Autonomous Object Tracking Robot with Object Avoidance

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Abstract

Our Project Goals were…

- Design an autonomous system to search a space for an object of a particular color
- Track and follow or avoid the object
- Send real time environmental data to a remote computer
- Display the robots environment on the computer in real time.

Overall, the project's focus was on the integration of disparate chassis, sensor, and logic modules into a single functioning system.

Introduction

In our planning phase, we decided to follow a provided project plan; each step consisted of both development of and implementation of the given module:

- Hardware Design
- Chassis/Drive Train Interface
- Power System
- Sensor Interface
- Computer Interface
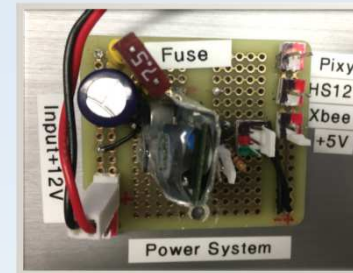- Object Avoidance Routine

An extensible HS12 processor, as well as the Drive Train (Hexapod), LIDAR, and Pixy Camera hardware and software were provided as disparate modules. A majority of this project revolved around solving interfacing problems with these modules.
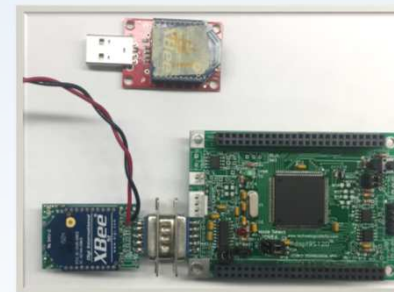
Hardware Design

- Avail surface area also important
- Pixy Camera's forward platform reduces elevation requirement of LIDAR
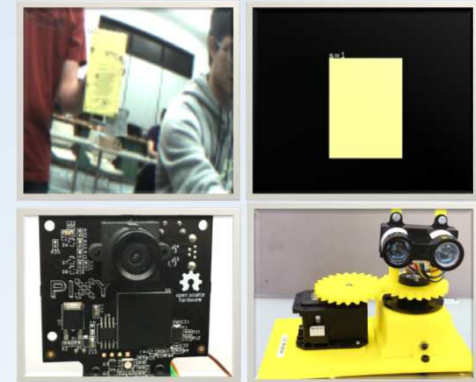- Battery, power system, servo controllers, and HS12 needed to be firmly anchored and have plenty of space

UD Mobile

Power System

Power System

XBee Transceivers & HS12

Pixy Cam & Lidar

Sensor Interfaces

Our sensors used multiple communication protocols including:

- SCI (Serial Communication Interface)
- SPI (Serial Peripheral Interface)
- PWM (Pulse Width Modulation)

Object Avoidance

By combining information from our sensors, we developed a simple routine to simultaneously avoid and track a colored object:

- Divides possible directions of movement into quadrants, then determines the distance of objects in the given quadrants
- Uses nested if statements to strafe around obstacles and avoid dangerous collisions

Conclusions

- Core project requirements were met
- Project emphasized the value of modular designs
- Differing communication methods are valuable for modularity, even in the same system