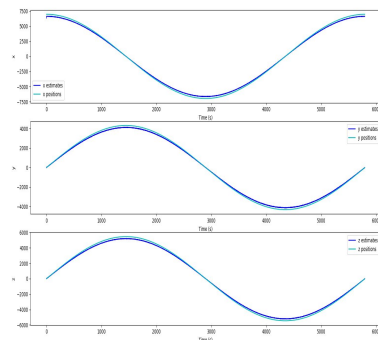
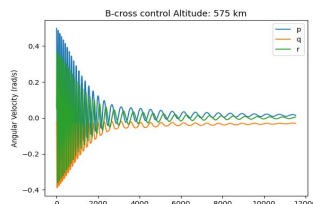


Weekly Quad Chart - 11/10

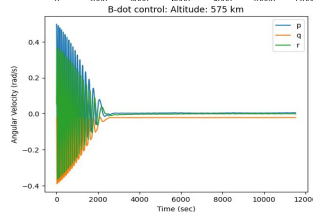
Updates



Kalman filter for orbit estimation



B-cross control for detumbling



B-dot control for detumbling

Blockers and Requirements

Blockers

-

Requirements

- Crash course by Zac on MEKF
- Pycubed board to start twiddling with software frameworks

Weekly Results and Plan

- Implemented Kalman filter for orbit estimation
- Implemented b-cross control for detumbling. Ran some experiments to compare the performance of b-dot and b-cross control
- Started listing risks and potential mitigations
- Fprime compatible with PyCubed board

Next week

- Implement simple MEKF
- Formally compare the performance of the detumbling control techniques in a Monte carlo sim.
- Continue risk analysis
- Basic workflow/state machine using Fprime on PyCubed
- Start evaluating options for estimation architecture with vision inputs
- Keep implementing more risk analysis

Interface dependencies

Avionics:

- Finalize computer framework and sensor selections

Mechanical:

-

Vision:

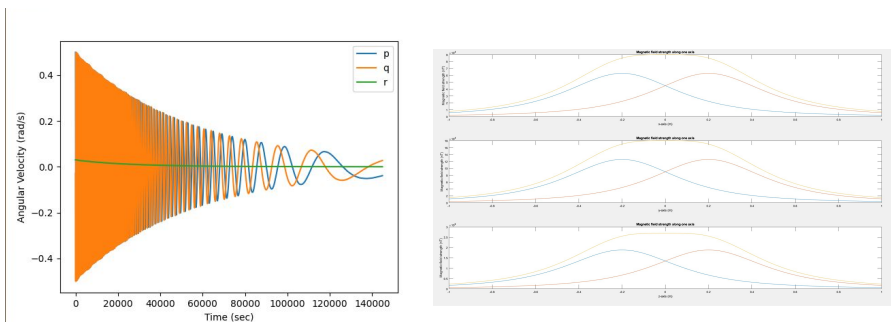
- Discuss any major changes or updates to output of vision system

COMOPS:

- Communication protocol & Commands

Weekly Quad Chart - 4/10

Updates



Implemented a detumbling simulation with a BDot controller.
Magnetic field in 3-axis Helmholtz coils

Blockers and Requirements

Blockers

-

Requirements

- Crash course by Zac on MEKF
- Pycubed board to start twiddling with software frameworks

Weekly Results and Plan

Weekly Results

- Solved wabhas problem with CVX, SVD, q-method and gauss newton method
- Implemented a detumbling simulation with a BDot controller. Sim models translational and rotational kinematics and dynamics for the cubesat.
- Finished the Helmholtz coil's matlab simulation, which can give the magnetic field on 3-axis

Next week

- Implement simple MEKF
- Add sensor noise, bias, sensor filtering for sim

Interface dependencies

Avionics:

- Finalize computer framework and sensor selections

Mechanical:

-

Vision:

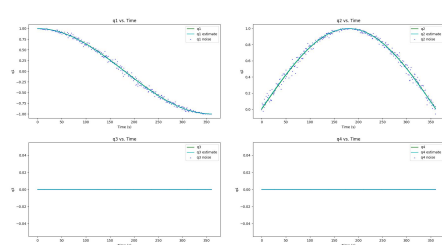
- Discuss any major changes or updates to output of vision system

COMOPS:

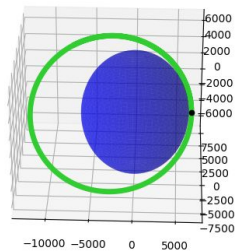
- Communication protocol & Commands

Weekly Quad Chart - 27/09

Updates



Simple attitude determination in quaternions



Simulating orbit propagation with two-body dynamics

Blockers and Requirements

Blockers

-

Requirements

- Crash course by Zac on MEKF
- Pycubed board to start twiddling with software frameworks

Weekly Results and Plan

Weekly Results

- Implemented simple EKF for attitude determination
- Studied and implemented quaternion operations in python required for MEKF
- Trade study between CircuitPython vs FPrime
- Simulated orbit propagation with two-body dynamics
- Studied HIL testing for magnetometer, magnetic torquer, and IMU

Next week

- Study attitude determination course notes
- Implement first version of attitude estimator
- Start playing around with chosen architecture
- Start designing the Helmholtz cage for HIL simulation

Interface dependencies

Avionics:

- Finalize computer framework and sensor selections

Mechanical:

-

Vision:

- Discuss any major changes or updates to output of vision system

COMOPS:

- Communication protocol & Commands

Weekly Quad Chart - 20/09

Updates

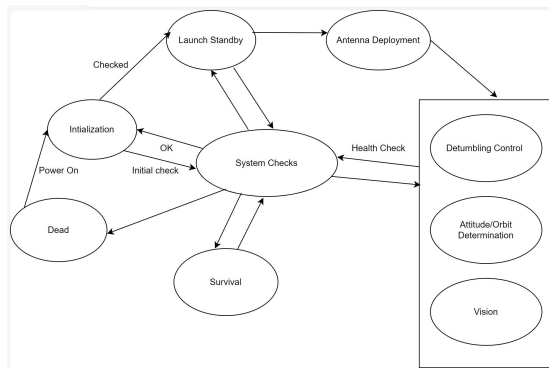


Figure: Basic state machine diagram

Blockers and Requirements

Blockers

-

Requirements

- Recorded satellite sensor(sun,magnetometer) measurements
- Crash Course by Zac

Weekly Results and Plan

Weekly result

- Studied resources on quaternions and MEKF
- Initiated development on attitude estimation with basic quaternion operations
- Developed basic state machine
- First version of simulation for satellite position based on Newton's law of gravity and RK4

Next week

- Implement simple attitude estimator
- Progress on subsystem interfaces
- Meeting with Comms for functional partitioning and protocol
- Meeting with Avionics for hardware choices
- Iterate on State machine design and simulation

Interface dependencies

Avionics:

- Software framework/ baseline computer system
- Kernel functionality
- Sensors & Actuators drivers

Mechanical:

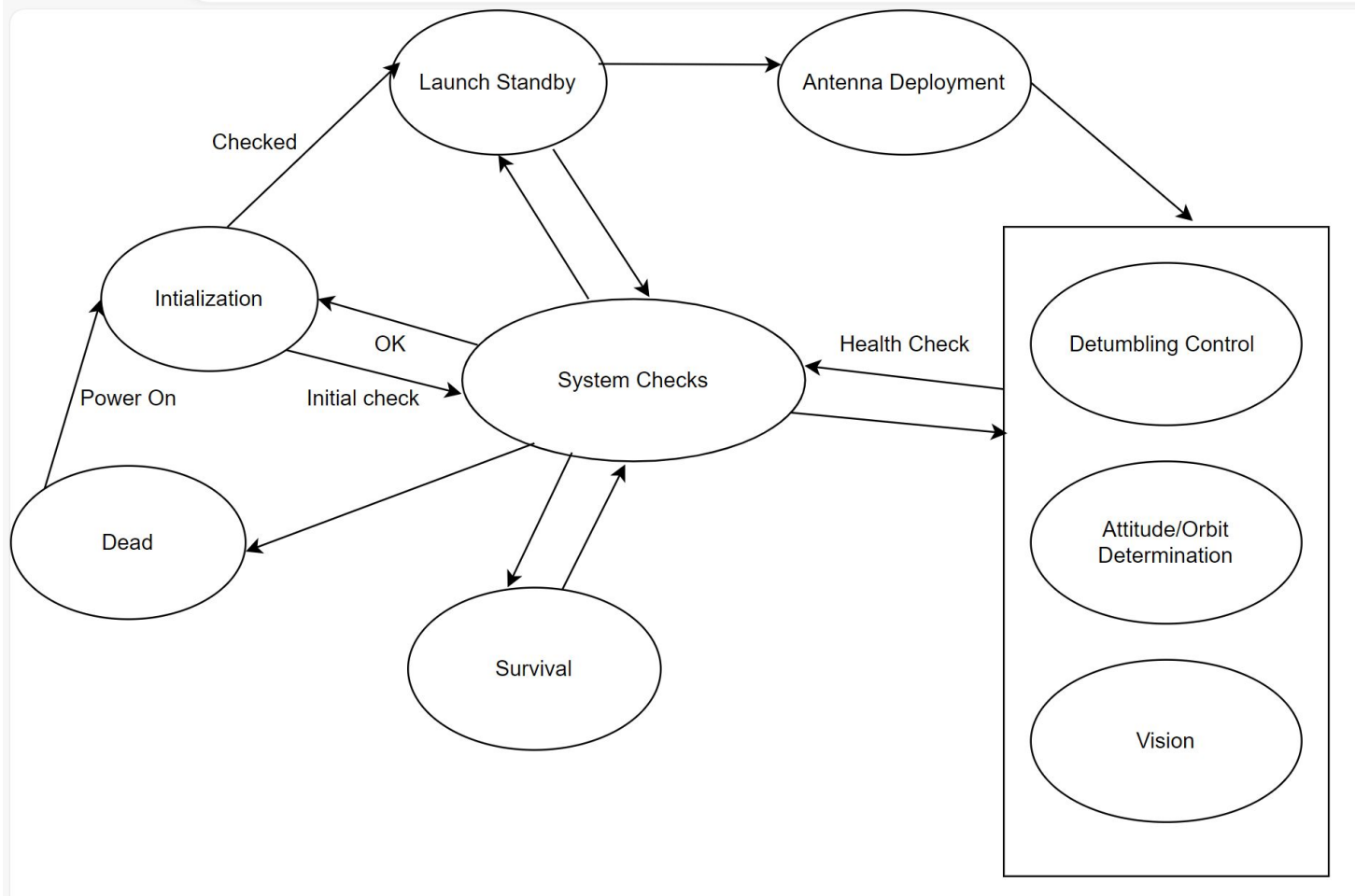
- Mass estimate
- Moment of inertia
- Mechanical layout

Vision:

- Discuss any major changes or updates to output of vision system

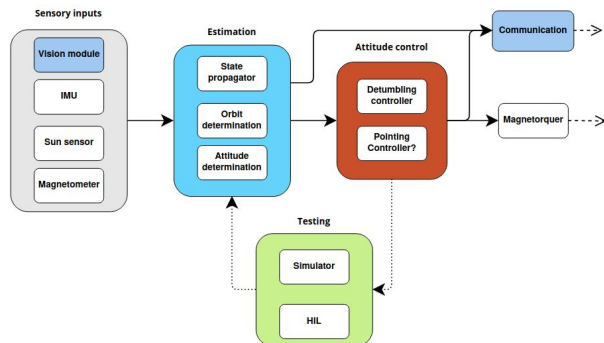
COMOPS:

- Communication protocol & Commands



Weekly Quad Chart - 12/09

Updates



- Developed first draft of attitude and orbit determination architecture

Blockers and Requirements

Blockers

- Coming up with specific numbers in the requirements (sensors)
- Lack of background in orbital and attitude dynamics (simulation, estimation, attitude control)

Requirements

- None

Weekly Results and Plan

Weekly result

- Refined the level 2 requirements
- Developed initial block diagram for estimation
- Studied material about Kalman filter, spacecraft attitude determination and control system
- Preliminary actuator and sensor selection

Next week

- Develop milestone chart
- Study resources given by Zac on attitude determination and (M)EKF
- Start development of simple EKFs
- Simulation rigid-body dynamics (2 body and attitude)
- General flight software architecture
- Design first draft of cyber physical architecture for estimation module
- Create first draft of software design document for attitude control

Interface dependencies

Avionics:

- Software framework/ baseline computer system
- Power budget?
- Sensors & Actuators drivers

Mechanical:

- Mass estimate
- Moment of inertia
- Mechanical layout

Vision:

- Vision system output to finalise orbit and attitude determination design architecture. Set up meeting this week

COMOPS:

- Type of antenna and influence on pointing requirement

