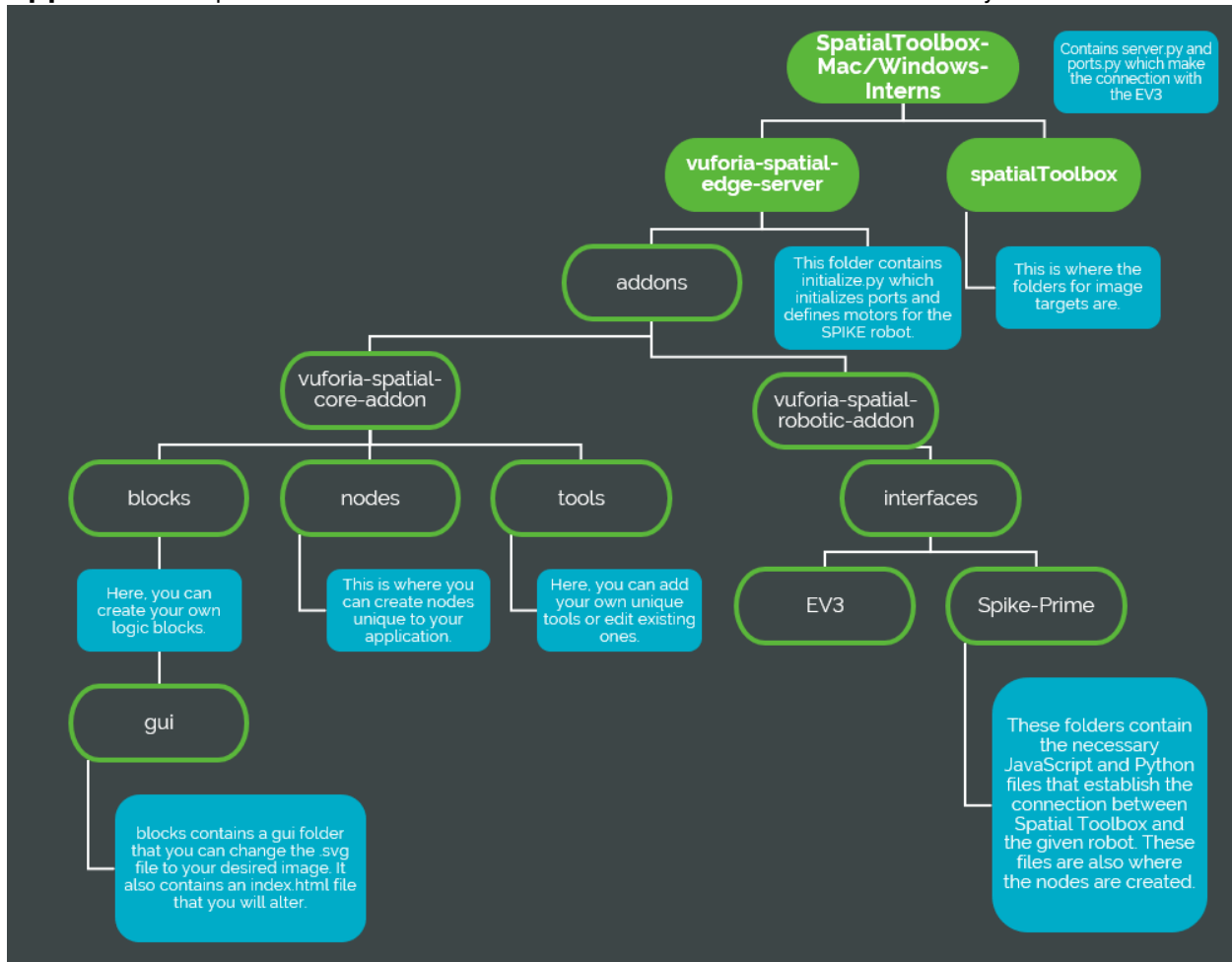


Appendices and Additional Resources

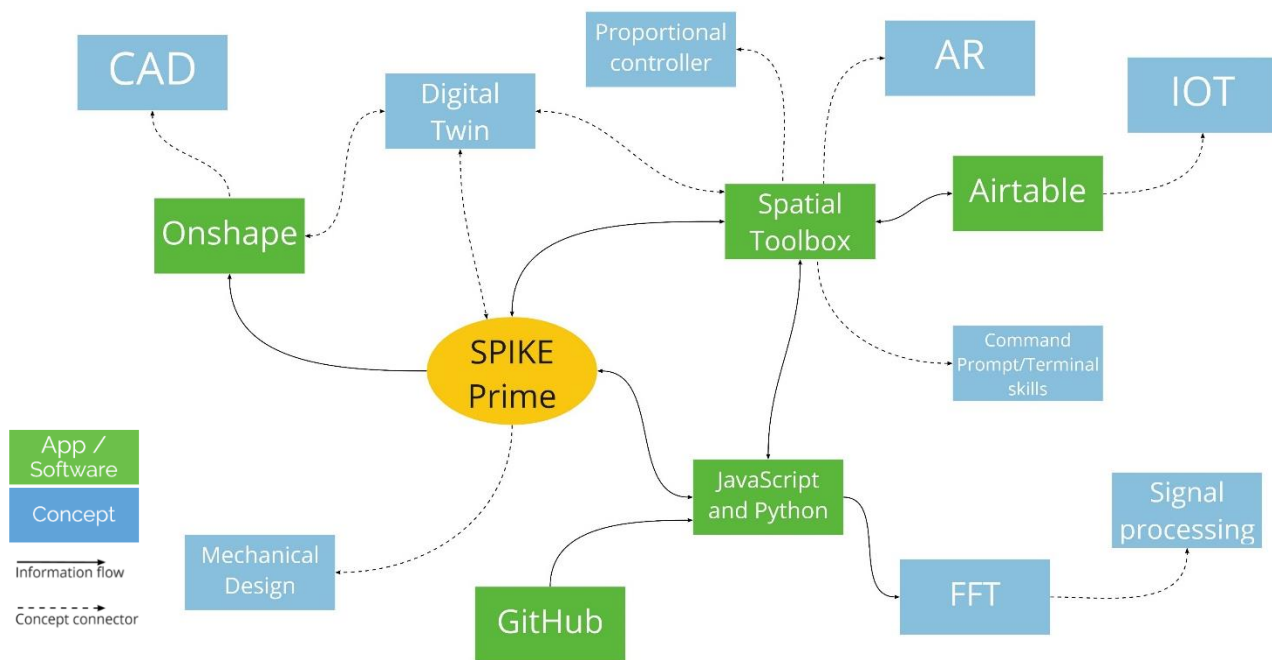
This page is created with the intent of being an appendix to all the documentation that has been given for this project. Please refer to this document throughout this project.

There are also additional resources listed for further explanation with all parts of this project.

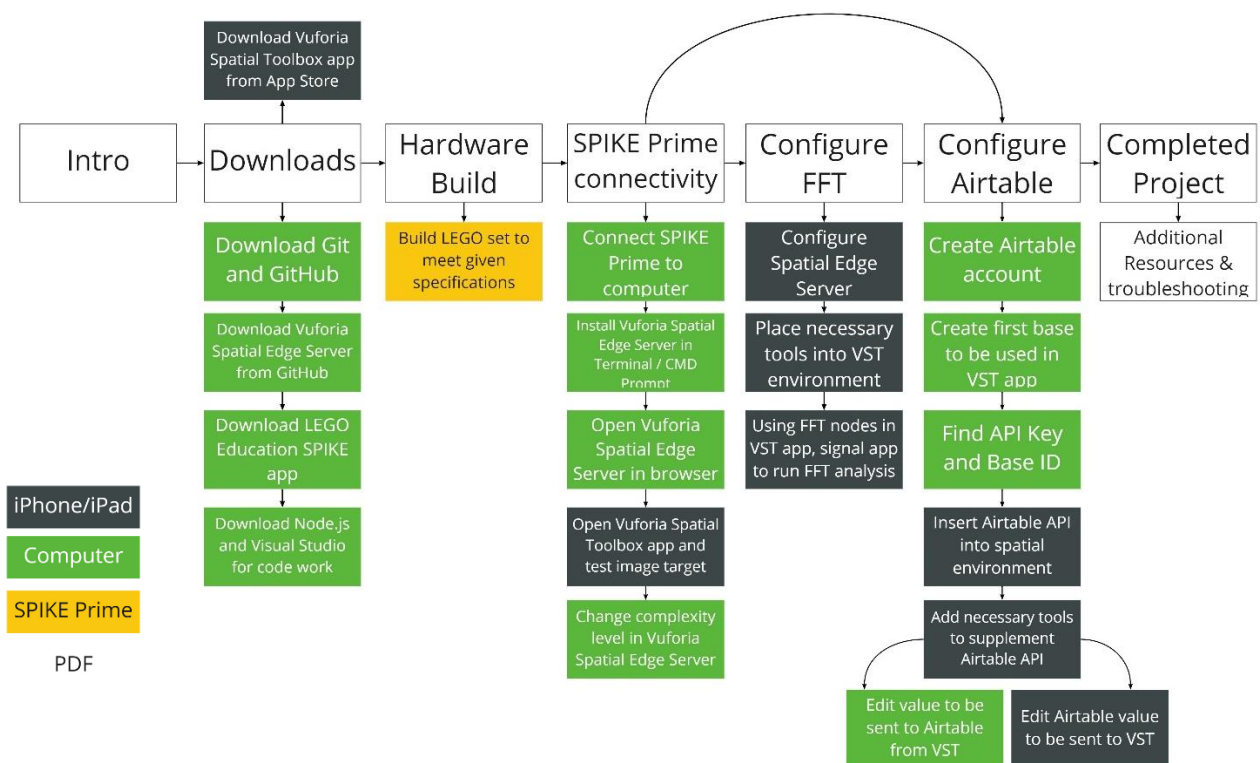
Appendix A: SpatialToolbox-Mac/Windows-Interns folder hierarchy



Appendix B: Concept Map



Appendix C: Project Process Map



Appendix D: Node Explanations

Beginner

Beginner has 5 nodes: screen, LED, motors, distance, and stopMotors. This one should be used by students who are just starting to work with the SPIKE Prime for the first time.

- The screen node is connected to the screen of the SPIKE Prime so that the image on the SPIKE Prime interface can be changed
- The LED node allows for a number to be typed in to change the color of the LED on the SPIKE Prime
- The motors node, when toggled on, starts all the motors of the SPIKE
- The distance node outputs the distance that the SPIKE is from another object in cm
- The stopMotors node stops the motors from running when toggled on

Intermediate

Intermediate mode has 7 nodes: 3 motor nodes, a color sensing node, distance node, force node, and stopMotors node. This should be used by students who feel that they have gotten the hang of the Beginner mode.

- The three motor nodes are now separated for individual motor control, as opposed to the one motor node in Beginner mode that started all the nodes at once. In this case, users should note which motor is connected to which input on the SPIKE Prime. For example, if there are motors at inputs A, B, and C, the motors will match up with the number of motor nodes. The motor at input A on the Hub will be motor1, input B will be at motor2, and so on. If there are less than three motors, only motor1 and motor2, or only motor1 will be used.
- The color node will output a color when it is read the color sensor that can be attached to the SPIKE and can be attached to a Value tool that will display the name of the color
- The force node will output the amount of force that is put on it in Newtons, and like the color node, can be attached to a Value tool for viewing
- The distance and stopMotors nodes work the same as in the Beginner mode

Sensor

Sensor mode is meant to be used when sampling using a high refresh rate and has gotten rid of some nodes, including all motor nodes, in order to do that. This mode consists of the same color, distance, and force sensors from the Intermediate mode and has added in accelerometer and gyroscope data in the X,Y, and Z directions.

- The three accelerometer nodes will output acceleration data for a certain direction in cm/s^2
- The three gyroscope nodes will output rotation data in degrees/s
- The color, distance, and force sensors work the same as they have in previous nodes

Advanced

Advanced mode combines concepts from all three modes before it. It contains three motor nodes, for up to three motors to be connected, force, distance and color sensors, a stopMotors node, and X, Y, and Z outputs for the gyroscope and accelerometer. All these nodes work the same as in previous modes. It also adds four new nodes: FFTStart, FFTLength, FFTAxis, and FFTOutput, which are used for doing Fast Fourier Transform analyses.

- FFTStart works as a toggle to trigger the FFT analysis. When it is turned on, data sampling will start
- FFTLength is used for deciding the number of samples that are going to be taken into the FFT analysis. It intakes sample integers between 16 and 512 samples at powers of 2 (16, 32, 64, etc). Higher sample rates lead to accurate results but will also take slightly longer due to more samples being taken.
- FFTAxis takes an input of 0, 1, or 2, which represent the X, Y, and Z axes on a coordinate system, respectively. This determines the axis along which the FFT analysis will be calculated.
- FFTOutput outputs the solution of the FFT analysis. This will be attached to a Number tool, where the primary frequency of oscillation of the system will be displayed

Additional Resources

- [LEGO SPIKE Prime support/FAQ's](#)
- [Vuforia Spatial Toolbox Forum](#) – this is the go-to area for any questions relating to the Vuforia Spatial Toolbox and is monitored by the Spatial Toolbox team
- [How to create an object with an AR interface](#) – tutorial for creating a new object in the Vuforia Spatial Edge Server
- [How to create an image target](#) – tutorial for creating personal image targets using either the Vuforia Spatial Edge Server or PTC Developer Portal
- [How to create a tool](#) – tutorial teaching how to create additional tools for the pocket
- [How to create a new hardware interface](#) – tutorial for adding additional hardware interfaces to connect to something other than a SPIKE Prime
- [Explaining the Vuforia Spatial Robotic Addon](#)
- [Dive deeper](#) – a section outlining the system architecture, data model, and local vs global tools in Vuforia Spatial Toolbox
- [Airtable Support](#)