MM4GDM Group Design & Make Project

The University of Nottingham

UNITED KINGDOM · CHINA · MALAYSIA

QUADVISION

Aims

The aims of what the quad copter should do were defined by the customer in the statement of requirements

- Maintain a visual lock on the target
- Autonomously follow the designated target using IR and GPS in real time
- Target to be a flashing IR LED beacon pulsing at a set frequency and a GPS beacon
- Live stream video
- Record video

Figure 2: Clockwise from top left- GoPro view, Target, Mission Planner, Pixy view with IR filter

Systems

Ardupilot

The Ardupilot flight controller controls all of the drone's functions, it has a live GPS link and is connected via a wireless video kit to the base station.

Gimbal (controls the camera movement)

Based on output from the Infrared System, the gimbal follows the target and tries to keep it at the centre of its field of view.

Video Systems

A GoPro is attached to the gimbal and is used to record the target. This video is then streamed in real time to the base station via 5.8GHz transmitters.

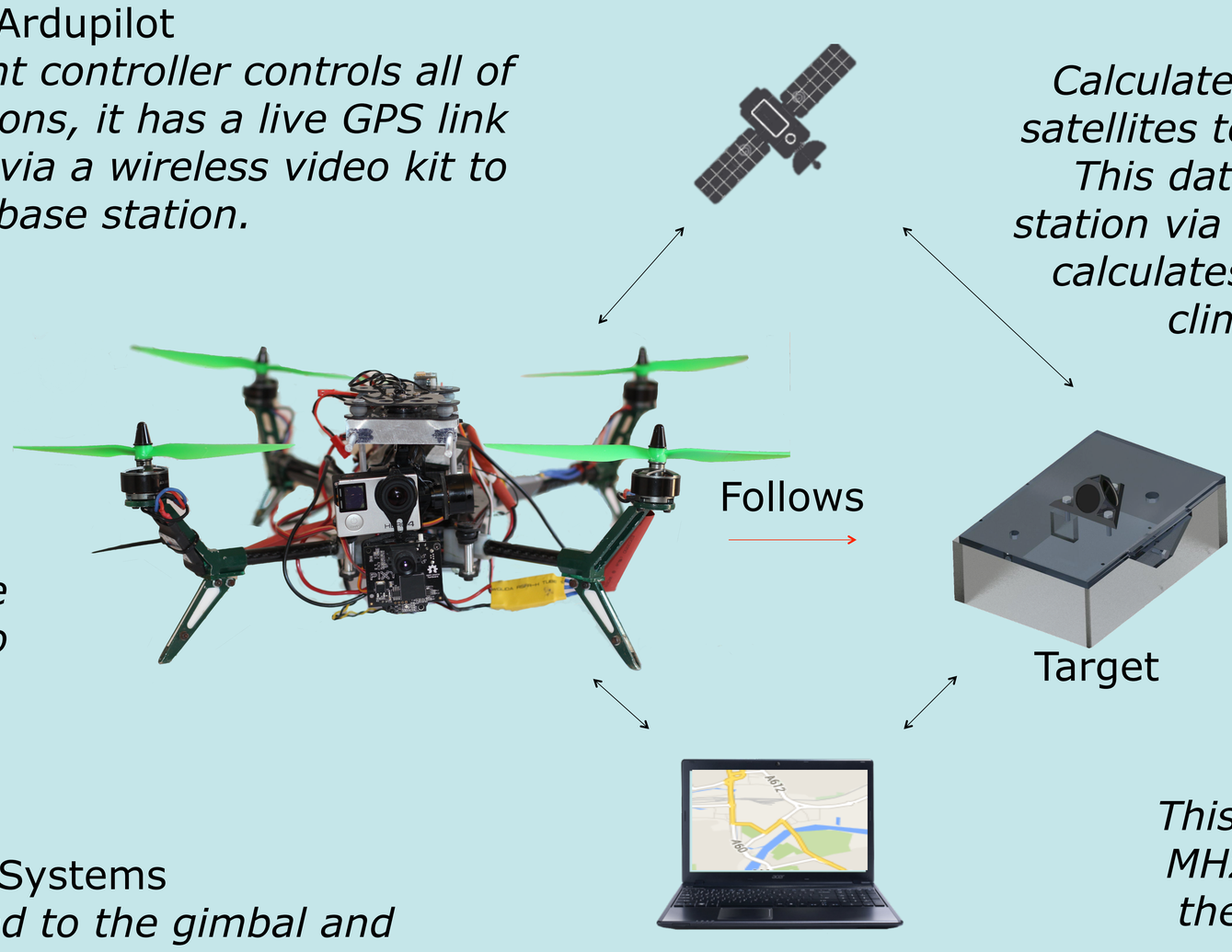

Figure 3: Concept Illustration

GPS Breakout

Calculates the position of the beacon using satellites to an accuracy of less than ±1.5m . This data is then transmitted to the base station via XBEE's (radio transmitters). It also calculates the altitude, speed, heading and climb at a refresh rate of 10Hz.

Infrared System

An infrared LED beacon pulses at a set frequency, which is detected and tracked by the Pixy camera. This is then outputted to the gimbal.

Mission Planner

This software was used to create a 433 MHz video link between the drone and the base station, allowing commands from the control script to be communicated and implemented. It also provides live information about the current state of the drone.

Target Tracking Coding Flowchart

Review

Improvements which could be made to the drone would require an increased budget and would include improving the accuracy of the GPS signal for the system, increasing the capacity of the batteries to increase the flight time and adding extra functionality to the control script.

The drone is reasonably capable of performing the task required, as described by the customer in the aims. It can perform guided flight, follow the GPS beacon and track the IR signal.