**CAST CPET-563 Embedded Systems II Dr. Kaputa**

**Spring 2019**

**Gold Team Deliverables**

1. **System Requirements Doc [Deliverable 1]**

[REQ-1] LED Battery Indicators

The orange LED shall be on without blinking when the bus voltage is greater than 7.4 volts, blink at 1 Hz between 6.8 and 7.4 volts, and blink at 5 Hz when below 6.8 volts.

[REQ-2] Kill Switch

The motors shall be able to be disabled through a single kill switch on the receiver.

[REQ-3] Calibration

The drone shall hold zero pitch and yaw after calibration.

[REQ-4] Correction

The drone shall return to zero after perturbation.

[REQ-5] GUI

The drone shall have a GUI displaying diagnostic information such as PWM commands, bus voltage, and altitude.

[REQ-6] Autonomous mode

The drone shall be able to toggle between manual and autonomous modes via receiver rate switch.

[REQ-7] Navigation Mode

The drone shall perform trajectory 1 immediately after entering autonomous mode and perform trajectory 2, exactly 15 seconds after finishing trajectory 1.

[REQ-8] Basic Tracking Mode

The drone shall enter basic tracking mode via a "1" on the flight mode switch.

[REQ-9] Ball Tracking

The drone shall track a pink tennis ball via visual servoing.

[REQ-10] Tracking GUI

The drone shall have a GUI displaying diagnostic information as well as the real time video feed.

[REQ-11] Advanced Tracking Mode

The drone shall enter advanced tracking mode via a "2" on the flight mode switch.

[REQ-12] Face Tracking

The drone shall track faces via visual servoing.

[VER-1] LED Battery Indicators

REQ-1 shall be verified if voltage signal displayed via oscilloscope matches the LED for each battery voltage range.

[VER-2] Kill Switch

REQ-2 shall be verified via test and the test shall be determined to be successful if motors can clearly be recognized as significantly losing power when the kill switch is hit.

[VER-3] Calibration

REQ-3 shall be verified via test and the test will verify that calibration will invalidate any weight imbalances on the drone and keep the drone level.

[VER-4] Correction

REQ-4 shall be verified via test and the test will verify that when the drone interacts with a perturbation, it will return back to how it was balanced during calibration.

[VER-5] GUI

REQ-5 shall be verified all metrics mentioned are properly populated and updated, pulling from the correct memory location.

[VER-6] Autonomous mode

REQ-6 shall be verified when the receiver rate switch if flipped to manual mode or autonomous mode, the drone’s functionality adjusts accordingly.

[VER-7] Navigation Mode

REQ-7 shall be verified by observing the Simulink multimeter and utilizing constant values to dictate the mode that the simulation in running in (to ensure navigation).

[VER-8] Basic Tracking Mode

REQ-8 shall be verified by viewing the drone’s server feed of the camera and ensure when autonomous mode switch is selected to “1”, the feed shows the live tracking of a tennis ball in front of the camera and the Simulink signals indicate responsiveness to moving the tennis ball.

[VER-9] Ball Tracking

REQ-9 shall be verified by moving the tennis ball, ensuring the Simulink signals respond to this movement, and allowing the drone to move freely to track the tennis ball.

[VER-10] Tracking GUI

REQ-10 shall be verified by opening the drone’s server and ensuring that the video feed is properly displayed and different tracking modes are displayed properly.

[VER-11] Advanced Tracking Mode

REQ-11 shall be verified by viewing the drone’s server feed of the camera and ensure when autonomous mode switch is selected to “2”, the feed shows the live tracking of faces in front of the camera and the Simulink signals indicate responsiveness to moving faces.

[VER-12] Face Tracking

REQ-12 shall be verified by moving with your face in range of the camera to ensure the drone’s tracking is working correctly.

1. **VCRM [Deliverable 2]**

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| --- | --- | --- | --- |
| **Requirement** | **Verification** | **A/I/D/T** | **Comment** |
| REQ-1 | VER-1 | Test |  |
| REQ-2 | VER-2 | Test |  |

1. **Cost and Schedule [Deliverable 3]**

Show initial PDR projections and schedule along with actual dollars and schedule. Highlight some risks and challenges that you ran into in order to explain the delta between estimated and actuals

1. **System Level Verification Procedure [Deliverable 4]**

Encoder Verification Test Set 1 [VER-1]

Test Setup:

- Take tread off of all motors

- procure oscilloscope

Test 1: Encoder 1

- Connect 3.3 V bench supply to pin TBD

- Connect oscilloscope probe to pin TBD

- Connect oscilloscope probe ground to pin TBD

- rotate motor clockwise looking at the motor from the outside

- record data

- rotate motor counter- clockwise looking at the motor from the outside

- record data

Test 2: Encoder 2

Test 3: Encoder 3

Test 4: Encoder 4

Encoder Verification Test Set 2 [VER-2]

Test Setup:

- Apply treads to motors if not already on

- procure oscilloscope

- ensure all encoders are powered

- load Snick with test software XYZ

Test 1: Encoder 1, 2 Coincidence

- Connect encoder 1 and 2 signals to the oscilloscope

- Translate the tread associated with encoders 1 and 2, 1 inch and verify that both channels produce 3.3V coincident pulses on the oscilloscope

- record data

Test 2: Encoder 3,4 Coincidence

- Connect encoder 3 and 4 signals to the oscilloscope

- Translate the tread associated with encoders 3 and 4, 1 inch and verify that both channels produce 3.3V coincident pulses on the oscilloscope

- record data

Test 3: Encoder 1,2 scale factor

- Translate the tread associated with encoders 3 and 4, 1 inch and verify that both channels produce 500 counts shown in the python console

- record data

Test 4: Encoder 3,4 scale factor

- Translate the tread associated with encoders 3 and 4, 1 inch and verify that both channels produce 500 counts shown in the python console

- record data