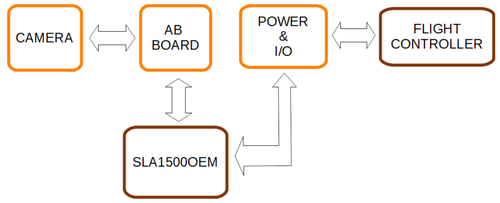
SightLine APPLICATIONS

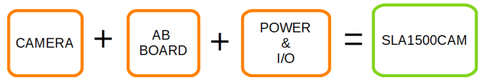
UAV Visual Landing Aid

Premise

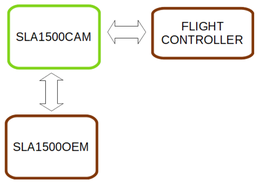
SightLine Applications has developed a precision visual landing aid for UAV's. The Landing Aid supports autonomous landing operations by automatically finding and tracking an easy to place landing pattern. A wide range of cameras must be supported, and custom AB boards must be designed for each one to interface with the SightLine hardware.



Each of these AB boards can have cable, power, and electrical connectivity issues that are problematic for the end user. The proposed solution is to develop an all in one unit with plug and play capabilities that can be directly connected to the SightLine hardware.

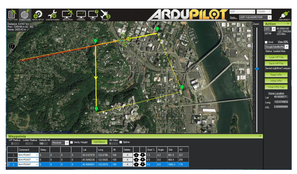


By doing so camera connectivity and selection problems are eliminated, and deployment is made much easier for the end user.

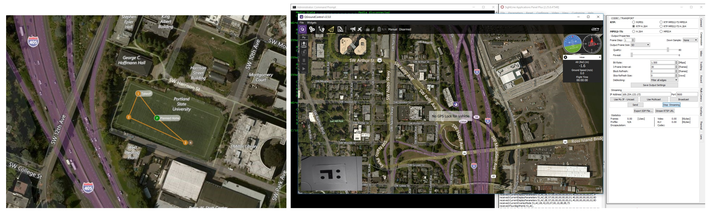


Solution

Software



Similar to Qgoundcontrol, Mission planner is another open-source software allows users and developers fully control their drone. In this project, we used Mission Planner for setting up a fly simulation which is usually called system in the loop (SITL). This help us understand the drone's behavior and how adjust the drone's parameters could affect the drone's behavior. The simulation provides varieties of tools and command that can change the speed of drone, speed and direction of wind, precision landing, and flight mod.

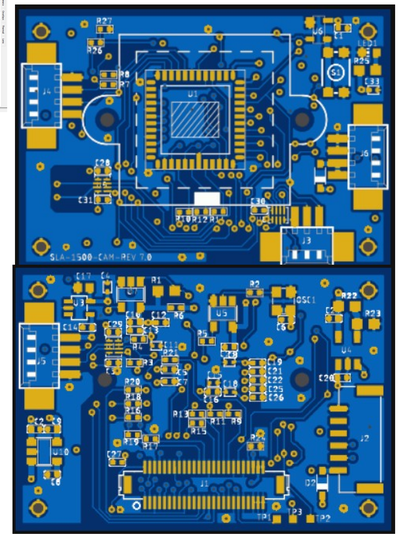


Qgroundcontrol is an open-source software that allows users/ developers controlling their drone fully and autonomously. In this project, we tried to understand the behavior of Qgroundcontrol in controlling the drone and precision landing. Qgroundcontrol allows users/ developers adjust and control every single parameter of the drone as well as set up a mission for the drone flying autonomously including take-off and precision landing.

Quadcopter

For testing purposes we built a custom quad copter with a Pixhawk 4 flight controller. Using QGroundcontrol software we were able to fly the quad-copter to different way points and land the UAV autonomously via the ground control station. This was vital to our understanding of UAV operation, and end user experience.

Hardware



The 1x1.5" SLA1500CAM utilizes the On-Semi AR0134CS, a monochrome 1/3-inch 1.2 Mp CMOS digital sensor with a 74MHz output. It connects seamlessly with the SightLine SLA1500OEM image processing hardware via a 50-pin Hirose DF12 connector eliminating a handful of cable, and connectivity issues. With a 5V input the SLA1500CAM converts and distributes the 3.3V, 2.8V, and 1.8V required for operation. The SLA1500CAM provides level translation for communication between the SightLine hardware, the flight controller, and the optical sensor. It also offers the following I/O via standard Molex connectors: Power and serial communication for the flight controller, Discrete GPIO, Auxiliary I2C bus, Auxiliary serial communication, and Auxiliary power in.

****Hardware and communication with SLA1500OEM results****

Future Developments

We tested a current SightLine setup based on the SLA1500OEM with the Pixhawk4 flight controller and Qgroundcontrol software. Serial communication was established between the SLA1500OEM processing hardware and the Pixhawk4 flight controller, however, the serial signals sent from the SLA1500OEM to Qgroundcontrol via the Pixhawk4 were not recognized by Qgroundcontrol. We were able to stream video to Qgroundcontrol with a direct ethernet connection to the SLA1500OEM, however, when we tried to stream the video wirelessly to Qgroundcontrol the signals were not recognized. There are remaining compatibility issues with Qgroundcontrol and SightLine software. Potentially, a new capstone project focused on software and wireless communication will be available next year for students who are interested in drone communication protocols.

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