Candii

RoboJackets IGVC Team
IGVC – May 31, 2008

Team Overview

- Initially competed in 2003

- Did not compete in 2005

- Competed every year since 2006

- Mixture of both undergrad and grad students

- Multidisciplinary
  - EE, ME, CS, Comp E

MECHANICAL

Overall Design

- Motivation
  - Quick turns
  - Eliminate caster bias
  - Simple control

- Drivetrain
  - 2 powered wheels
  - 1 passive custom ball caster
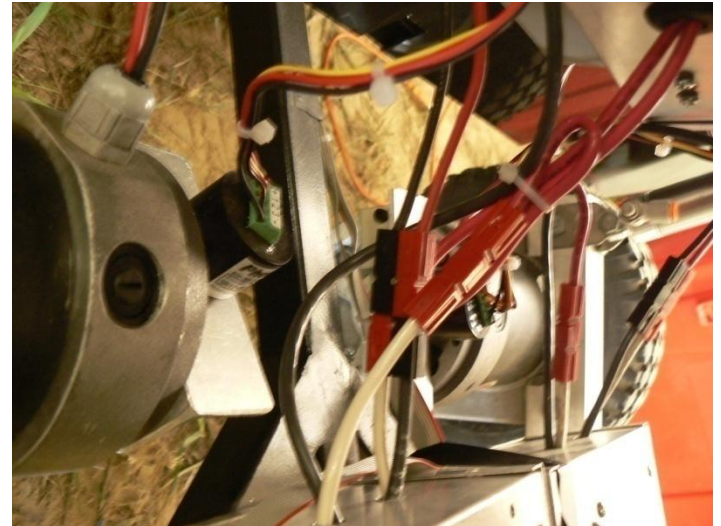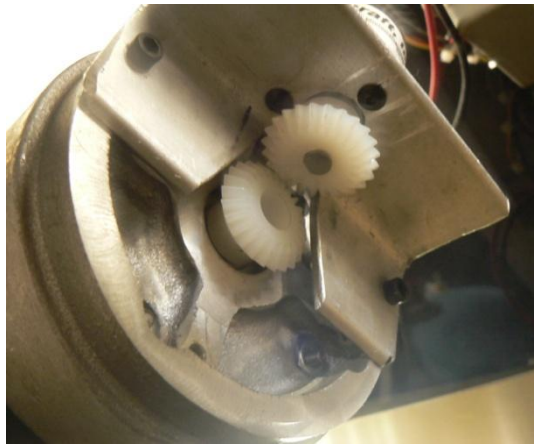
- Full suspension

Improvements

- Problem → Old ball harness
  - Inefficiencies + durability
  - Ball harness was flimsy
- Harness Upgrade
  - Single machined HDPE block
  - New / more ball castors
  - More rigid, secure, smoother motion

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Improvements

- Problem → No feedback from motors

- Encoder Integration
  - Originally not designed to accommodate
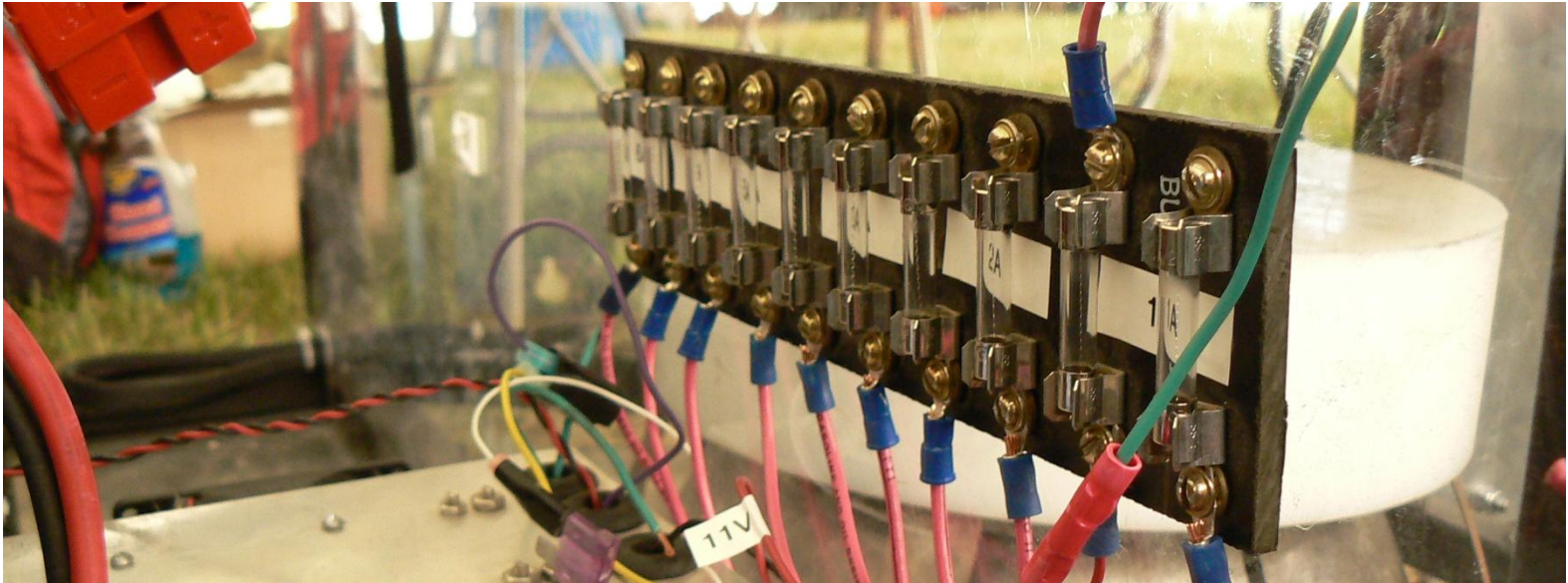 - Employed miter gears 1:1

Packaging

- Welded steel tube frame
- 3 Regions
  - Front – Motors + LIDAR
  - Middle – Electronics
  - Rear – Passive ball caster, laptop, camera.
- Velcro attached custom designed polycarb covering

Power

- 2 batter systems
  - 1 laptops
  - 1 motors
- Optically isolated @ control board
  - Eliminates electrical noise from motors
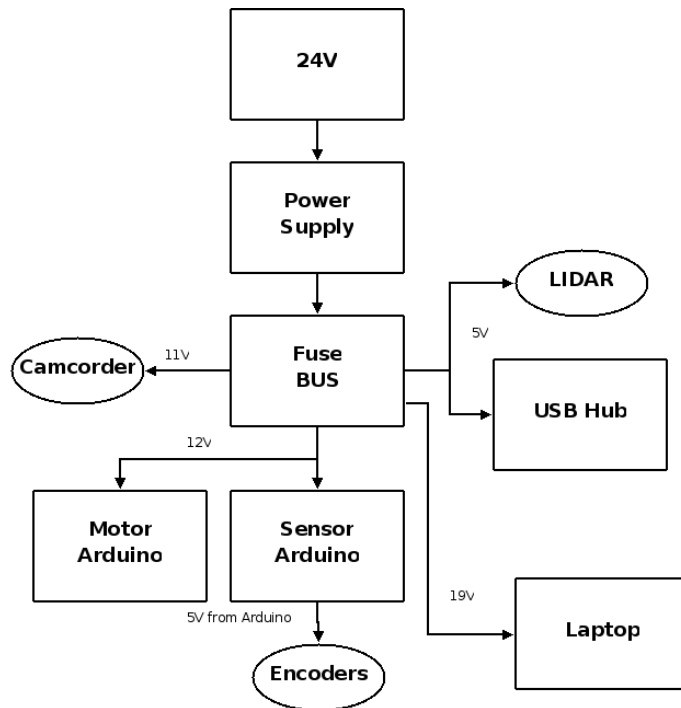

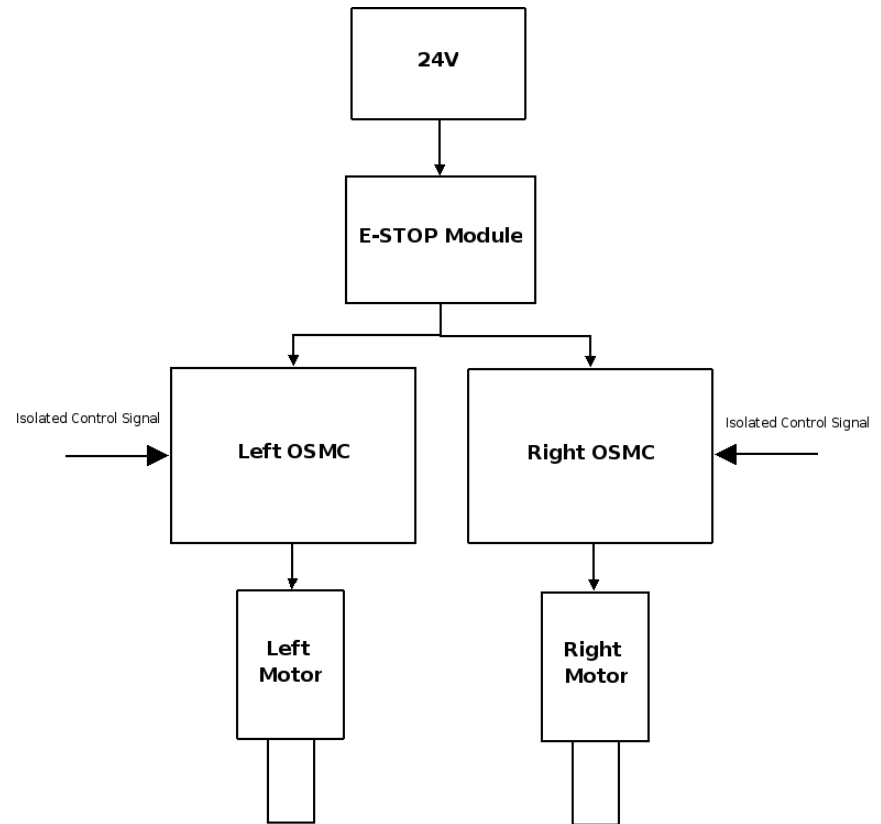RoboJackets

ELECTRICAL

Logic Ground Loop

- Custom power supply
  - Powers all logic systems
- Arduino logic boards
  - Motor control
  - Encoder readings
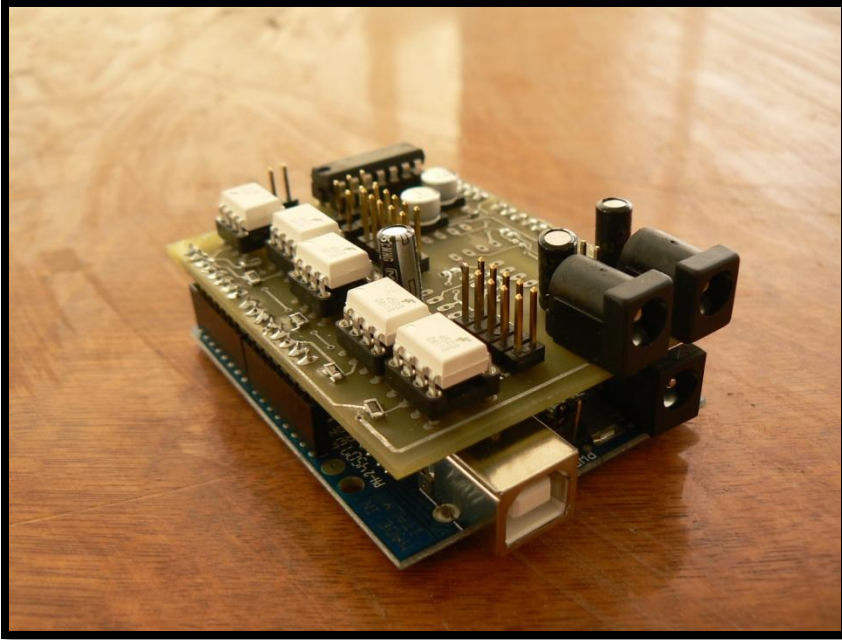- Camera + LIDAR provide primary input

Motor Ground Loop

- All power through E Stop module

- Open Source Motor Controllers
  - Power to DC Motors
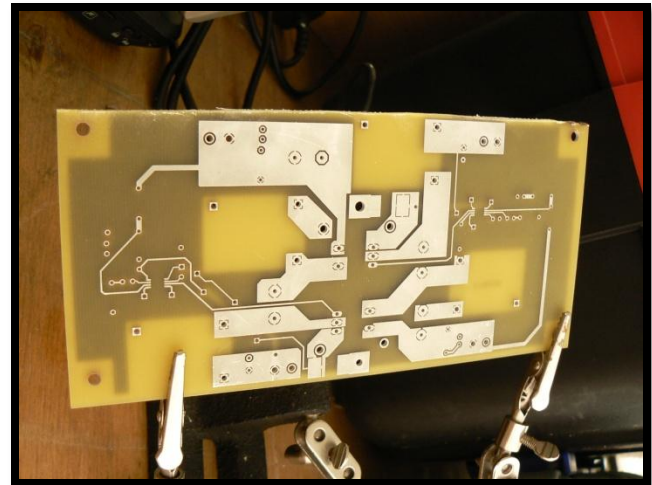 - Control signals from Motor Arduino

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Custom Designs

Arduino w/ shield

- Arduinos given extended functionalities via shield boards

- Power supply custom for robot



Custom supply

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SOFTWARE

System Overview

Laptop Running Player Server

Joystick Driver
Data Filtering
Environmental Data Processing
Path Planning
PID Control
Motor Driver

JVC Camcorder

LIDAR

Wheel Encoders

USB

Data Acquisition Arduino

Manage Data from
Connected Devices

Motor Arduino

PWM Generator
Voltage Measurement
Current Measurement
Soft E-Stop
Analog Joystick

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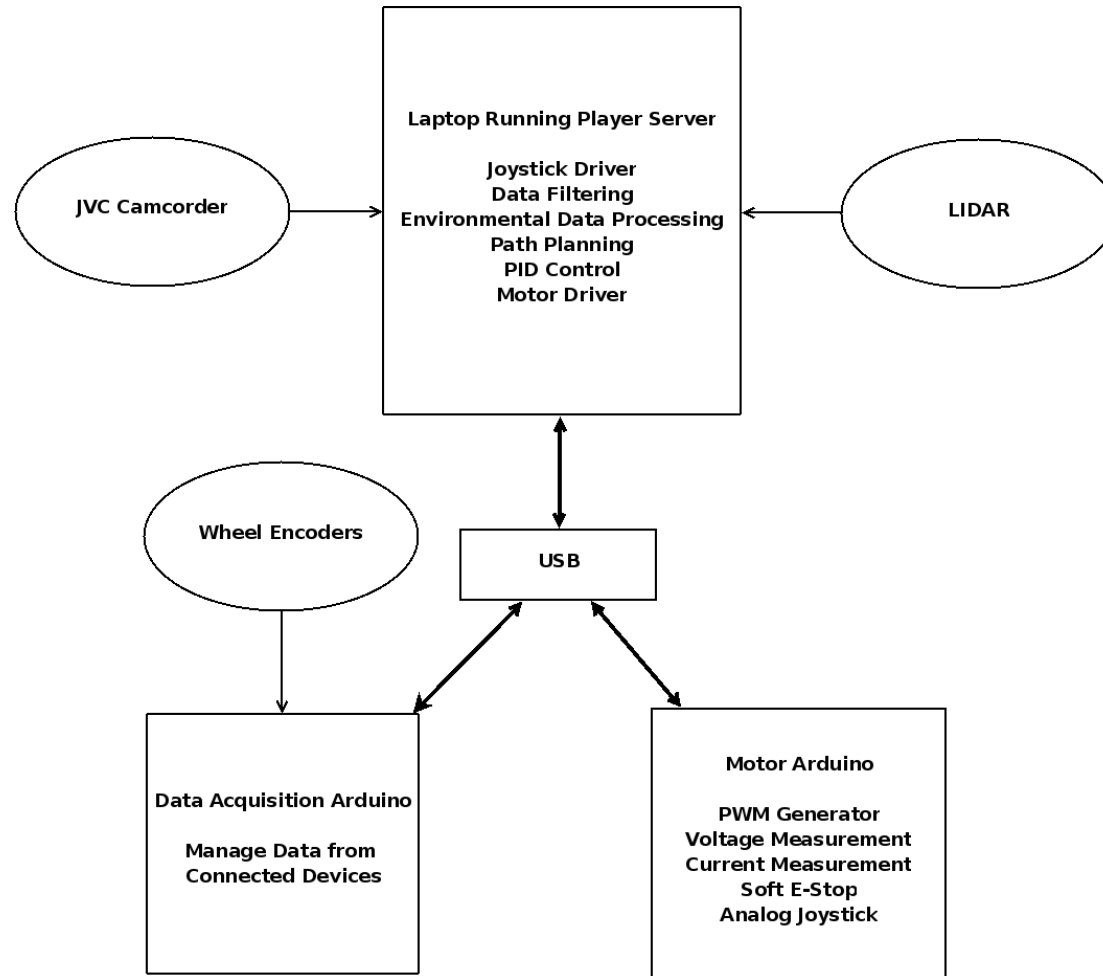
Vision Upgrade

- Past
  - Avoided barrels and stayed on course.
  - No image transformation
  - No path planning
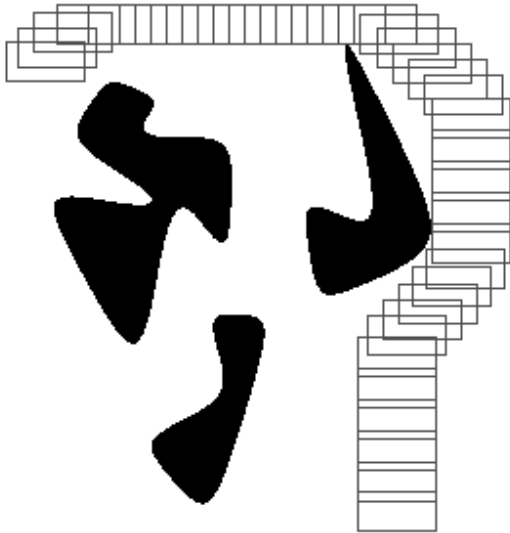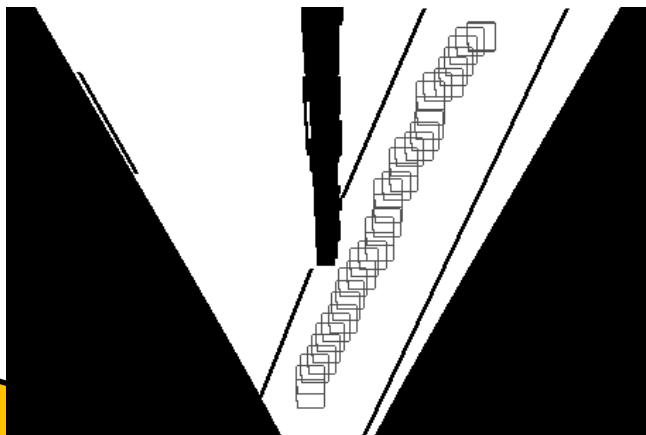- Currently
  - Transforming image
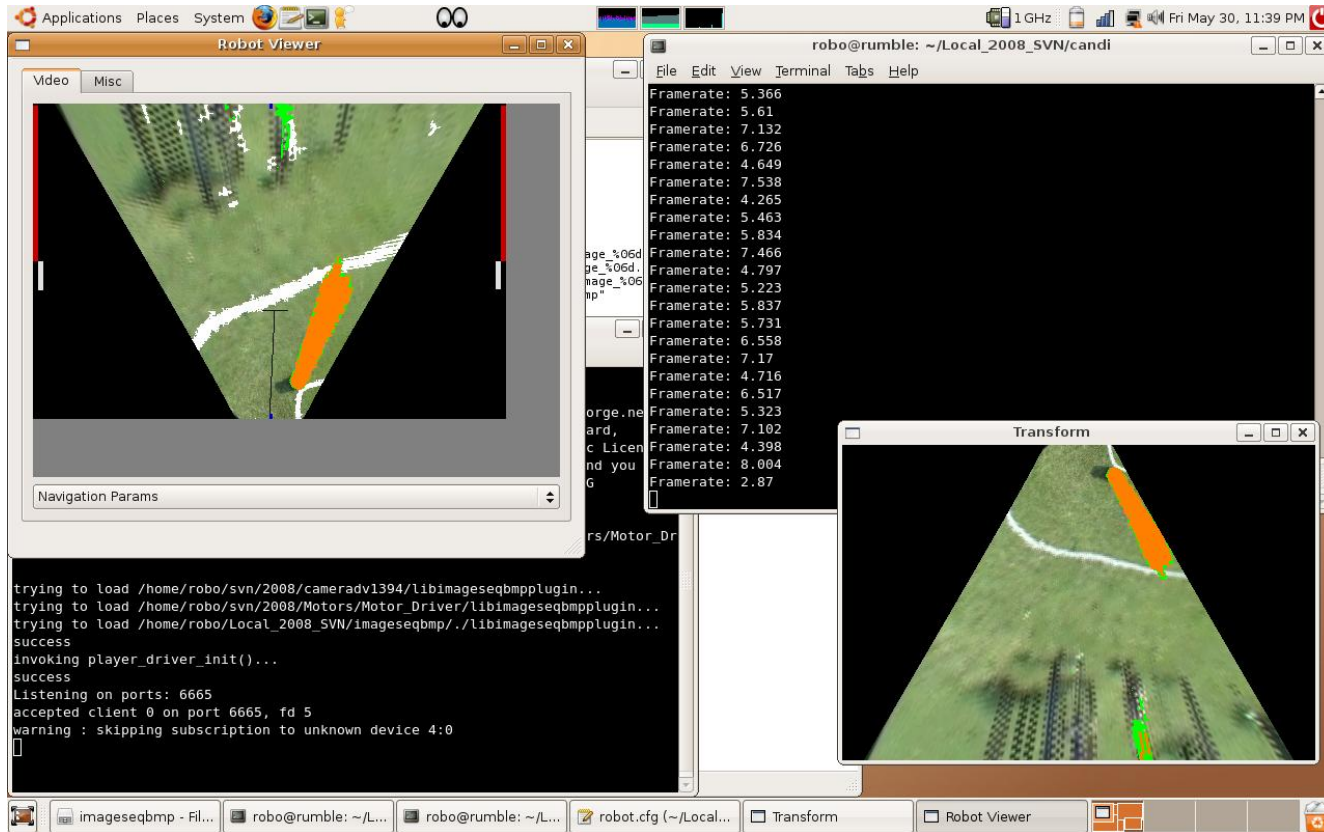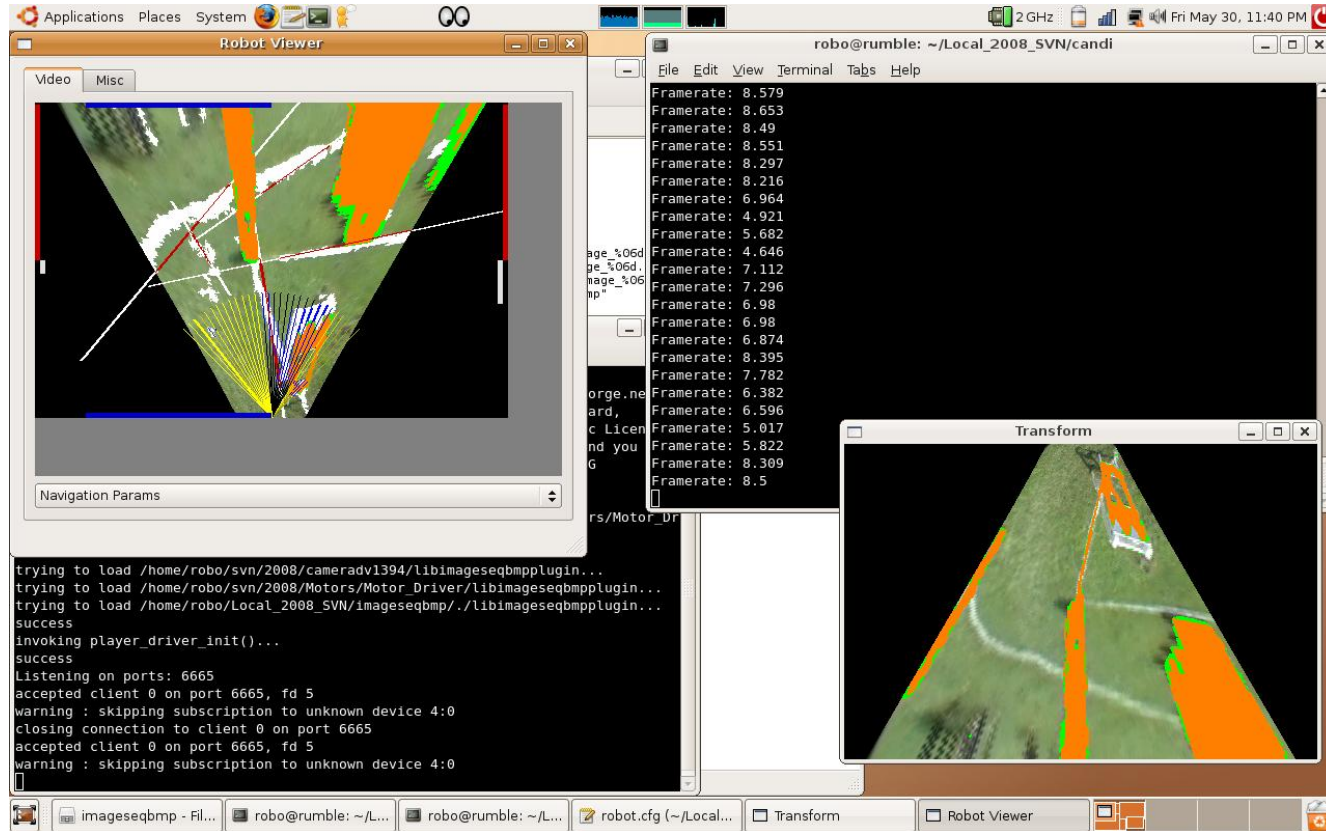 - Planning paths

2007
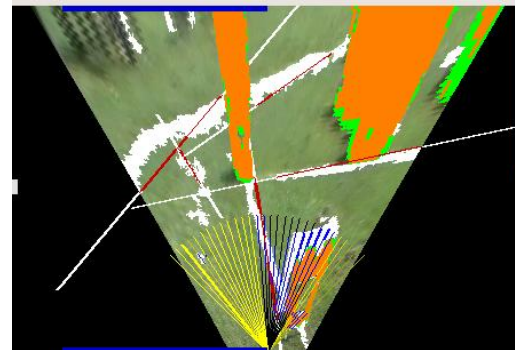
2008

Path Planner

- Graph based planner

- Potential fields

- Guaranteed path finding
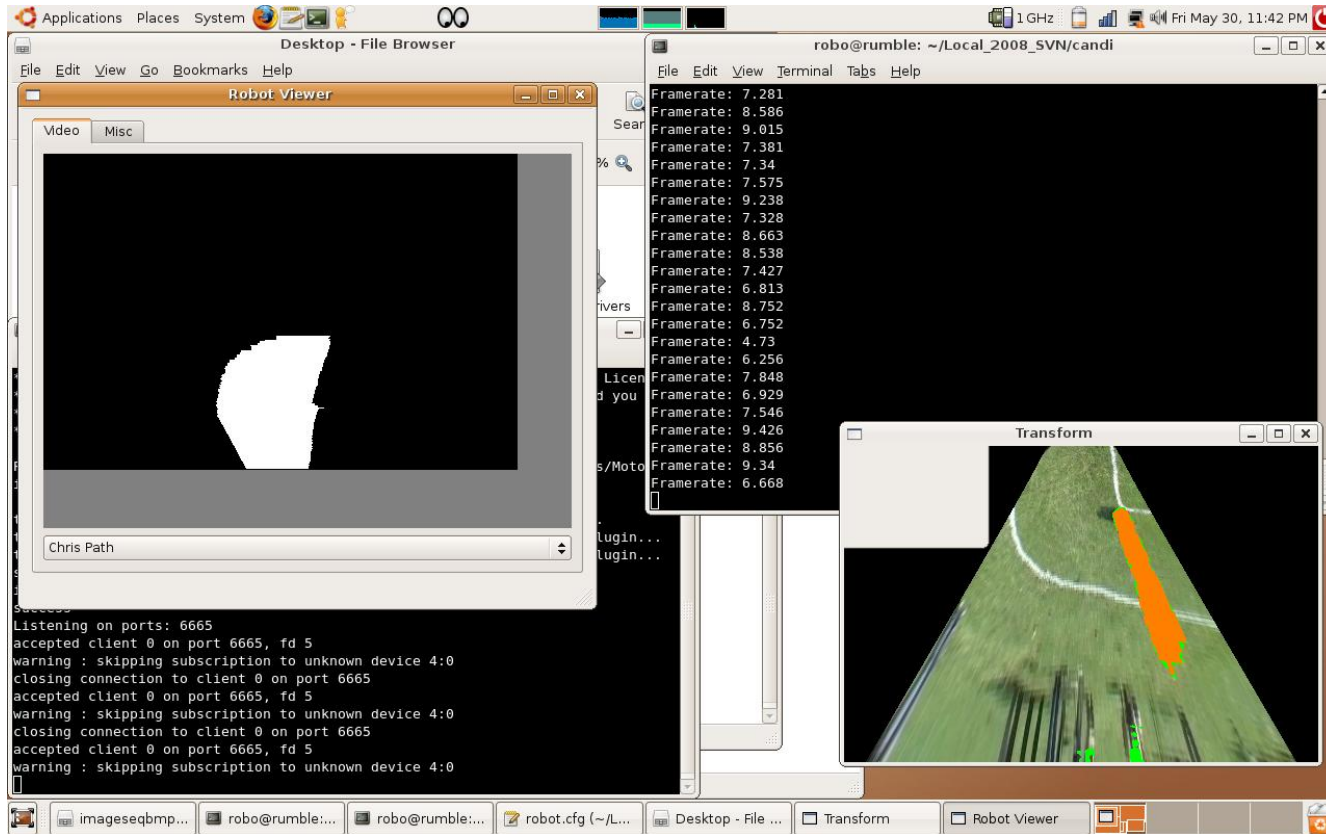
- Work with many geometries

Goal finding & Perspective transform

Line extensions & Reactive mode

Possible path & perspective transform

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www.robojackets.org