Individual Lab Report

Erik Sjoberg

Team C – Column Robotics

Rohan Thakker, Job Bedford, Cole Gulino

IRL 2

October 23, 2015

Individual Progress

Researched and identified path forwards for ROS code architecture

After several hours of research into mobile robot planning frameworks in ROS, I identified the framework embodied by the move_base package as a likely candidate. This framework provides a useful reference as to how a global planner, world state estimate, and local planners can be integrated with sensors, odometry, and external controllers which accept target velocities as input. A key feature of this approach is the co-location of the costmap with the global and local planners, which removes the need to send large messages containing the state of the world between processes at each timestep.

1.1 move_base

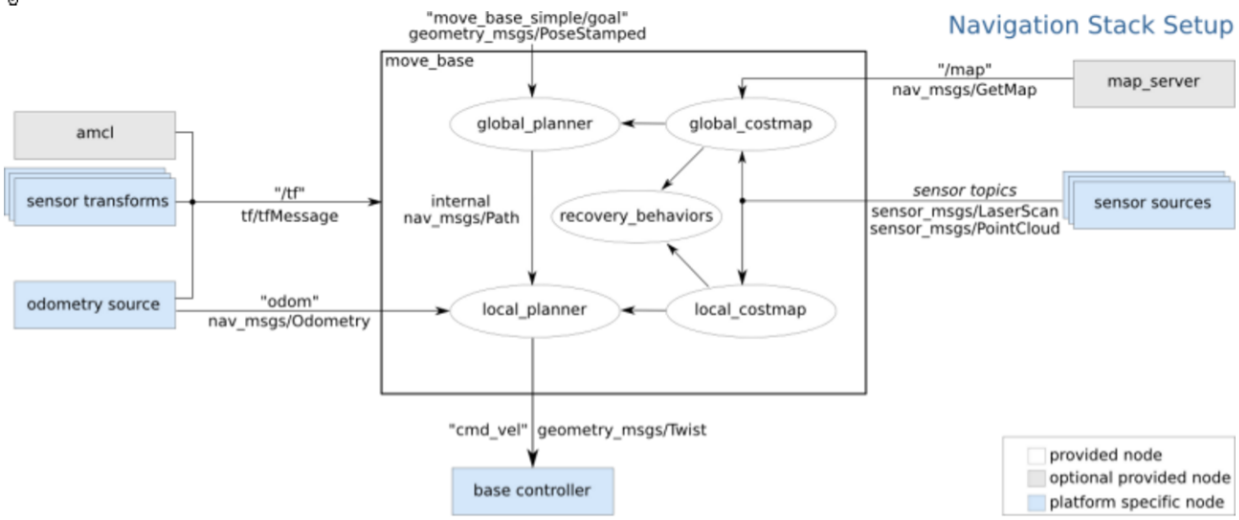

Figure 1: Schematic of the “move_base” ROS package

During this research I also came across an open-source implementation of a very promising optical flow package which we will be investigating further: https://github.com/uzh-rpg/rpg_svo

Implemented tracking for upcoming MRSD Project tasks

Applying our new task tracking framework to the actual deliverables for the MRSD project course (such as ILR, website checks, system presentations, etc) has significantly increased clarity around what each teammember needs to complete. Including this work in our actual project plan has proved to be vital, as the time requirements of the project course (including this ILR itself) represent a significant time commitment which had not been tracked.

No.	Demo Functionality	Tasks	Owner	Sprint	Status	Est. Work	Remaining	Work Done
6	**Misc Tasks**							
	Project management tools development		Erik	2	Half	8	2	6
	Revise WBS tasks		Cole	1	D	1	0	1
	Risk management plan		Cole	1	D	2	0	3
	Revise risk plan + assign owners	Hold meeting to update + allocate ownership of risk in management plan	All	2	D	4	0	3
	22-Oct Progress Review 1 in lab	Prepare: a. Progress b. Challenges c. Future work	Erik		D	1	0	4
		Post round-robin presenter order to website	Cole	1	D	1	0	1
		Verify all requirements met + delegate/organize tasks	Erik	2	D	1	0	1
	23-Oct Website Check 1 A19.1: Website Check 1	1. System summary - Cole 2. System design - Cleanup Rohan 3. System implementation 4. System performance 5. Project management - Erik 6. Media (videos, pictures, poster) - Job 7. Team page - 8. Documents Finish by Thursday after class	Erik, Cole, Job, Rohan	2	d	4	0	12
	27-Oct Systems presentation:		Erik	2		8	8	
	29-Oct Progress Review 2 in lab + ILR3	Prepare: a. Progress b. Challenges c. Future work		2	N	4	4	
	3-Nov Preliminary Design Review I (midsemester presentations)	Outline / record tasks + owners for PDR	Cole	2	D	1	0	2
		Complete PDR tasks		2	N	8	8	
	10-Nov A12: Final PDS PCB schematic and layout				N	4	4	
	12-Nov Progress Review 3 + ILR4	Prepare: a. Progress b. Challenges c. Future work			N	4	4	
	20-Nov A19.2: Website Check 2				N	4	4	
	24-Nov A14: Progress review 4 in lab + ILR5	Prepare: a. Progress b. Challenges c. Future work			N	4	4	
	3-Dec Progress Review 5 (includes Power Distribution System PCB) (Fall Validation Experiment)	Prepare: a. Progress b. Challenges c. Future work d. PCB			N	4	4	

Figure 2: MRSD Project course deliverable tracking

Workload projection for deliverable and scope planning

I also implemented a burndown chart which allows the team to see a projection of our progress into the future. Bringing clarity to the amount of work we have remaining, and the rate at which we are completing it (and adding new work!) has been an eye-opening experience. As can be seen in the chart below, although a significant amount of work was completed in the last week, we ended up adding an equal amount of new work to the plan which had previously not been tracked. With a few more weeks of data it will become clear what adjustments are required to our scope and/or rate of work.

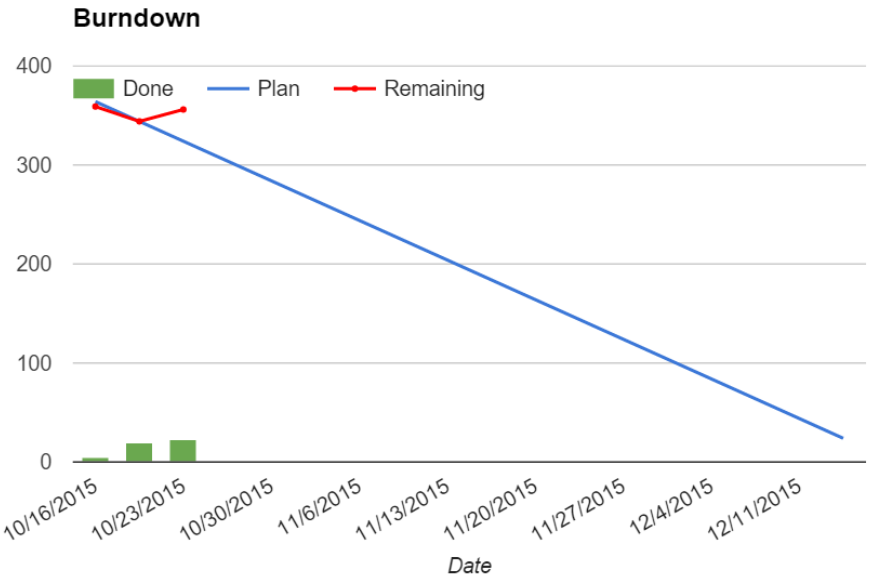

Figure 3: Burndown chart for forecasting

Challenges

One of the major challenges I've faced since the last ILR has been balancing project course work with outside requirements for internship hunting such as phone interviews and online programming tests. Since I anticipate a short window to accept any offer I receive, I have been trying hard to pack in as many interviews as possible. As a result of this I've become a lot more time constrained for my other coursework. Hopefully this will no longer be an issue in a few weeks once I have decided on a company and can once again focus on classwork exclusively.

Another challenge the team faced was with which single-board computer architecture to choose. ARM-based SBCs are popular for this application area, but X86 atom-based processors are also starting to show promise with their later generations. Because of the low cost, we have decided to purchase one of each architecture to enable a simple performance comparison. Furthermore we expect this to act as a risk hedge against the chance that a software package we need to use is very difficult to compile on ARM.

Teamwork

The table below summarizes the contributions of each teammate over the last week.

All teammates have been contributing well to the project, and we continue to make significant progress each week.

Job Bedford	**Cole Gulino**	**Erik Sjoberg**	**Rohan Thakker**
Design MOVER Node for AR.Drone in ROS	Risk Management Table	Set up ROS Framework and GIT Repo	READER Node for AR.Drone in ROS
Media and Visual Generation	Outline PDR tasks and work to be done	Work Breakdown Structure and Burn down chart	Selected and Ordered Quadcopter and SBC
	Set up website outline	Researched Robot Localization Packages	

Table 1: Tasks for the last week, by team member

Cole and I have focused on getting the frameworks and tools set up for the team, which has enabled Rohan and Job to focus on getting the core functionality working on our AR.Drone2 testbed. Once our AR.Drone2 testbed is up and working, attention on low-level controller work will quickly shift to the Iris+.

Plans for Upcoming Work

In the next week I'll be able to focus on reading in the AR.Drone2 sensor data and providing a simple GUI to test and verify our state estimation code. I will also proceed with integrating the coding work of our teammates into a stable platform with logging and testing infrastructure. Finally, I plan to continue apply our management tools to keep the team focused on the most important tasks.