

ELEC 499
January 30th, 2012

Progress Report

Group # 3 - *Radio-Tracking Camera Gimbal*

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Supervisor: Dr. Dong

Progress

At this stage the group has been searching for various receivers that could satisfy our project requirements. We've met with Dr. Dong to discuss the feasibility, approach, and overall theory behind the project.

One method of particular interest was to find receivers that could be driven by the same voltage-controlled oscillator when removing the carrier signal.

In other words:

$$\text{Receiver 1: } \cos(w_c t + \phi_1) \cos(w_c t + \phi_c) = \cos(\phi_1 - \phi_c)$$

$$\text{Receiver 2: } \cos(w_c t + \phi_2) \cos(w_c t + \phi_c) = \cos(\phi_2 - \phi_c)$$

$$\text{Receiver 3: } \cos(w_c t + \phi_3) \cos(w_c t + \phi_c) = \cos(\phi_3 - \phi_c)$$

...

$$\text{Receiver n: } \cos(w_c t + \phi_n) \cos(w_c t + \phi_c) = \cos(\phi_n - \phi_c)$$

[assuming lowpass filtering already]

Using these (or similar) equations one would be able to extract the phase difference between the receivers. The key point, however, is the reliance on the same VCO. This method is similar to a phase lock loop where the information we'd be interested in is the phase correction feedback.

At this stage we estimate the following equipment will be needed:

- Tripod (have)
- Pan-tilt motor
- Antennas
- Multiple Receivers
- Single Transmitter
- Microcontroller (PIC, ATMEL or something similar)

We've also compiled various academic papers on the topic of Angle of Arrival estimation and various other triangularization algorithms. Some of these papers have been found on the Internet, and Dr. Dong has provided some as well.

At this stage we've concluded that the project may be beyond our skill set and is simply too ambitious for us to complete by the end of the semester. Thus, we have created a back up project that we are much more confident to implement.

Back-up project – Wireless Power Bar

Supervisor: Unknown

This project has already been widely discussed within our group and would consist of a wirelessly controlled power bar that could be used to:

- Control multiple devices by the simple act of turning them on and off
- Control the devices using an internet interface (allowing the user to access it anywhere, create schedules, etc)
- Power consumption and monitoring system
- An attached camera to authenticate a wireless network (using a QR code)
- USB plug in for charging other devices

This device could be used for multiple purposes and is inline with the current trends for less power consumption and more home monitoring.

Equipment required for this project includes:

- Microcontroller (arduino, raspberry pi)
- Relays
- Wireless shield
- Cheap camera
- Basic electrical parts (buttons, LEDs, etc)
- Conversion circuit (transform 120 V AC to 5V DC)
- Various IC's for purposes such as power monitoring

The majority of the equipment for this project has already been obtained. As far as a supervisor is concerned, we are not worried about finding someone who would sponsor our project, as it is fairly general.