# DGC 120 Planning team meeting - Week 2

## TA:

• Lars Cremean (lars @cds)

### Stereovision subteam:

- Jeremy Gillula (jeremy @its)
- Haomiao "H" Huang (haomiao @its)
- Gunnar Ristroph (gunnar @its)

### LADAR subteam:

- Mike Thielman (thielman @yahoo.com)
- Kristo Kriechbaum\* (kk @its)

### Global subteam:

- Alan Somers (somers @its)
- Rocky Velez (rocky @its)
- Les White\* (leswhite @adelphia.net)

## Planning subteam:

- Sue Ann Hong (sueh @its)
- Thyago Consort (thyago @cds)
- Adam Craig (craig @its)
- Luis Goncalves\*

(luis @bologna.vision.caltech.edu)

Email all: team-software @cds.caltech.edu

\* = Non-DGC 120 support, minimum time commitment 10 hrs./wk., attend project meetings (Mondays, 8pm, 139 Moore), planning team meetings (Wednesdays, 8pm, 139 Moore), subset of field tests

# **Meeting Goals and Agenda**

## Goals:

- I Get demonstration of MTA code structure and operation
- ☑ Update team charts to reflect current status/objectives/timeline
- I Build upon Bugzilla database for keeping track of team tasks
- ⊠ Discuss development of local map class

## Agenda:

- 8:00 Meeting goals, agenda
- 8:05 New code structure review and demonstration (IG)
- 8:15 Action items review from previous week
- 8:25 Review and update of team status chart (add comments)
- 8:40 Review and update of team GOTChA chart and timeline
- 8:55 Task list review/ updates, focused on weekend field demo
- 9:15 Discussion of local map class (stereovision, LADAR, planning systems)
- 9:35 Adjourn

## Planning Team Action Items - Week 1 Review

#### **ALL Subteams**

• Create brief GOTChA chart and timeline consistent with team goals (email text OK) for subteam and send to Lars (lars@cds) - not necessary for HW1, but useful

### LADAR Subteam (MT, KK)

- ☑ Test new LADAR unit, find effective minimum and maximum range, and approximate max. angle of incidence for scan returns
- ☑ Develop one page "whitepaper" outlining LADAR subsystem parameters (scan resolution, number of scanpoints, mount angle, range, …) and performance estimates (terrain map resolution)

### Stereovision Subteam (JG, HH)

- ☑ Test out Steve Waydo's code with camera HW and iridium(?) to get images from camera pair
- ☑ Install and configure SVS on firewire computer, run test programs and get sample output
- ☑ Outline plan for integrating existing goodness map/ path evaluation code and generate preliminary schedule for integration

### Global Subteam (AS, RV, LW)

- Review code for waypoint following (brief)
- ☑ Find ArcView and Feature Analyst, find out capabilities and evaluate whether they are useful
- I Hunt down downloaded satellite images
- Send email to Lars to get tgz file of RP code (not in CVS), and spend a short amount of time trying to understand its functionality. Send email to Rich Petras (petras@helios.jpl.nasa.gov) requesting documentation
- ⊠ Request ALS whitepaper and emails from Dave or Lars

### Planning Systems Subteam (SAH, AC, $\Theta$ C)

- $\boxtimes$  Outline plan for creating reusable map class
- Itest waypointnav/WaypointNav in simulation and track down scaling bugs
- Demonstrate effective use of Dave Benson's visualization-gui

# **DGC 120 Planning team status chart**



DGC 120 Planning team



## **DGC 120 Planning team MTA Modules chart**

DGC 120 Planning team

Wednesday, January 14, 2004

# **DGC 120 Planning team GOTChA chart**

### <u>G</u>oals

- Effectively, quickly, safely and autonomously command the vehicle through the QID course
- ⊠Effectively, quickly, safely and autonomously command the vehicle across the entire DGC course
- ⊠Global subteam: Keep vehicle on course and navigate route efficiently

### **Objectives**

- ⊠Average X mph autonomously over ten hours over { A, B, C} type of terrain (A,B,C TBD)
- Similar objectives for different speeds, driving conditions (enumerated)
- ⊠Ability to accurately detect and command around obstacles under various driving conditions
- ⊠ Global: Preprocess waypoint data from RDDF in less than 2 hours (before race)
- ⊠ Global: Never stray off course
- Global: Spend minimal time traversing a route

### Technical Challenges

- ⊠Not crashing
- ⊠Avoiding other competitors
- ⊠Properly navigating water
- ⊠Terrain classification and proper response
- ⊠Managing "dead end" scenarios
- Effective response to fault information from emb. sys.
- ⊠Global: Accurate registration of static map data in UTM coordinates
- ⊠Robust software capability of running indefinitely without segfaults, runtime errors, memory leaks

#### <u>Approach</u>

- ⊠Vision and LADAR based sensing
- ⊠Arbiter-based driving framework to handle multiple sensory inputs
- ⊠Integration of software with portable MTAbased embedded system design
- ⊠Use of a priori known information (static maps) about course for navigation

# **Planning Team Timeline**



# **Planning: Subteam Composition**

### LADAR Team (MT, KK)

- ☑ Integration of LADAR hardware
- ⊠ Robust terrain map generation
- ⊠ Map path evaluation and vote generation

#### Stereovision Team (JG, HH)

- ☑ Integration and calibration of multiple sets of Firewire stereovision cameras
- ☑ Integration of purchased stereovision software from Videre systems
- ⊠ Generation of terrain maps from range maps
- ☑ Map path evaluation and vote generation

### Global Team (AS, RV, LW)

- ☑ Code for processing waypoint route data definition file (RDDF)
- Generation and processing of static (a priori) maps for use during race
- Efficient navigation of route corridor, with guarantee of staying in-bounds
- $\ensuremath{\boxtimes}$  Map path evaluation and vote generation

### Planning Systems Team (SAH, AC, ΘC)

- ☑ Development and documentation of reusable map classes, with data logging capability
- ☑ Development of simulation environment for testing and debugging code, as needed
- Iterating and refining of arbiter algorithms for combining votes, guidelines for voters
- ☑ Testing and development of dynamic feasibility evaluator (DFE)
- ☑ Develop visualization tools for debugging, as needed

#### **Comment and remarks**

☑ Need to get people aligned with where the most work needs to be done

### Project meetings M 8-9pm, 139 Moore

Team meetings W 8-9:30pm, 139 Moore

- I Condensed subteam status updates
- I Brief timeline review
- ⊠ Issues to resolve
- $\boxtimes$  Action items

**Optional** Sat. ~noon, pizza in shop (Guggenheim)

# **Bugzilla updates - Task list, Action items**

Top Five:	LADAR subteam:
	1.
Stereovision subteam:	2.
1.	3.
2.	4.
3.	5.
4.	
5.	Planning subteam:
5.	Planning subteam: 1.
5. Global:	Planning subteam: 1. 2.
5. <b>Global:</b> 1.	Planning subteam: 1. 2. 3.
5. Global: 1. 2.	Planning subteam: 1. 2. 3. 4.
<ul> <li>5.</li> <li>Global:</li> <li>1.</li> <li>2.</li> <li>3.</li> </ul>	Planning subteam: 1. 2. 3. 4. 5.
<ul> <li>5.</li> <li>Global:</li> <li>1.</li> <li>2.</li> <li>3.</li> <li>4.</li> </ul>	<b>Planning subteam:</b> 1. 2. 3. 4. 5.

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