.MathJax svg { shape-rendering: crispEdges; } @media print { body > div { page-break-inside: avoid; page-break-after: always; } g[style*="filter: drop-shadow("] { filter: none !important; } } product-tree.drawio.pdf@page gePageFormat-____-____ { margin: 0; size: 23.39in 33.00in; } .gePageFormat-____-____ { page: gePageFormat-____-____; width: 23.39in; height: 33.00in; } .gePageFormat-____-____ > svg { margin: 0.00in; } mjx-container[jax="SVG"] { direction: ltr; } mjx-container[jax="SVG"] > svg { overflow: visible; min-height: 1px; min-width: 1px; } mjx-container[jax="SVG"] > svg a { fill: blue; stroke: blue; } mjx-container[jax="SVG"][display="true"] { display: block; text-align: center; margin: 1em 0; } mjx-container[jax="SVG"][display="true"][width="full"] { display: flex; } mjx-container[jax="SVG"][justify="left"] { text-align: left; } mjx-container[jax="SVG"][justify="right"] { text-align: right; } g[data-mml-node="merror"] > g { fill: red; stroke: red; } g[data-mml-node="merror"] > rect[data-background] { fill: yellow; stroke: none; } g[data-mml-node="mtable"] > line[data-line], svg[data-table] > g > line[data-line] { stroke-width: 70px; fill: none; } g[data-mml-node="mtable"] > rect[data-frame], svg[data-table] > g > rect[data-frame] { stroke-width: 70px; fill: none; } g[data-mml-node="mtable"] > .mjx-dashed, svg[data-table] > g > .mjx-dashed { stroke-dasharray: 140; } g[data-mml-node="mtable"] > .mjx-dotted, svg[data-table] > g > .mjx-dotted { stroke-linecap: round; stroke-dasharray: 0,140; } g[data-mml-node="mtable"] > g > svg { overflow: visible; } [jax="SVG"] mjx-tool { display: inline-block; position: relative; width: 0; height: 0; } [jax="SVG"] mjx-tool > mjx-tip { position: absolute; top: 0; left: 0; } mjx-tool > mjx-tip { display: inline-block; padding: .2em; border: 1px solid #888; font-size: 70%; background-color: #F8F8F8; color: black; box-shadow: 2px 2px 5px #AAAAAA; } g[data-mml-node="maction"][data-toggle] { cursor: pointer; } mjx-status { display: block; position: fixed; left: 1em; bottom: 1em; min-width: 25%; padding: .2em .4em; border: 1px solid #888; font-size: 90%; background-color: #F8F8F8; color: black; } foreignObject[data-mjx-xml] { font-family: initial; line-height: normal; overflow: visible; } mjx-

container[jax="SVG"] path[data-c], mjx-container[jax="SVG"] use[data-c] { stroke-width: 3; }

ASU RDR

- 1. Rover
  - 1.1. Mechanical Systems
    - 1.1.1. Mobility System
      - 1.1.1.1. ActuatorSizing
      - 1.1.1.2. Research
      - 1.1.1.3. Suspension Model
      - 1.1.1.4. CAD and CAE
    - 1.1.2. Wheel Assembly
      - 1.1.2.1. Research
      - 1.1.2.2. CAD and CAE
    - 1.1.3. Tires
      - 1.1.3.1. Research
      - 1.1.3.2. CAD and CAE
      - 1.1.3.3. Material Selection
    - 1.1.4. Chassis
      - 1.1.4.1. Research
      - 1.1.4.2. CAD and CAE
    - 1.1.5. Storage Mechanism
      - 1.1.5.1. Research
      - 1.1.5.2. CAD and CAE
      - 1.1.5.3. ActuatorSizing
    - 1.1.6. Drilling Mechanism
      - 1.1.6.1. Research
      - 1.1.6.2. CAD and CAE
      - 1.1.6.3. ActuatorSizing
    - 1.1.7. Fixations
      - 1.1.7.1. Mast Fixation
      - 1.1.7.2. Sensors Fixation
      - 1.1.7.3. Cameras Fixation
    - 1.1.8. Manufacturing
      - 1.1.8.1. Mast Fixation
      - 1.1.8.2. Sensors Fixation
      - 1.1.8.3. Storage Mechanism
      - 1.1.8.4. Drilling Mechanism
  - 1.2. Embedded Systems
    - 1.2.1. Low Level Control
      - 1.2.1.1. Microcontroller Selection
      - 1.2.1.2. Tractive System Control
      - 1.2.1.3. Storage Mechanism
      - 1.2.1.4. Drilling Mechanism
    - 1.2.2. Data Acquisition
      - 1.2.2.1. Sensors Selection
      - 1.2.2.2. Cameras Selection
      - 1.2.2.3. DAQ Interfacing
  - 1.3. Electrical System
    - 1.3.1. Main PCB
      - 1.3.1.1. PCB Design
      - 1.3.1.2. PCB Assembly
      - 1.3.1.3. PCB Testing
    - 1.3.2. Tractive System
      - 1.3.2.1. Motor Selection
      - 1.3.2.2. Motor Drivers Selection
    - 1.3.3. Safety Systems
      - 1.3.3.1. Emergency Switch
      - 1.3.3.2. Fuses
      - 1.3.3.3. Safety Circuits
    - 1.3.4. Power Source
      - 1.3.4.1. Battery Sizing
      - 1.3.4.2. Battery Selection
      - 1.3.4.3. BMS
      - 1.3.4.4. EMS Interfacing
    - 1.3.5. Power Regulation
      - 1.3.5.1. Power Distribution
      - 1.3.5.2. Wiring
    - 1.3.6. Electrical Kit
      - 1.3.6.1. Drivers Module
      - 1.3.6.2. Bucks Module
      - 1.3.6.3. PCB Module
  - 1.4. High Level
    - 1.4.1. Perception
      - 1.4.1.1. Research
      - 1.4.1.2. Obstacle Detection
      - 1.4.1.3. Sample Detection
      - 1.4.1.4. Landmarks Detection
      - 1.4.1.5. Simulation and Testing
    - 1.4.2. Localization
      - 1.4.2.1. Research
      - 1.4.2.2. Landmark Localization
      - 1.4.2.3. Visual Odometry
      - 1.4.2.4. SensorFusion
      - 1.4.2.5. Simulation and Testing
    - 1.4.3. Path Planning
      - 1.4.3.1. Research
      - 1.4.3.2. LocalPlanning
      - 1.4.3.3. Global Planning
      - 1.4.3.4. Simulation and Testing
    - 1.4.4. Control
      - 1.4.4.1. Research
      - 1.4.4.2. Path Tracking
      - 1.4.4.3. Simulation and Testing
- 2. 6-DOF Robotic Manipulator
  - 2.1. Mechanical Systems
    - 2.2.1. Mechanical Design
      - 2.2.1.1. ActuatorSizing
      - 2.2.1.2. Drive Mechanisms
      - 2.2.1.3. Links Design
      - 2.2.1.4. End Effector Design
    - 2.2.2. Manufacturing
      - 2.2.2.1. CycloidalDrive
      - 2.2.2.2. Belt Drive
      - 2.2.2.3. End Effector
  - 2.2. Electrical Systems
    - 2.2.1. Electrical Design
      - 2.2.1.1. Component Selection
      - 2.2.1.2. Circuit Diagram
      - 2.2.1.3. Motor Selection
      - 2.2.1.4. Motor Drivers Selection
    - 2.2.2. Power Regulation & Distribution
      - 2.2.2.1. Power Distribution
      - 2.2.2.2. Wiring
  - 2.3. High Level
    - 2.3.1. Perception
      - 2.3.1.1. Aruco Marker Tracking
      - 2.3.1.2. Sample Detection
      - 2.3.1.3. Grasp Estimation
      - 2.3.1.4. Simulating & Testing
    - 2.3.2. Control
      - 2.3.2.1. MoveIt Integration
      - 2.3.2.2. Simulating Control Algorithm
      - 2.3.2.3. Integration with Rover
    - 2.3.3. Localization
      - 2.3.3.1. Landmark Localization
      - 2.3.3.2. Sensor Fusion
      - 2.3.3.3. Simulating & Testing
    - 2.3.4. Simulation
      - 2.3.4.1. Import Model to Simulator
      - 2.3.4.2. Setup Simulation Environment
      - 2.3.4.3. Test Arm Integration
- 4. Documentation
  - 4.1. ERC Documents
    - 4.1.1. Proposal Document
    - 4.1.2. Outreach Document
    - 4.1.3. Video Material
    - 4.1.4. Final Report
    - 4.1.5. Science Planning Report
    - 4.1.6. Presentation Test
  - 4.2. Team Documents
    - 4.2.1. Permits
    - 4.2.2. Task Reports
    - 4.2.3. Code Documentation
- 3. Drone
  - 3.1. Mechanical Systems
    - 3.1.1. Mechanical Design
      - 3.1.1.1. Calculations
      - 3.1.1.2. Design
      - 3.1.1.3. Selection
    - 3.1.2. Manufacturing
      - 3.1.2.1. Drone Frame
      - 3.1.2.2. Fixations
  - 3.2. Electrical Systems
    - 3.2.1. Electrical Design
      - 3.2.1.1. Component Selection
      - 3.2.1.2. Motor Selection
      - 3.2.1.3. Motor Drivers Selection
    - 3.2.2. Power Regulation & Distribution
      - 3.2.2.1. Power Distribution
      - 3.2.2.2. Wiring
    - 3.2.3. Battery
      - 3.2.3.1. Battery Sizing
      - 3.2.3.2. Battery Selection
      - 3.2.3.3. BMS
  - 3.3. High Level
    - 3.3.1. Localization
      - 3.3.1.1. Research
      - 3.3.1.2. Coding
      - 3.3.1.3. Testing / Simulation
    - 3.3.2. Navigation
      - 3.3.2.1. Research
      - 3.3.2.2. Coding
      - 3.3.2.3. Testing / Simulation
    - 3.3.3. Perception
      - 3.3.3.1. Research
      - 3.3.3.2. Coding
      - 3.3.3.3. Testing / Simulation
  - 3.4. Communication
    - 3.4.1. Connection
    - 3.4.2. Configuration
- 5. Fundraising
  - 5.1. Applying for Funding
    - 5.1.1. Searching for Competitions
    - 5.1.2. Applying for Competitions
    - 5.1.3. Follow-up Process
  - 5.2. Deals with Partners
    - 5.2.1. Potential Parterships
    - 5.2.2. Reaching out to Suppliers
    - 5.2.3. Follow-up Process
- 6. Testing
  - 6.1. Simulation
    - 6.1.1. Envirnoment Setup
    - 6.1.2. Importing Models
    - 6.1.3. Simulation Analytics
  - 6.2. Real-life Testing
    - 6.2.1. Component Testing
    - 6.2.2. Integration Testing
    - 6.2.3. Field Testing
    - 6.2.4. System Performance Evaluation
- 7. Control Station
  - 7.1. System Supervisor
    - 7.1.1. Research
    - 7.1.2. Coding
    - 7.1.3. Testing
  - 7.2. GUI
    - 7.2.1. UI Design
    - 7.2.2. Back-end Coding
    - 7.2.3. Testing
  - 7.3. Communication
    - 7.3.1. Connection
    - 7.3.2. Configuration
    - 7.3.3. Mast Selection
    - 7.3.4. Transciever Selection
- 6. Testing
  - 6.1. Simulation
    - 6.1.1. Envirnoment Setup
    - 6.1.2. Importing Models
    - 6.1.3. Simulation Analytics
  - 6.2. Real-life Testing
    - 6.2.1. Component Testing
    - 6.2.2. Integration Testing
    - 6.2.3. Field Testing
    - 6.2.4. System Performance Evaluation