HKN Lockhead Martin Judges Choice Award

Remote Inspection Using Aerial Vehicles

39-500 CIT Honors Research
Spring 2001

A Flying Robot Platform

Goal

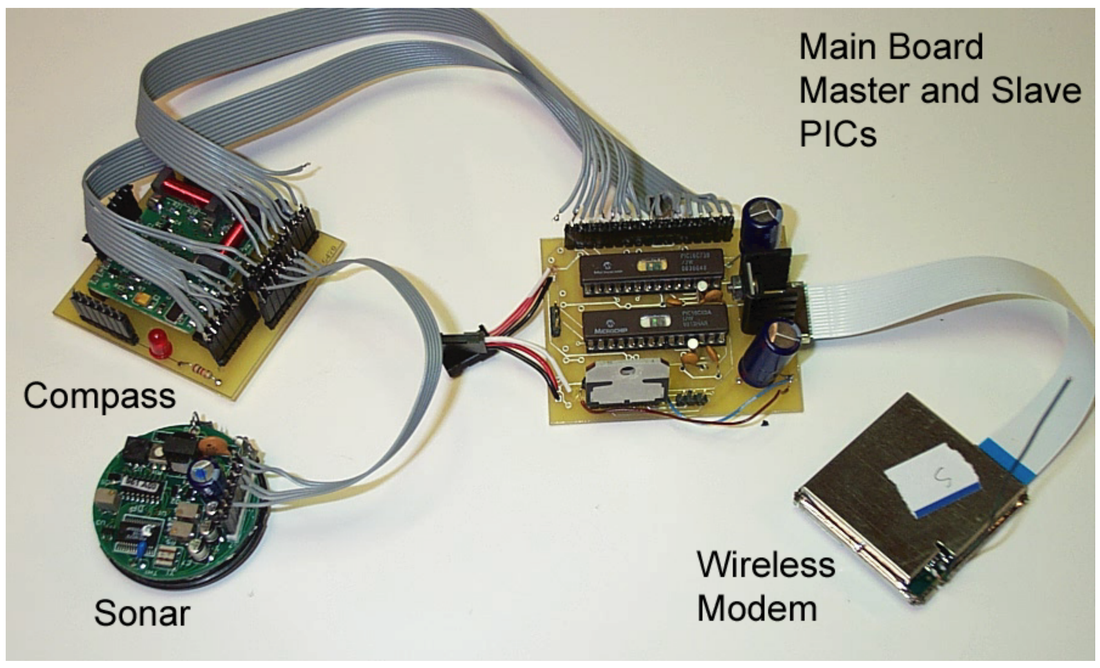
- To design and build a platform for robotic blimp experimentation
  - This includes:
    - 1. The Physical Blimp
    - 2. The Control System on the blimp
    - 3. The off board host computer software
  - The blimp will be used as a robotic platform for remote inspection of civil infrastructure.

Advantages Of A Blimp

- Flying adds a degrees of freedom
- Compared to other flying technologies blimps have several advantages:
  - ♦ Simpler to control (stays aloft without active control)
  - ♦ Can hover with little or no power

Disadvantages Of A Blimp

- Blimps are large
- Lift capacity is limited
  - ♦ 1 cubic foot (28 L) of helium lifts about 1 ounce (28 g)
- System is under actuated

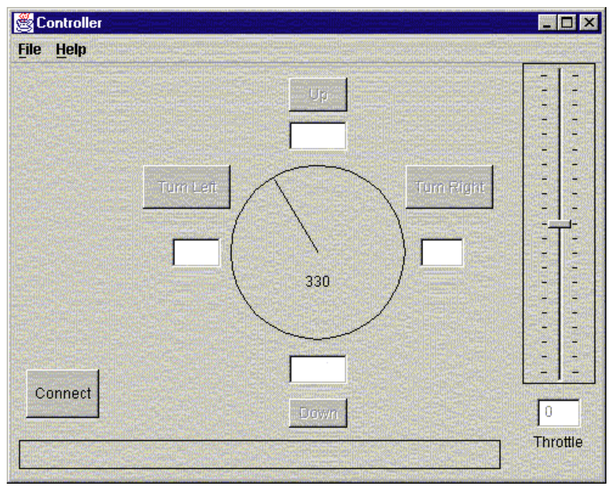


The Physical Blimp

- 7 ft long indoor blimp
  - ♦ Envelope is constructed of metalized nylon
  - ♦ About 16 cubic feet of gas capacity
    - Total lift is about 16 ounces (~500 g)
    - Blimp itself is 3.5 ounces (~100 g)

On Board Sensors

- 4 Sonar Sensors
  - Provides analog output proportional to distance
  - About .67 ounces (~20 g)
- Electronic Compass Module
  - ±1 degree accuracy
  - No moving parts
  - Serial output
- Wireless Camera
  - Transmits to a video
  - monitor

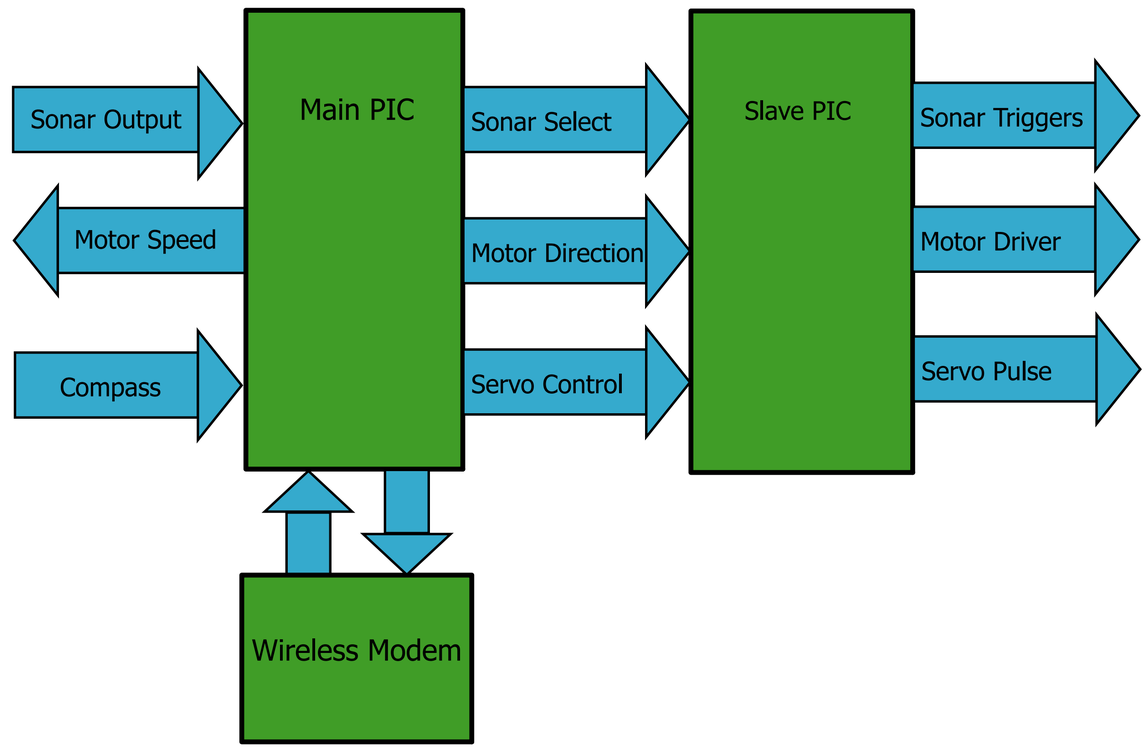


Host PC

- Java program
  - ♦ Displays sensor data
  - ♦ Sends commands
  - ♦ Flexible and extendible

On Board Controller

- Main 16C73B PIC microcontroller
  - ♦ Sends reads sensor data
- 19.2 Kbps wireless serial link
  - ♦ Sends sensor readings to host PC
  - ♦ Receives commands from host PC
- Slave 16C63A PIC microcontroller
  - ♦ Decodes Motor direction lines
  - ♦ Generates sonar trigger pulses
  - ♦ Generates servo control pulses



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