

Android Enabled Programmable Camera Positioning System

Design Team 3



The Project

The AFRL tasked design team 3 with constructing an automated infrared camera positioning system capable of pointing at a given GPS location based on a programmed schedule. In order to keep costs low an Android smartphone is used for its multitude of sensors and processing power.

The Requirements

The design solution needed to meet these requirements set by the AFRL:

- The phone needs to read target GPS points from a schedule stored on the SD card.
- The design should utilize the phone's sensors to gather the camera's position and orientation
- The phone needs to communicate with a laptop to send a signal indicating that the infrared camera should take a picture
- The phone needs to take a picture using its own onboard camera for context
- The mount should be able to support a 25lb camera
- Optimize for cost vs. performance
- Must be accurate within 2°

The Budget

Item	Price
Stepper Motors and Power	\$130
Mount Materials	\$100
Components for Logic	\$20
Components for Motor Controllers	\$130
Android Smartphone	\$50
Total	\$430

The Team



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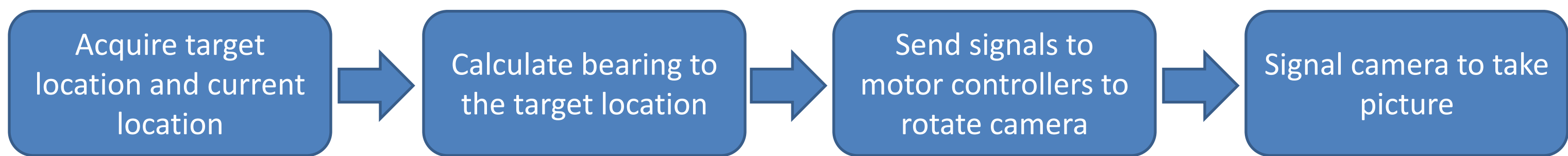
Chris Sigler
Document Prep

The Approach

The design approach was based around two key decisions. The first is the choice to use stepper-motors for rotation. These motors provide a high level of accuracy and substantial holding power to support the heavy camera. Another key decision was the choice to control the motors with the phone's headphone jack.



The Solution



The Software

The Android application developed for the project reads from the schedule file and determines its next target. It then gets its location and orientation and calculates the amount of rotation required to point it at the target. It then outputs a series of DC voltages through the headphone jack to tell the motors how to rotate. A small preview shows what the camera is currently looking at.



The Hardware

When the phone outputs a voltage on the headphone jack the PIC microcontroller takes it and issues a signal to the motor controllers indicating the speed and direction in which to rotate. Because of the gearing and holding torque of the stepper-motors they have no problem moving and holding the entire 25lb infrared camera.

