical Flow and used said metric to tele-operate/optimize a CrazyFlie Quadcopter.
 - Implemented RANSAC and Homography functions to reject outliers and reduce noise from vision inputs for better translation of sensor input.
 - Implemented sensor-fusion by injecting sensor values along with vision algorithms to better optimize camera pose.

- Simultaneous Localization and Mapping Implementation.
 - Working on a fast distributed SLAM algorithm to efficiently map an environment and have robust pose determination using Markov methods and Occupancy Grids on an off the shelf cheap wheeled robot (Pololu 3pi) while achieving autonomy.
 - Worked on a CrazyFlie Quadcopter incorporating an additional Sonar Sensor to optimize PIDs for calibrated hovering and tracing terrain in real time.
 - Successfully compiled and integrated an efficient and robust functional distribution of a customized Debian kernel on the Intel Edison and implemented Robot Operating System (ROS) framework on the above mentioned boards in order to procure a distributed and portable approach to robotic computation.
- Resource Accounting and Optical Flow using OpenCV on Wearables.
 - Worked on implementing Optical Flow on the Google Glass to determine Odometry and pose orientation from visual features.
 - Successfully tele-operated microcontroller based quadcopters/wheeled robots using the sensor data on the Google Glass.
 - Measured and compared resource information (Battery Temperature, Voltage, Frame Rate) and determined computational cost when running Face Detection on board the Google Glass using OpenCV and after sending camera frames from the Google Glass to an off board computer running OpenCV.
- Smart Insole Human Computer Interface for Empowering Mobility.
 - Designed and implemented firmware to extract data from an Insole equipped with a 9-DOF IMU and 48 Pressure Sensors via Bluetooth.
 - Ported Data over a web socket to a Unity based portal to tele-operate a virtual foot in real time and visualize it on the Oculus Rift. Added functionality to have the virtual foot react with objects with physics in the virtual environment.

**Rochester Institute of Technology,
Rochester, NY.**

Summer 2009 - Fall 2012

Research Assistant

- Worked on the modeling and optimization of an efficient distributed TCAS for modular avionics leading to more autonomous aircraft dynamics during flight processes.
- Worked on a "Eye Tracker" and studied the link between eye movements and human cognition.
- Calibrating eye movements on the tracker with visual perception.

**Monroe 2 Orleans BOCES,
Rochester, NY.**

March 2012 - August 2012

Network Engineer

- Worked in projects which included dedicated Wireless Network Testing.
 - Implemented Mobile Device Management Solutions.
 - Gained valuable expertise in Network Security and Administration while working with Server Management and Software Migration.
 - Daily interaction with customers to meet their needs and requirements for IT support.
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