Poster paper

Research Proposal: Developing systems for the remote control of an Airship

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Research groups worldwide use remote vehicles as proving grounds for new technologies. With computing over the next few years becoming increasingly focused on intelligent environments, research into areas such as distributed autonomous control systems is very important. We intend using a blimp as a platform for development. A blimp provides a test bed for computer control system development in an inherently unstable environment so providing many significant challenges. It also however is a viable 'out of the box' vehicle which makes it an extremely visible marketing device profiling the technological focus of Otago Polytechnic. We propose a two stage development, the first, a smaller (15ft) indoor blimp. This will provide the platform for research and teaching, converting the radio control system to an embedded computer system. Stage two would provide an operational outdoor vehicle, capable of untethered flight in all but the strongest of winds.

It is envisaged that GPS, miniature remote video camera, gyroscope, internet and cell phone technologies be added to the blimp so to construct a vehicle that overcomes normal remote control constraints. Using readily available technologies and publicly accessible infrastructure it is envisaged that such a capability would provide a cost effective tool for applications as diverse as ecological research through to search and rescue.

Research questions:

1. Is using PC based technologies to remotely control a dirigible via wireless LAN practical? (both technology and control system issues).

2. What are the HCI implications of controlling a remote vehicle via PC a interface?

It is envisaged that these remote dirigibles would be operated by non pilot trained people therefore it is extremely important that all data received for the control and operation of the dirigible be as "intuitive" as possible. Such testing will provide interesting data as well as stimulate student interest in HCI.

3. Is it possible to extend the use of these PC based technologies from WLAN to Internet over the cellular network?

4. Is it possible to use onboard sensors and processing to maintain a stationary position?

Dirigibles are responsive to the air current, temperature and moisture changes, which they encounter. This means that they require constant input to maintain control. If control is lost a dirigible will not crash as you would expect with an airplane or helicopter however it will not be where you left it last. Devising algorithms that will contain a dirigible with in predetermined parameters will prove challenging as environmental factor are constantly variable while the control and drive mechanisms are of a limited capability.

5. Is it possible to use onboard systems to complete a requested flight path? It is hoped that the vehicle will be semi-autonomous, enabling independent grid patterns for search-and-rescue applications.

6. Is it possible to use low power radio technologies to reduce the dependency of wire onboard the dirigible and so reduce the weight of infrastructure?

7. Is it possible to enhance flight time endurance by generating our own energy needs? Energy requirements for maintaining control and population systems are key determinants for flight time endurance. Advances in the production and storage of electrical energy on mobile systems are of prime importance in today's world. It is envisaged that the latest technologies in photo cell and reverse flow motors / generators could be incorporated to greatly enhance fuel efficiency but can it be done within the weight constraints of a dirigible flight system.

8. Is it possible to incorporate structural and fuel cell components?

9. Are there viable alternatives to steeper motors, servos and solenoids with which to replace control surface actuators?