Rudder Control for an Autonomous Sailboat

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Introduction

The Atlantis is an autonomous catamaran which uses motor actuated rudders for steering. The rudder angle location must be precisely monitored for accurate navigation. The following information will show how the rudder control was implemented as well as describe key components used.

HC12 Microcontroller

The HC12 microcontroller is used as the "brain" for the rudder subsystem. It effectively brings together each component and allows them to work together. It is able to process and implement user commands via a communication bus.

240:1 DC Motor

The rudder is driven using a 240:1 gear head motor.

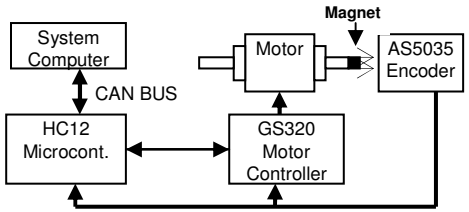
AS5035 Encoder

The AS5035 is a magnetic encoder. It uses the changing magnetic field of a moving magnet to sense motor rotation. The out put is in the form of two square waves offset by 90 degrees.

G320 Geckodrive

The G320 Geckodrive motor controller drives the gear head motor through logic signals applied by the HC12.

Atlantis: Autonomous Catamaran



Block diagram showing interconnections between each system component

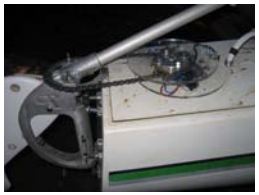
Troubleshooting

Complications encountered while initially testing the system were due to noise in the lines. Shielded cable and an optical isolator were used to filter the noise.

Shielded Wire and Optical Isolator

Rudder Calibration

In order to accurately control the rudders the encoder counts must be translated into angles. This was accomplished by taking encoder readings as the rudder rotated through its range of motion. An encoder reading was recorded for each ten degree increment of the rudders travel.



Completed Motor Control Subsystem Mounted in Boat Hulls

-Baskin School of Engineering-