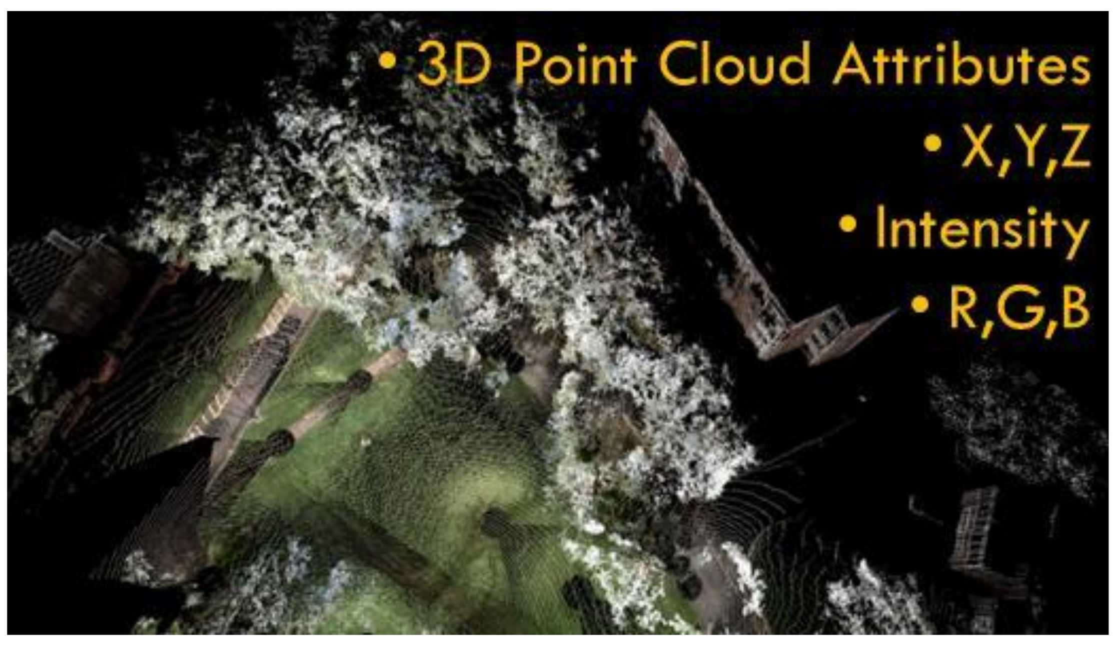
AUTONOMOUS MAPPING AND LOCALIZATION OF MOBILE ROBOTS

Akin Tatoglu, Assistant Professor, Mechanical Engineering
University of Hartford, College of Engineering, Technology and Architecture

Problem Statement: Mobile robots are continuously getting more integrated to our lives: their wide range of use includes daily mundane tasks such as vacuum cleaning or tasks that mankind needs to utilize machines to achieve goal, such as exploration of new planets. Although existing robots have the capabilities to accomplish many tasks, their autonomy is still limited and might require human assistance at some point. Full autonomy still requires more accurate and *adaptive localization and path planning algorithms* as well as *feature detection, definition* and *tracking methodologies*.



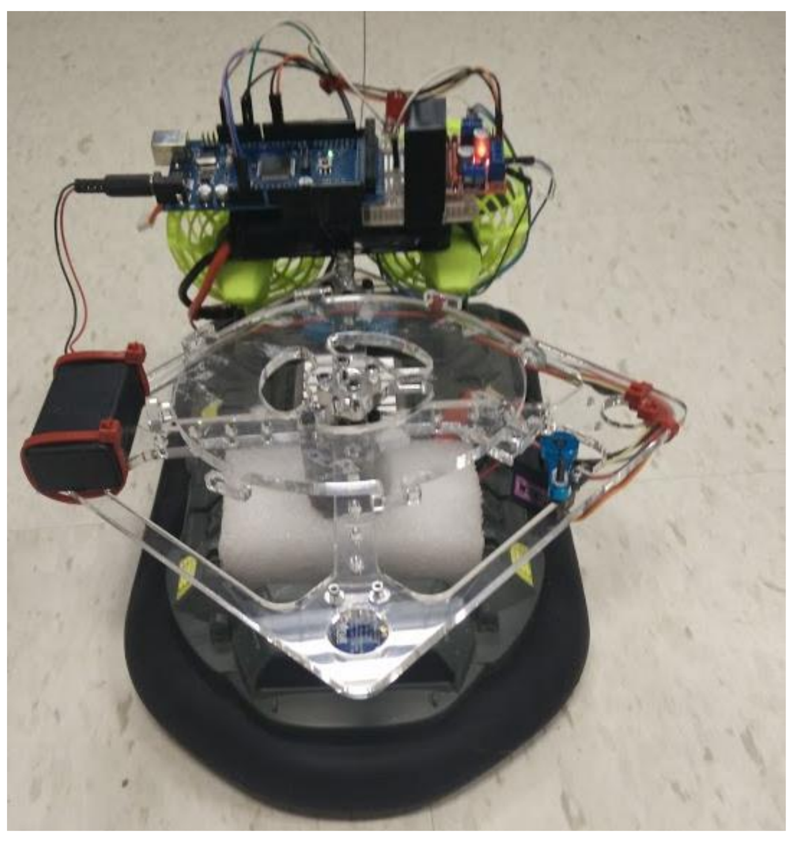
Mapping: A mobile robot map is a data set includes information about surroundings which were perceived by sensor suit assembled on its body.

Localization: For any mobile robotic application, the first problem needs to be answered is 'Where am I?'. After this information is determined, system could complete given mission.

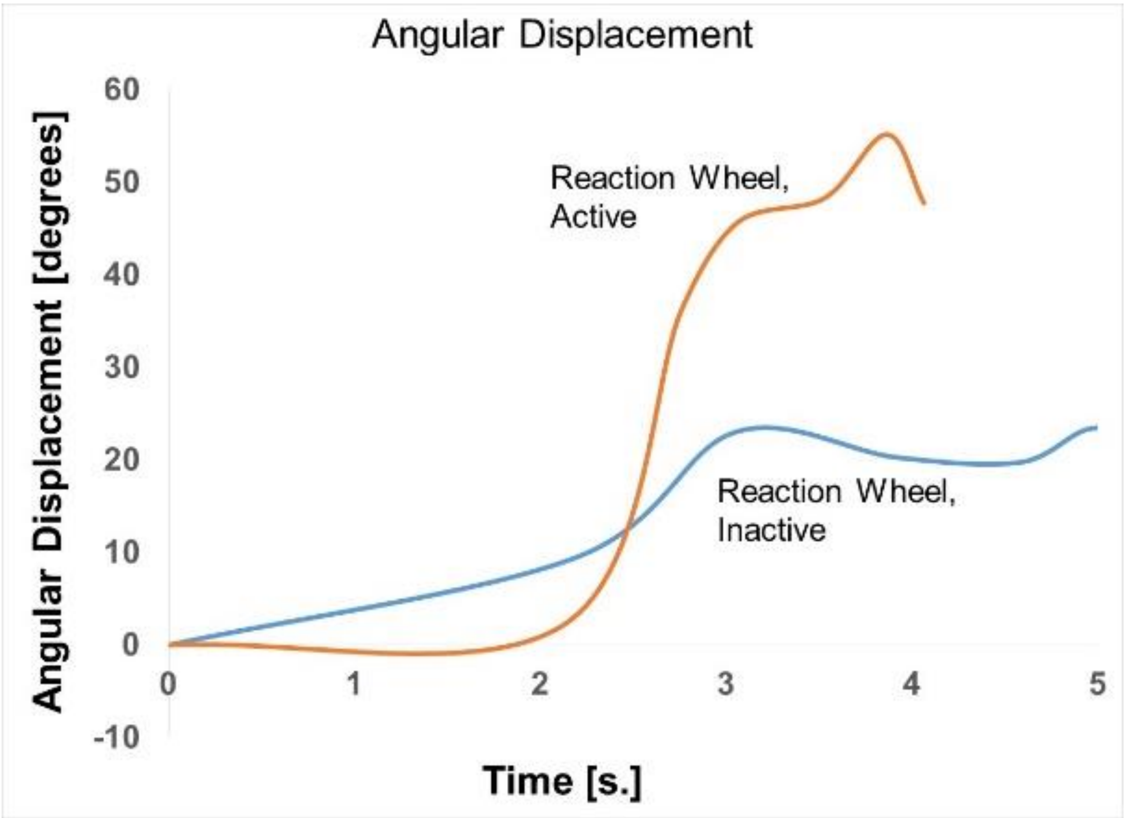
Sensor Fusion: A robotic sensor suit could consist various types of sensors. All data must be evaluated together to have a better understanding of the state.

UTILIZING REACTION WHEELS TO INCREASE MANEUVERABILITY AND LOCALIZATION ACCURACY OF A HOVERING ROBOT, A. Tatoglu, S. Greenhalge, K. Windheuser, International Mechanical Engineering Congress & Exposition,16

This paper discusses and examines the application of a reaction wheel mounted to a hovering body to allow for rapid maneuver. Reaction wheel is designed to have enough mass to adjust motion of the hovering robot due to unexpected drift or requested maneuver. Wheel would accelerate to high velocity and experience an instantaneous brake which allows energy stored in moment of inertia to be transferred from wheel to body.



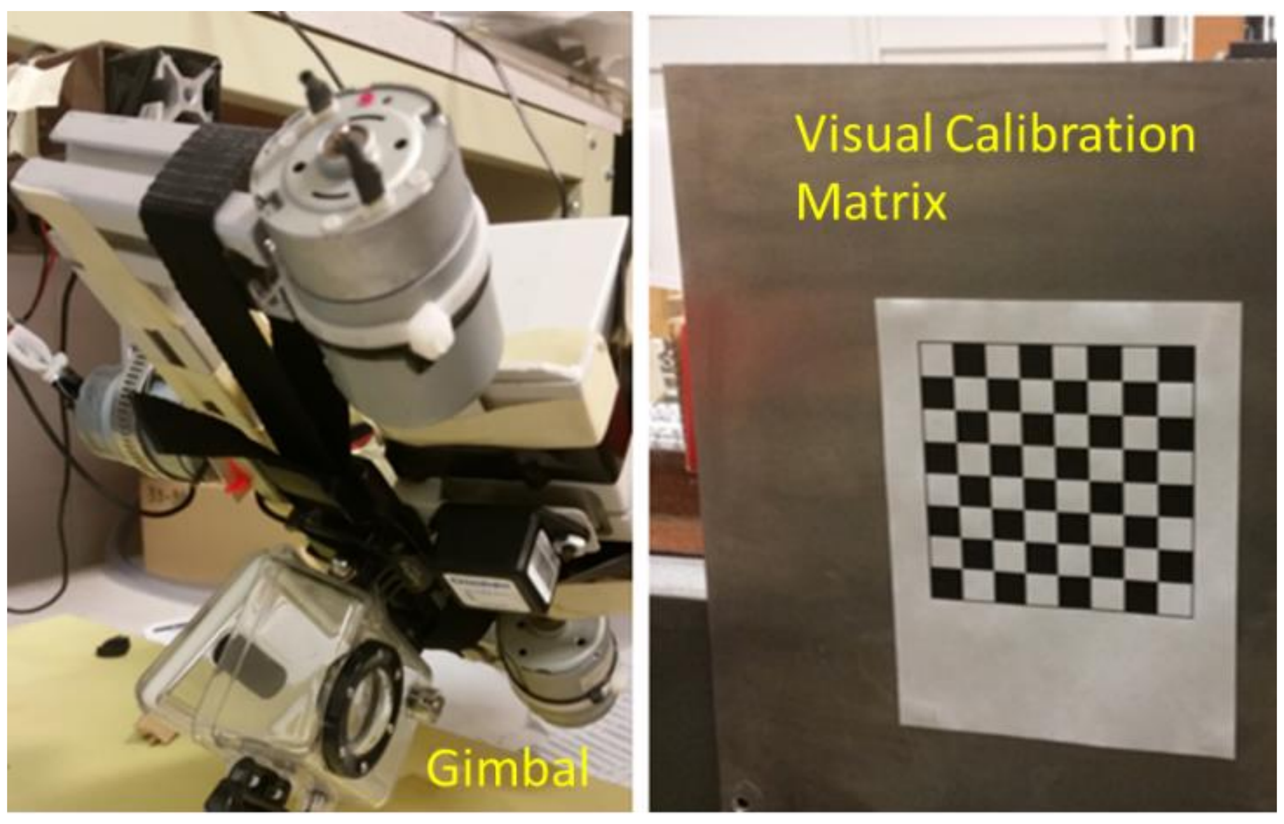
Hovercraft with internally powered and controlled momentum wheel



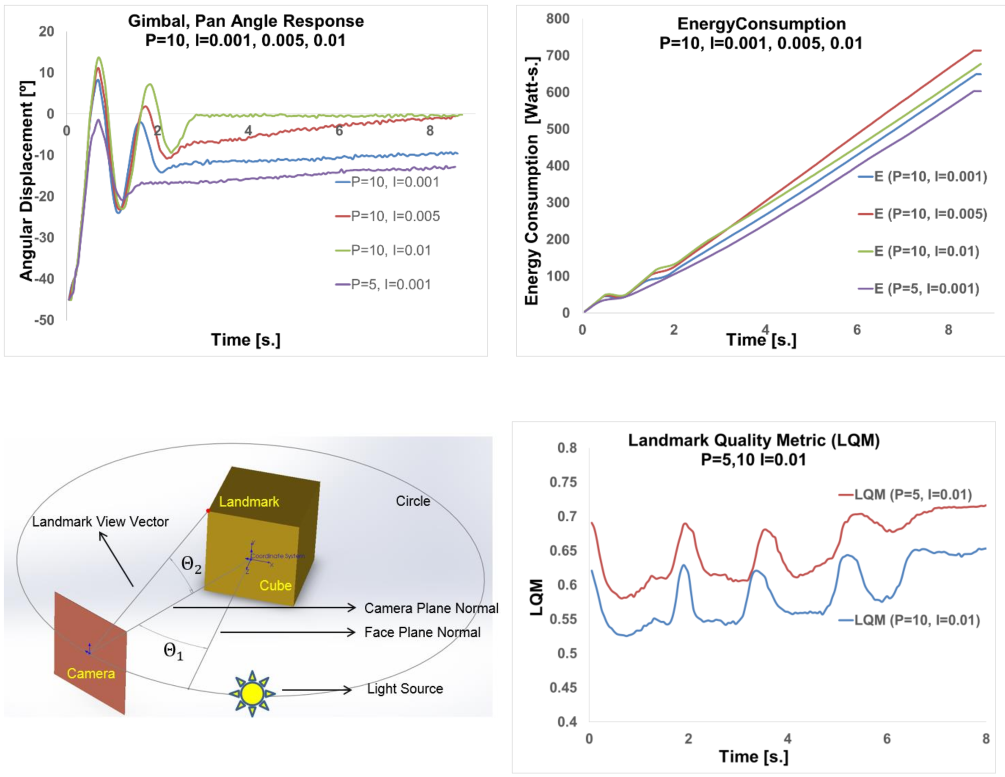
Angular displacement with and without wheel

ADAPTIVE GIMBAL CONTROL APPROACH TO ACCOUNT FOR POWER CONSUMPTION AND LANDMARK TRACKING QUALITY, A. Tatoglu, C. Campana, ASME International Mechanical Engineering Congress & Exposition, 2016

Unmanned Aerial Vehicles (UAV) are commonly used for robotics research and industrial purposes. Most of the autonomous applications use visual sensors and inertial measurement units for localization. In this research paper, we simultaneously investigate and compare stability, power consumption and landmark tracking quality of a visual sensor mounted gimbal specifically for rapid UAV motion requirements where input signal continuously varies such as at obstacle rich environments.



Gimbal, camera and visual calibration template



Landmark definitions and angular displacement, energy consumption, Landmark Quality metric vs. time.

UNIVERSITY OF HARTFORD
COLLEGE OF ENGINEERING, TECHNOLOGY, AND ARCHITECTURE

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Akin Tatoglu, PhD | Assistant Professor | Mechanical Engineering | P: 860-768.4591 | tatoglu@hartford.edu