Room Mapper Robot System

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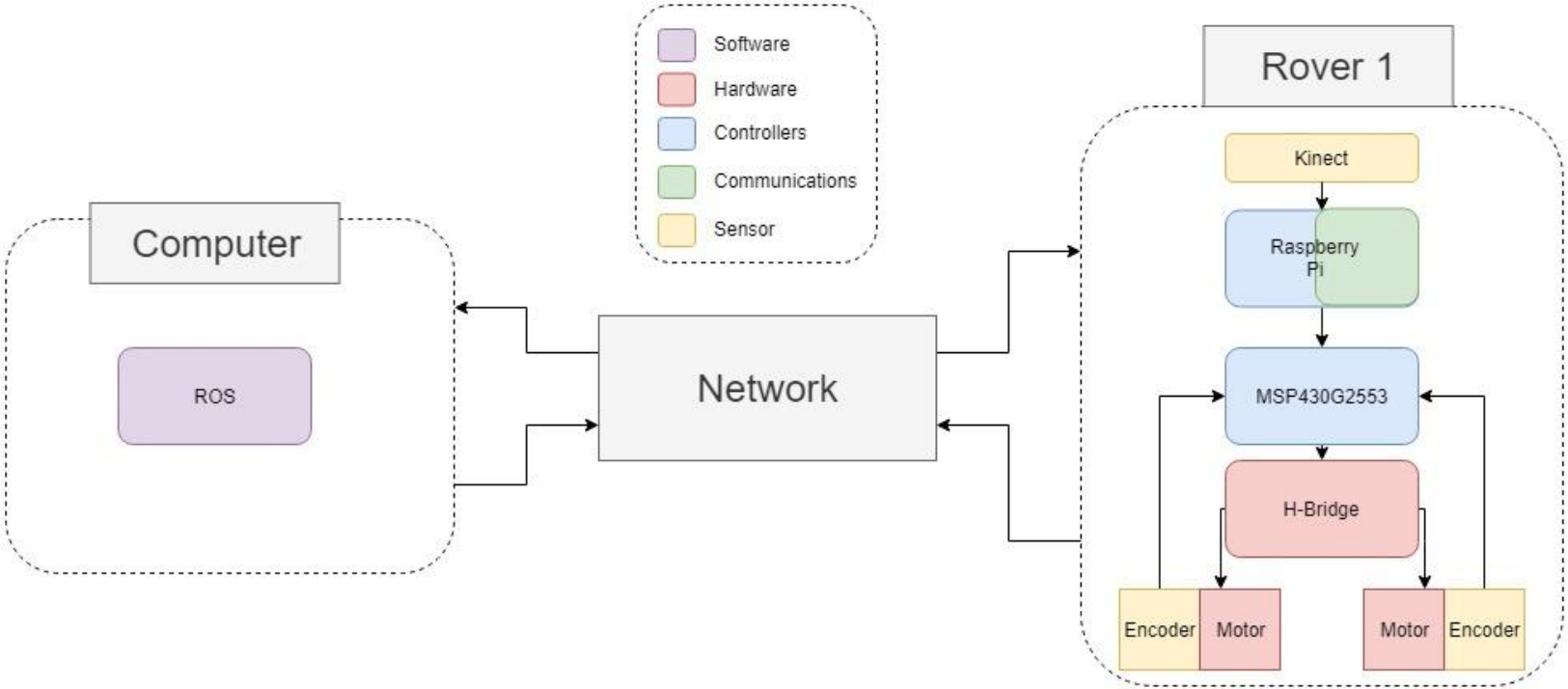
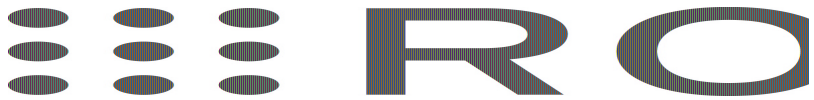

Software
Hardware
Controllers
Communications
Sensor
Computer
ROS
Network
Rover 1
Kinect
Raspberry Pi
MSP430G2553
H-Bridge
Encoder
Motor
Motor
Encoder

System Description

- A robot unit actively maps out an area using a Kinect camera
- The image data received will be used to reconstruct a 2D map of the space
- A user will then be able to select a route in the space for a the primary robot to follow back through the room, autonomously, and reach a specific location



ROS (Robot operating system) is an open source OS for robotics. It is widely used for the implementation of SLAM. It is designed to be modifiable to fit each systems requirements. Each ROS package consists of several nodes that communicate through topics over a local network.

ROS Topics

- All ROS nodes communicate through topics
- Each node can publish or subscribe to one or more topics

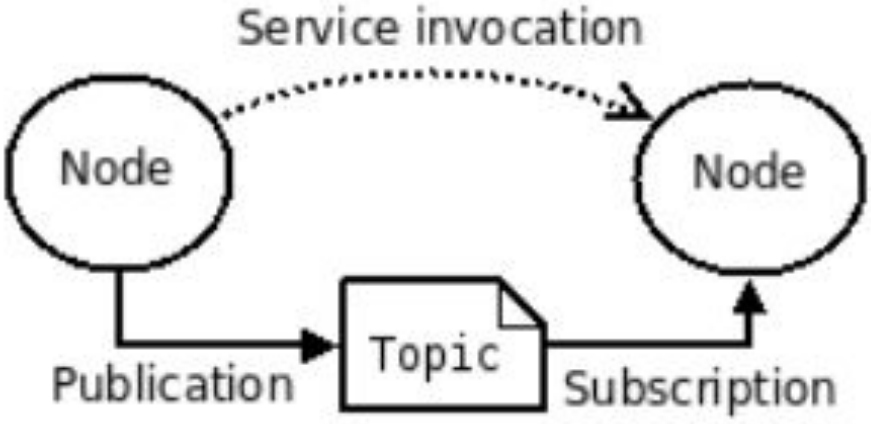
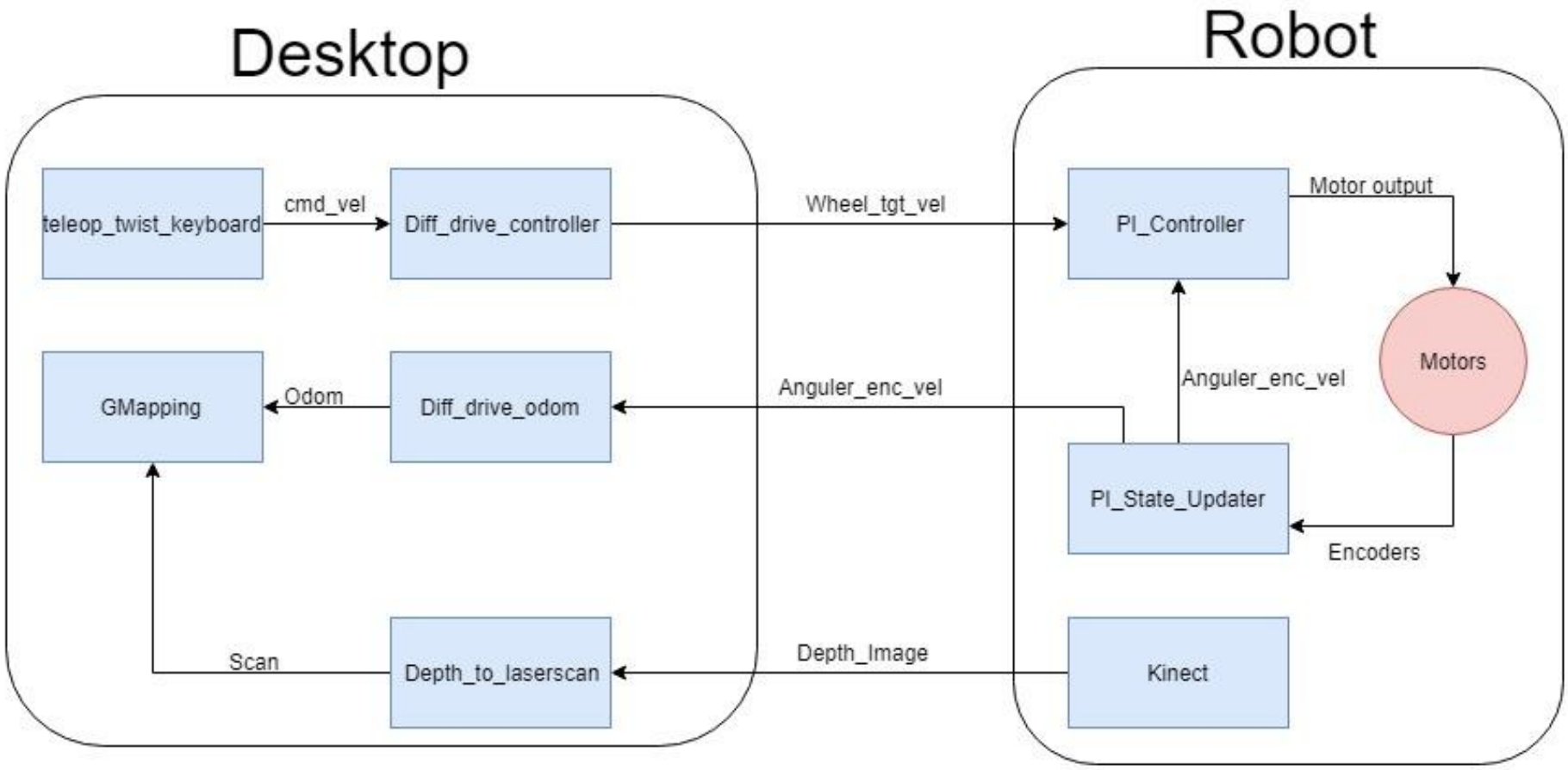
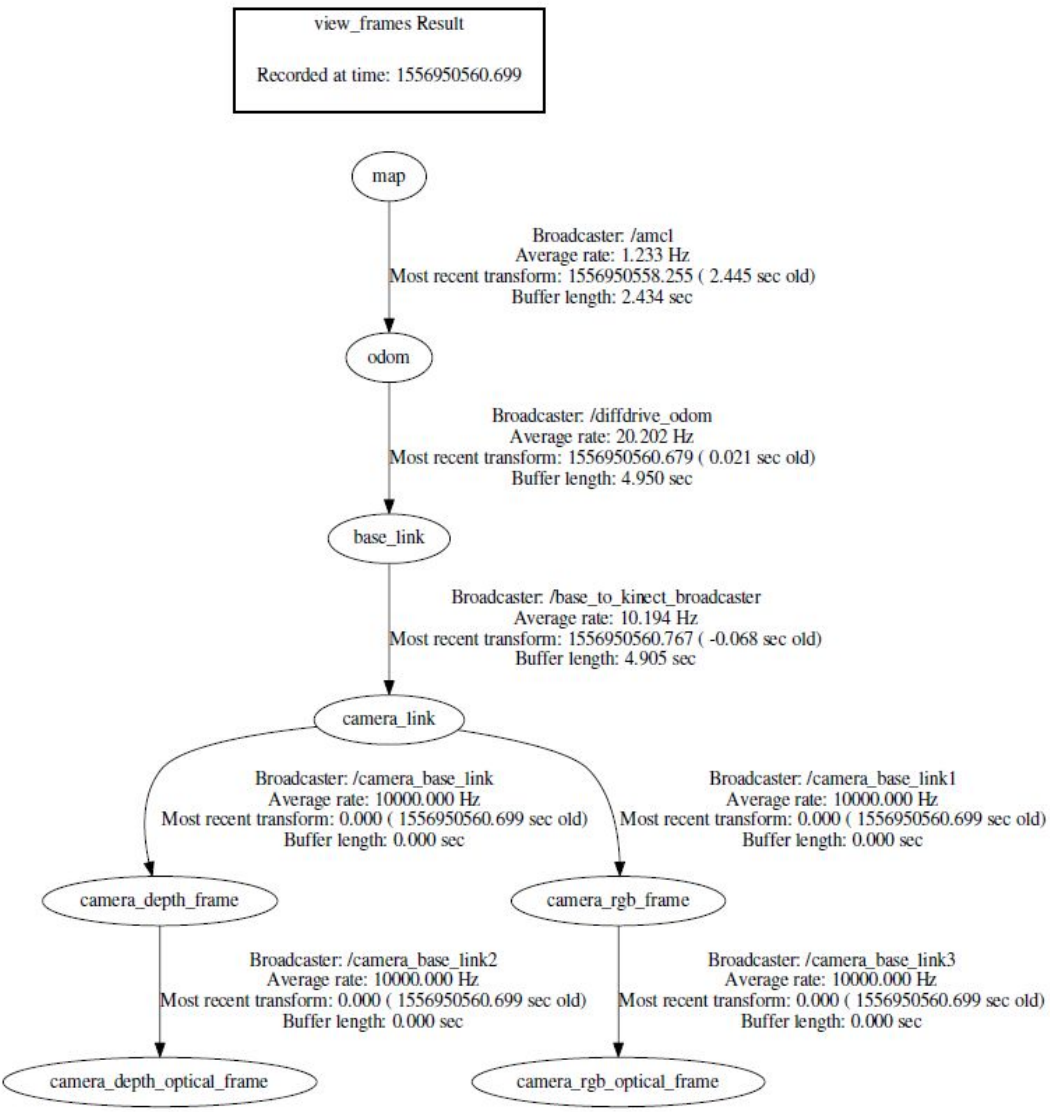
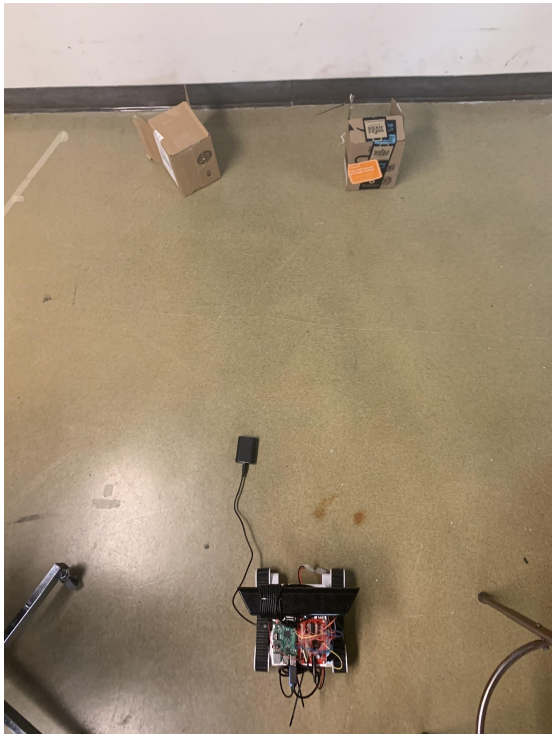


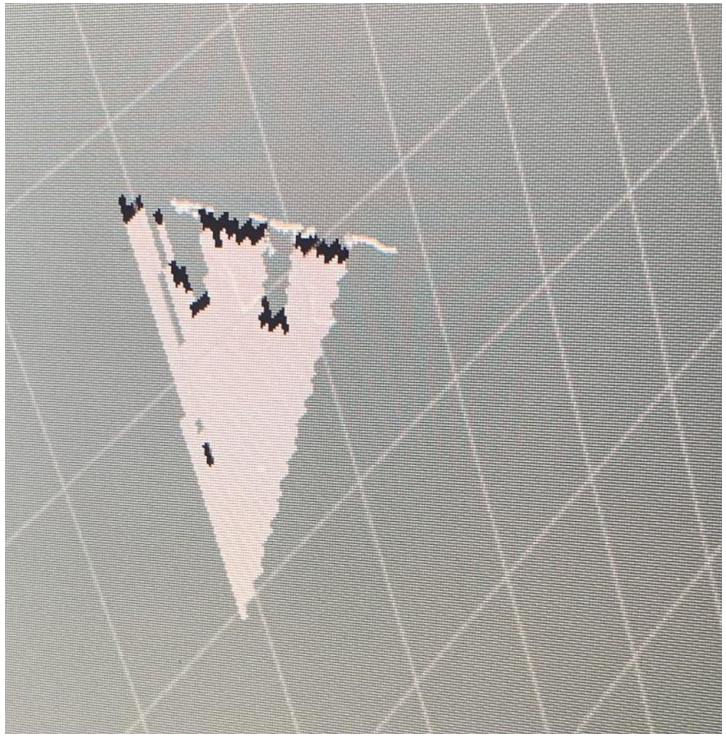
Image from ROS.org


Desktop
Robot
teleop_twist_keyboard
cmd_vel
Diff_drive_controller
Wheel_tgt_vel
PI_Controller
Motor output
Motors
GMapping
Odom
Diff_drive_odom
Anguler_enc_vel
Anguler_enc_vel
PI_State_Updater
Encoders
Scan
Depth_to_laserscan
Depth_Image
Kinect

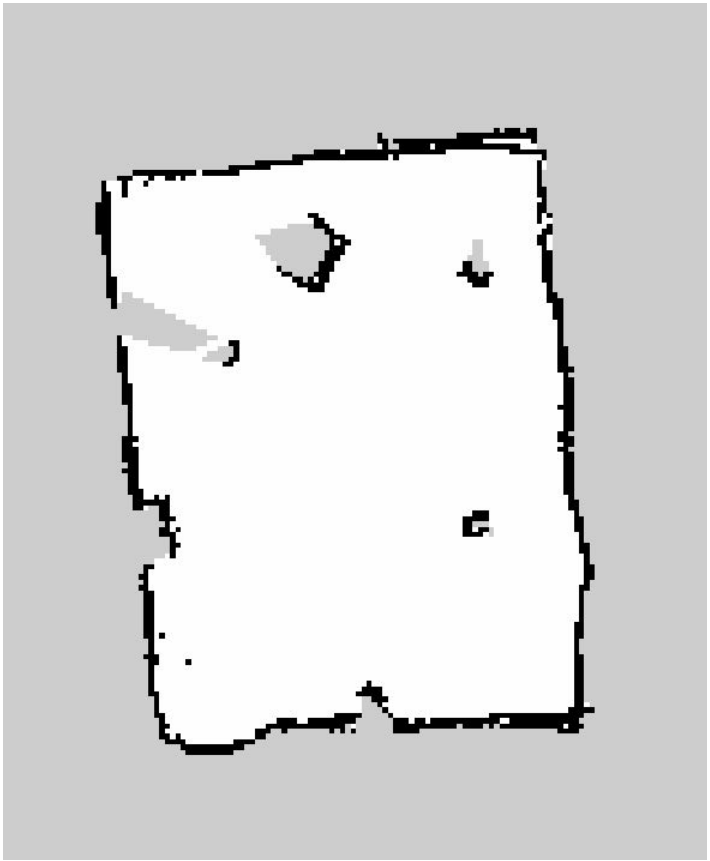

view_frames Result
Recorded at time: 1556950560.699
map
Broadcaster: /amcl
Average rate: 1.233 Hz
Most recent transform: 1556950558.255 (2.445 sec old)
Buffer length: 2.434 sec
odom
Broadcaster: /diffdrive_odom
Average rate: 20.202 Hz
Most recent transform: 1556950560.679 (0.021 sec old)
Buffer length: 4.950 sec
base_link
Broadcaster: /base_to_kinect_broadcaster
Average rate: 10.194 Hz
Most recent transform: 1556950560.767 (-0.068 sec old)
Buffer length: 4.905 sec
camera_link
Broadcaster: /camera_base_link
Average rate: 10000.000 Hz
Most recent transform: 0.000 (1556950560.699 sec old)
Buffer length: 0.000 sec
Broadcaster: /camera_base_link1
Average rate: 10000.000 Hz
Most recent transform: 0.000 (1556950560.699 sec old)
Buffer length: 0.000 sec
camera_depth_frame
camera_rgb_frame
Broadcaster: /camera_base_link2
Average rate: 10000.000 Hz
Most recent transform: 0.000 (1556950560.699 sec old)
Buffer length: 0.000 sec
Broadcaster: /camera_base_link3
Average rate: 10000.000 Hz
Most recent transform: 0.000 (1556950560.699 sec old)
Buffer length: 0.000 sec
camera_depth_optical_frame
camera_rgb_optical_frame

Kinect Depth to Laser Scan





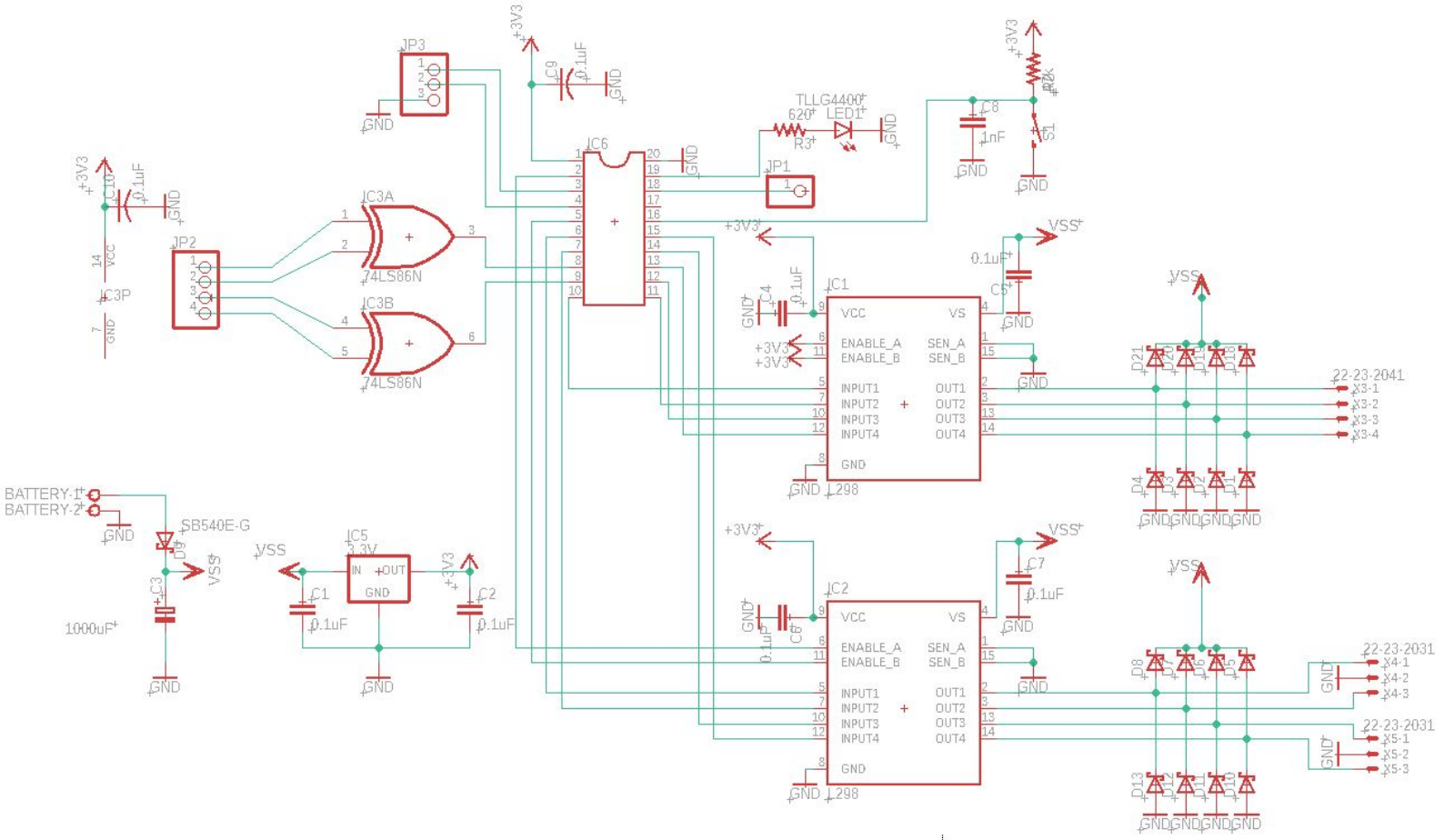
Mapping Results



Power Budget

	Part Name	# of Each Part	Operating Current (mA)	Supply Voltage (V)	Power (W)
3	Rover 5 Motors	2	210	9.6	4.032
4	Rover 5 Encoders	2	40	3.3	0.264
5	MSP430G2553	1	0.42	5	0.0021
6	Raspberry Pi 3 B	1	480	5	2.4
7	Xbox 360 Kinect	1	0.18	12	0.00216
8	L298N	1	36	9.6	0.3456
9	74HC86 XOR Chip	1	0.2	3.3	0.00066
10	BAJ2DD0T 12 V Regulator	1	2	14.8	0.0296
11	LD1085V50 5 V Regulator	1	5	12	0.06
12				**Total Power:**	6.70026
13					
14	**Battery**		**Capacity (mAh)**		**Capacity (Wh)**
15	14.8 V Lithium Ion		2200		32.56
16	5 V Lithium Ion		5200		26
17					
18				**14.8 Running Time (h)**	7.571635203
19				**5V Running Time(h)**	10.83333333

PCB Circuit Schematic



PCB Board Layout

L: 4.75 in

W: 3.95 in