Automated Flight Control of an Unmanned Blimp

Vito Sabella

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Project Goals

- **To Automate the Flight Control of an unmanned 30 foot blimp.**
- **A Subsidiary of the STWING-SEAS Blimp Project.**
- **An Ongoing Project.**

Description

- **Utilizes GPS and rate gyros for feedback.**
- **Mathematical model will fuse with feedback to provide control.**
- **Model will include:**
  - **Inertial Moments**
  - **Wind and Drag Elements**
  - **Variations in propulsion**
  - **Sensor errors and applied corrections.**

Model (Mathematical!)

(Not this kind of model!)

- **3-D Model.**
- **Wind and Drag Forces.**
- **Torques, Pitch, Yaw. No roll.**
- **To-Do:**
  - **Virtual Mass Terms**
  - **Second Order and other Terms (Precessions, Coriolis effect.)**

Automation of motion.

- **Matlab/Java model of feedback laws.**
- **Provides 2-D positioning.**
- **Working with Dr. George Kantor on optimal path choices.**
- **Since no reverse thrust hovering is near impossible. Setting proper boundaries for waypoints.**

Feedback System

- **GPS Provides Earth-Spaced XYZ position data with +/- 5 meter accuracy, velocity information, and differential heading estimates.**
- **Mounting of GPS must have a clear view of satellites yet be at a low point to prevent errors due to roll.**

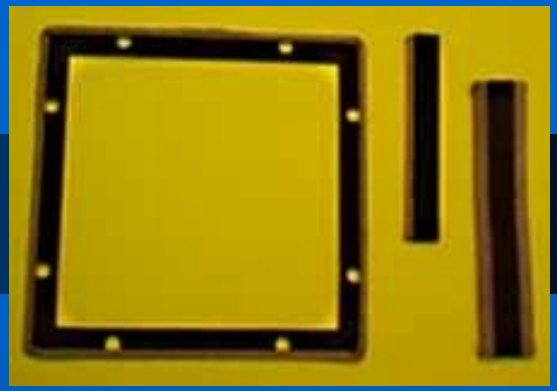
Feedback System (2)

- **Gyroscope mounting has a huge effect on sensor accuracy. Different motions cause sensor drift.**
- **Tradeoff: Using analog integrator gives us more position accuracy due to higher sample rate. But it drifts.**

The Blimp Operating System

- **Multi-threaded pre-emptive operating system for blimp processes.**
- **Due to its Java nature real time hardware access a problem.**
- **Solution: A Real Time Java Virtual Machine project was started to modify the Virtual Machine.**

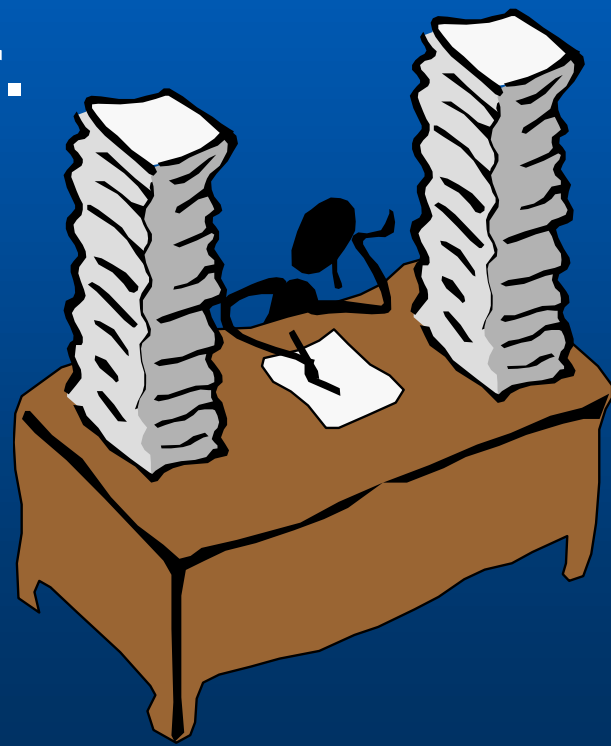
Technical Hurdles



- **Mounting of sensors for optimal data reading.**
- **RF Shielding to prevent sensor data corruption.**
- **Weight Considerations**

Non-Technical Hurdles

- **Damage to the blimp.**
- **Organization of manpower.**
- **Funding for project.**
  - **Insurance Costs.**



Conclusion

- **Feedback laws prototyped in software to hardware interface.**
- **Real World Testing!**
- **Stable Sensors Platform for CMU**
- **Questions?**