To: Professor Merz
From: Benjamin Nitkin
Subject: IGVC Progress Report
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The electronics and software team is preparing to transition from brainstorming to programming and experimentation. In the past week, we decided to use a laptop for the robot. We also decided to borrow a pair of computers from Professor Rosenbauer to experiment with. Before we order anything, I decided to take another look over past design reports, focusing on sensors.

For several weeks, the Electronics Team has been considering whether to use a laptop or a desktop machine as the robot's nerve center. (An ultralight fanless PC was briefly considered, but dismissed due to high costs.) Each platform has advantages and disadvantages. A PC would be free from Professor Rosenbauer but is large and requires peripherals and power. A laptop would take $800 from our budget, but is all-in-one, light, and can run under its own power. (We'll likely add an adapter to power the laptop off of the robot's primary batteries.) This past week, we came to a decision: the integration and small footprint of a laptop are worth the price.

Before we begin purchasing, we need to begin integrating the robot's sensors, especially the stereo vision. Even though the final robot will use a laptop, we decided to borrow a pair of desktop computers from Prof. Rosenbauer for experimentation. She has a small collection of retired machines.) One will have with Ubuntu Linux installed to facilitate experimenting with ROS. The other will run RoboRealm. We'll try to setup navigation using each platform, then decide which suits our needs better for the final robot.

After concerns last week about sensor costs, I decided to look over other team's sensor loadouts. As mentioned in a past memo, almost all teams use the following sensors:

- Laser range finder
- Camera
- Accelerators
- Gyros
- Compass
- GPS

What's more, many use the same exact brand of sensor: SICK or Hokuyo for rangefinders, Sparton for the compass, and NovAtel for the GPS. Tellingly, the sensors are almost universally donated or discounted; the retail price for rangefinders is $5000-6500, compass is $2000, and GPS is $2000-25000. Reviewing datasheets for these components compared to less expensive ones revealed an order of magnitude differences in accuracy. The Sparton compass is accurate to 1/10 degree, versus one degree resolution for a $50 sensor. Similarly, a NovAtel GPS is accurate to 20cm; a $60 unit is only good to 2-3m. All told, the expensive variants of sensors offer higher accuracy, but aren't cost-effective for our project.

Old team reports held other useful information, too. Competition robots use electronic speed controls (ESC's) rated between 50 and 100A continuous (based on the few teams that provided ratings). The Lafayette robot can reuse the 150A Victor 885s from the battlebot, assuming they're functional. Most teams use two lead-acid batteries in series to provide 24VDC. Running the motors at 24V, rather than 12, offers more power at the same current.