Olin College

SAIC

SCOPE
Senior Consulting Program for Engineering

SCARF Road Following in conjunction with SAIC

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What is SCARF?

- Supervised Classification Applied to Road Following
- Differentiates between road and non-road in a color digital image

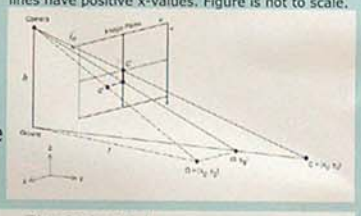
Project Goals

- Test SCARF
- Restore vehicle to working condition

Software System

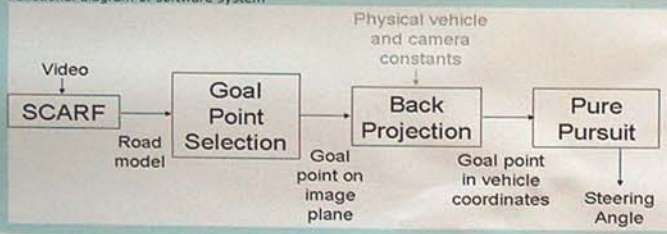
The software system has 4 stages:

- SCARF processes an image
- A goal point is selected
- Goal point is transformed into vehicle coordinates (see figure at right)
- A steering angle is calculated and sent to the vehicle



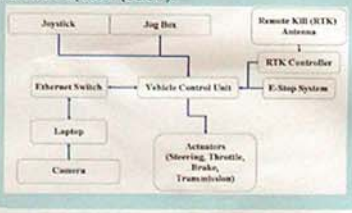
Overview of back projection optics in vehicle coordinates. Solid lines are in the zy-plane and dashed lines have positive x-values. Figure is not to scale.

Functional diagram of software system



Hardware System

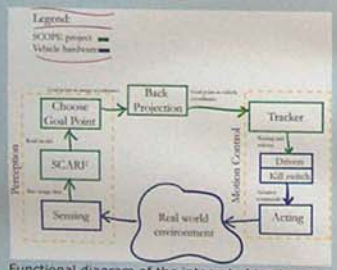
Photo of team with vehicle (above). Diagram of current hardware system (below).



The vehicle is a 2001 Honda ATV that was converted into a robotic platform by SAIC. We repaired and modified the vehicle to suit our testing needs. This included:

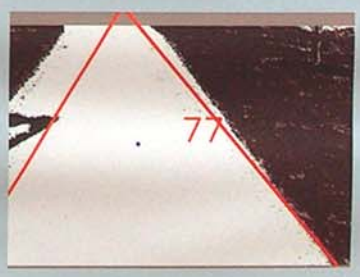
- Removed MBCU from control loop
- Repaired Emergency-stop system
- Restored corrupted VCU hard drive
- Replaced Laptop
- Mounted FireWire camera onto vehicle
- Removed obsolete wiring and connections

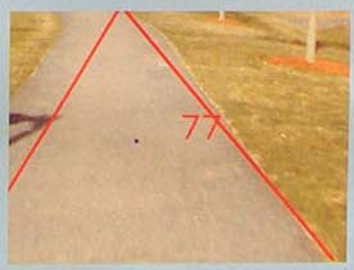
Integration and Testing



Functional diagram of the integrated testing system. Software components are in green and the hardware components are in blue. We developed all of the non-SCARF software functions and adapted the hardware functions to work with our software.

When SCARF processes an image, it creates a probability image which identifies what SCARF thinks is road (white) and non-road (black). From this SCARF calculates a road model (red lines). Here are examples of a raw image (above), a probability image (top right), and a composite road image showing the road model (right).





The complete testing system consists of our software program integrated with the vehicle hardware. We tested SCARF on a variety of paths around Olin to try to determine the best conditions to run SCARF.

In addition to testing, we produced a user guide for future users of the vehicle platform and software program.

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