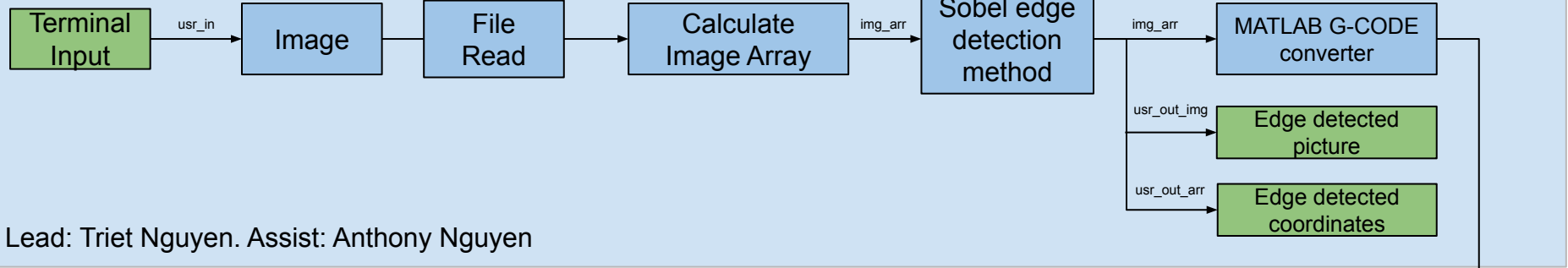
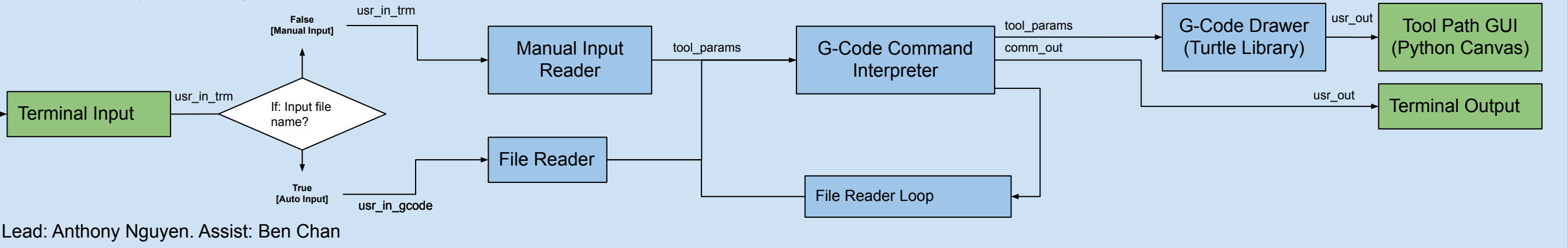


Interface Definition Table			
Name	Type	Value	Description
usr_in_img	User input	Image path	Receive Inputs: - Image - File path to an image
usr_in_gcode	User input	G-CODE file path	Receive inputs: G-CODE file
usr_in_trm	User input	Terminal input	Receive inputs: - Terminal inputs - Manual G-CODE commands
usr_out_img	User output	Image	Display: - Edge detection image 2D array
usr_out_arr	User Output	Array	Output: Edge detection values converted to an array
img_arr	Image array	2D array	2D array of values
gcode	G-CODE file	G-CODE	G-CODE file containing G-CODE commands. Output form MATLAB, and input to the G-CODE parser/GUI and Arduino.
tool_params	Python object: Tool parameters	Python object containing variables for the following values: - float X - float Y - float Feed rate - str Mode - str Units - int Current tool - int Next tool	- Target x-coordinate - Target y-coordinate - Target feed rate - Set tool movement to absolute or relative - Set units between inches and millimeters - Keep track of the current tool for switching tools - Set next tool
comm_out	Python variables: Tool commands	Float values for X, Y, Z, and T positions.	Instantaneous power state - X-axis motion - Y-axis motion - Z-axis motion - Tool switch rotation
pwr_in	Power input	Voltage (5V)	Arduino NANO regulated power supply
pin_out	Arduino PIN output		Arduino output PINs
step_out	Stepper Output	A+, A-, B+, B-	Pulse voltages from motor controller to stepper motors
pwm_x	x-axis servo PWM	Integer [0, 255]	Instantaneous feed rate of x-axis servo. Min 0, Max 255 = 6" per second.
pwm_y	y-axis servo PWM	Integer [0, 255]	Instantaneous feed rate of y-axis servo. Min 0, Max 255 = 6" per second.
pwm_z	z-axis servo PWM	Integer [0, 255]	Instantaneous feed rate of z-axis servo. Min 0, Max 255.
LEDn_[0..3]	LED indicators	4 sets of LEDs - LED1_[0..3] - LED2_[0..3] - LED3_[0..3] - LED4_[0..3]	4-LEDs for each motor controller. 16 total. LED indicators are powered by an op-amp and are wired in parallel with A+, A-, B+, B- for each controller. Wired to ground.
24v_in	24V input	Voltage (24V)	Receives 24V input from external source.
5v_out	5V output	Voltage (5V)	Output 5V - Supplies the Arduino with 5V - Indicating supply voltage output with an indicator LED.

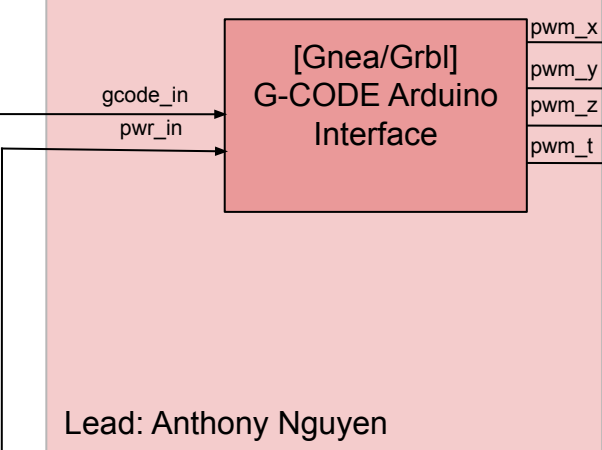
MATLAB - Edge Detection



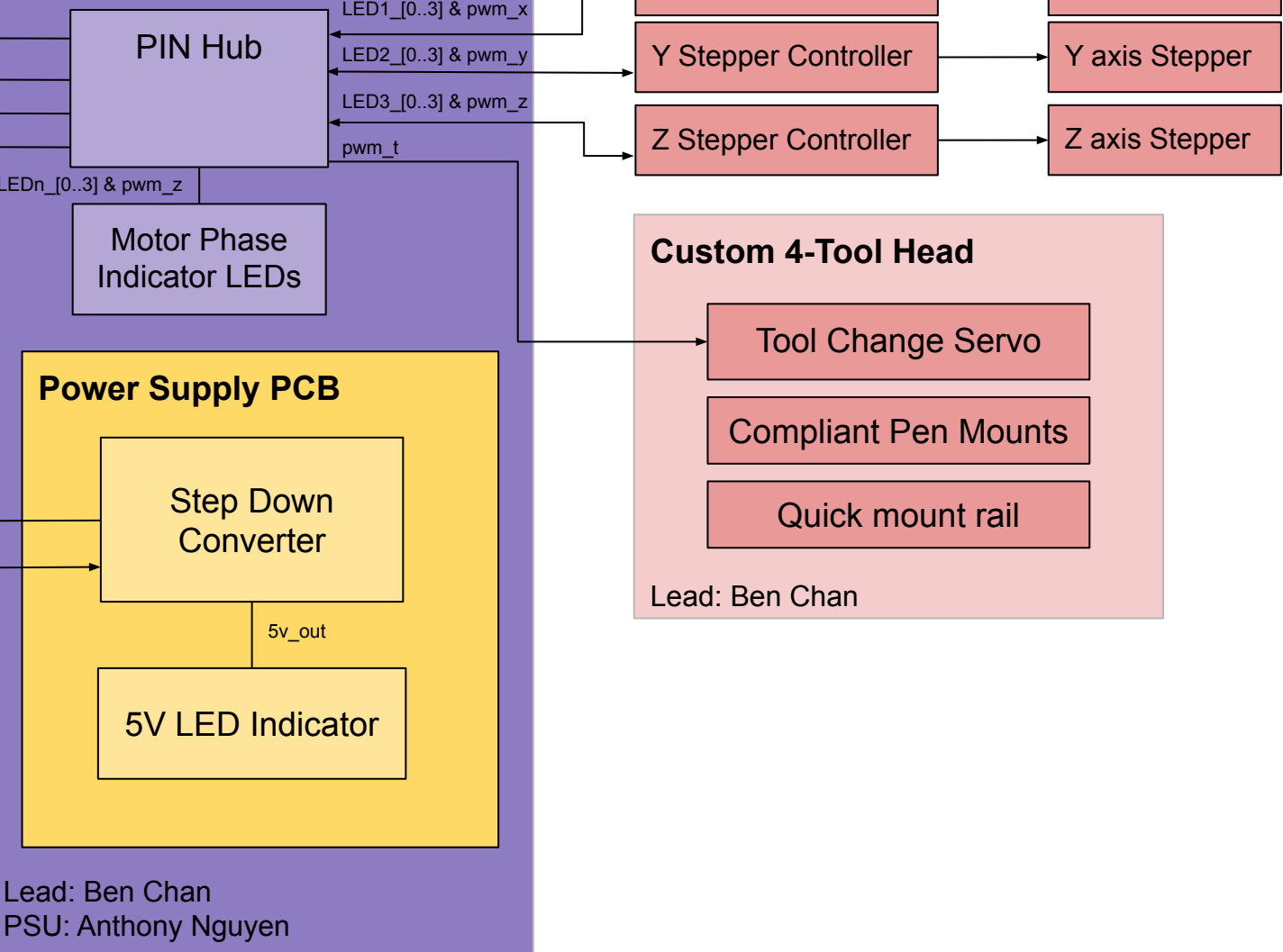
Computer - Python Program



Arduino



PIN Hub and Phase LEDs



KEY

	User Interface
	Software
	Custom PCB
	Hardware
	Power Supply