



Dwight Look College of

ENGINEERING
TEXAS A&M UNIVERSITY

Team 72: WIZARD (Weed Identification and Zapping via Autonomous Robot Device) Bi-Weekly Update 2

Will Fenno

Conner Mullen

Sponsor: Dr. Markus Zink

**German Team: Leon Jaksch,
Michael Dachender, Lisa Krug**

TA: Sabyasachi Gupta

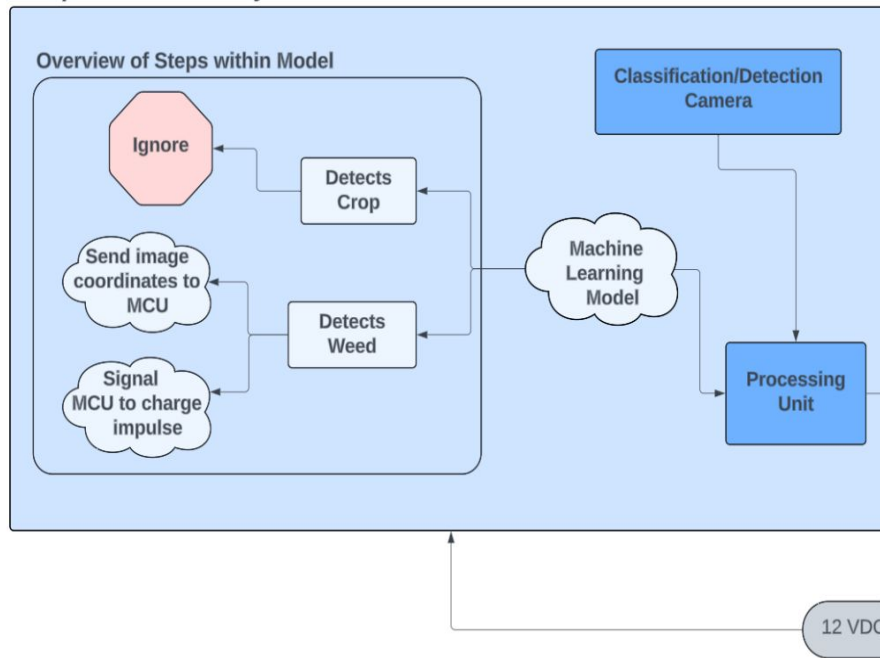
Project Summary

- Organic farming does not allow the use of herbicides for weed control; an alternative method is required.
- WIZARD will use camera recognition through machine learning to accurately identify weeds and deliver a targeted electrical impulse.

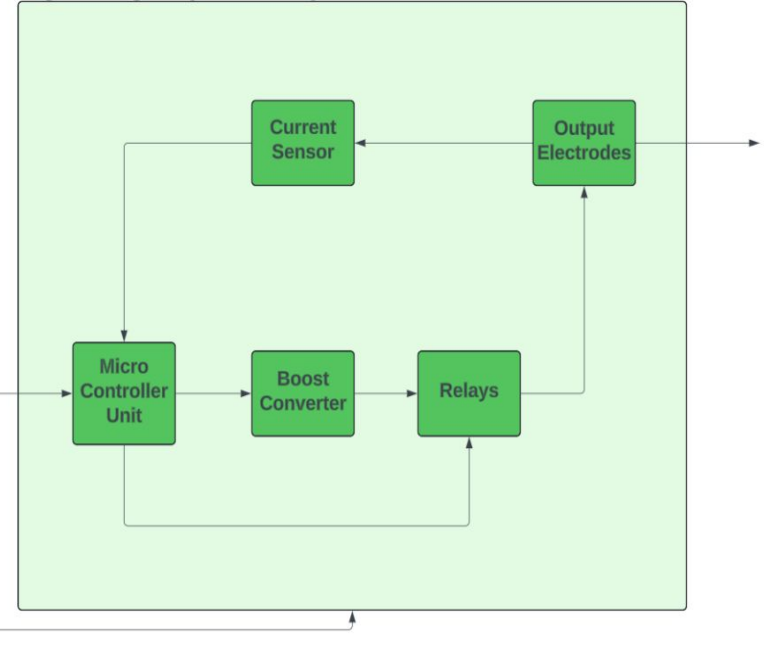


Project/Subsystem Overview

Computer Vision Subsystem: Will Fenno

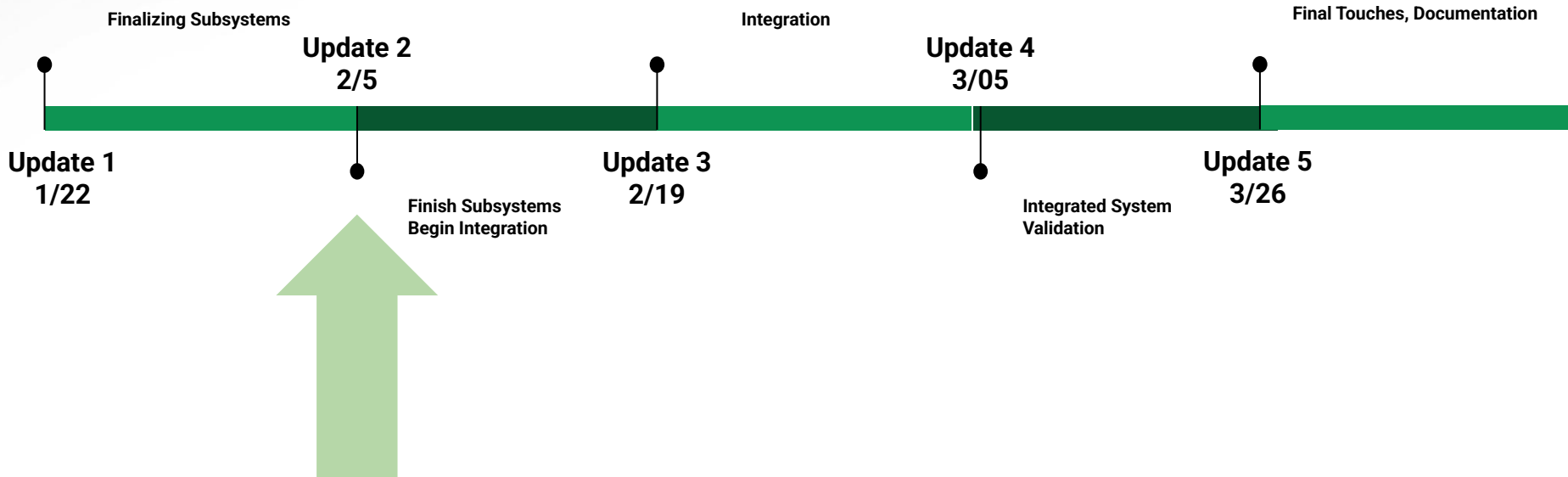


High Voltage Impulse Subsystem: Conner Mullen





Project Timeline





Subsystem 1 - Computer Vision

Will Fenno

Accomplishments since last update 26 hrs of effort	Ongoing progress/problems and plans until the next presentation
Tested and verified functionality of real-time detection code using ML model and CSI camera on Jetson for integration.	Working on enabling TensorFlow to utilize the Jetson's GPU for increased performance.

Subsystem 1 - Computer Vision

Will Fenno

Observed low FPS due to Tensorflow running on the CPU instead of the GPU.

Utilizing the Jetson's GPU and potentially TensorRT will boost performance and finish my subsystem.





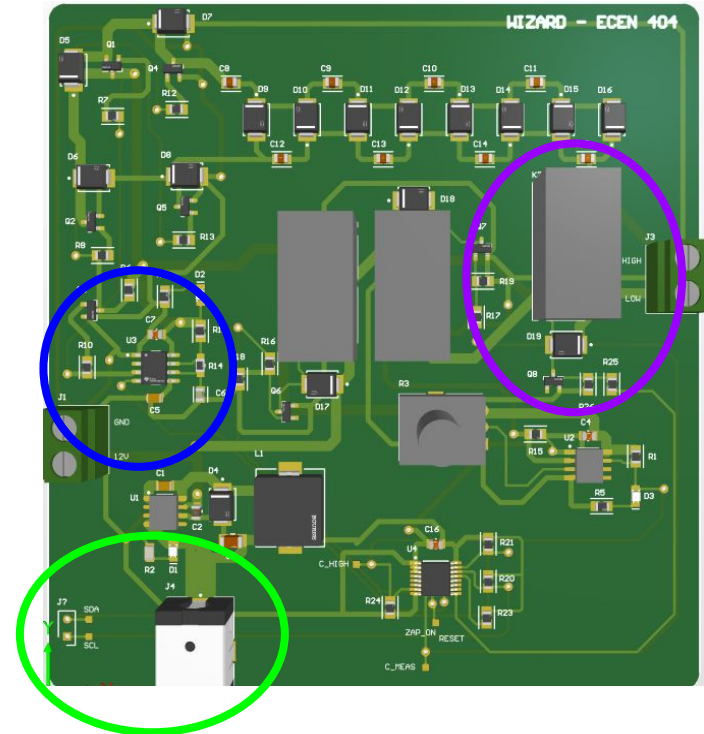
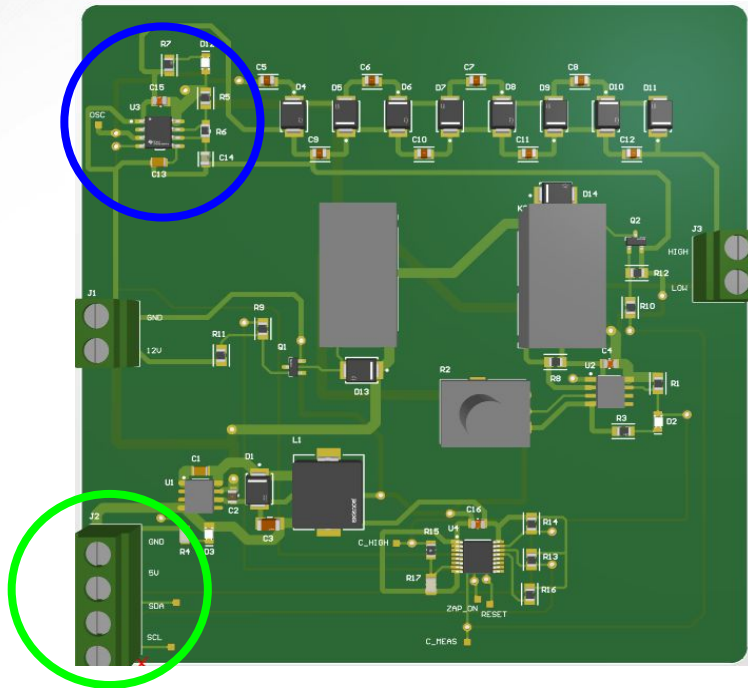
Subsystem 2 - High Voltage

Conner Mullen

Accomplishments since last update 12 hrs of effort	Ongoing progress/problems and plans until the next presentation
Updated PCB ordered	Assemble, validate updated PCB for use in integrated system

Subsystem 2 - High Voltage

Conner Mullen



Execution Plan

[illegible]



Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Owner
3.2.1.1.	Capacitor Charge and Discharge Time	Time between start of charge up and end of discharge is less than 8 seconds	Measure voltage across output electrodes throughout a charge and discharge cycle, calculate time delta	TO BE TESTED	Conner Mullen
3.2.1.2.	Electrode Discharge Mode	Electrodes are only connected to high voltage output after contact is detected	With no contact: confirm that the voltage across electrodes is low With contact: confirm that indicator LED is on, and that the voltage across electrodes is high	TO BE TESTED	Conner Mullen
3.2.1.3.	False Positive Rate	FPR of less than 5% to prevent unintended crop damage	Conduct image classification test using a validation set with known crop and weed labels. Track the number of images where crops are incorrectly identified and calculate results	COMPLETED	Will Fenno
3.2.1.4.	False Negative Rate	FNR of less than 5% to prevent missed weeds	Conduct image classification test using a validation set with known crop and weed labels. Track the number of images where weeds are incorrectly identified and calculate results	COMPLETED	Will Fenno
3.2.1.5.	Camera Field of View	System detects objects at a range of 62.2 degrees horizontally and 48.8 degrees vertically	Measure the system's response to objects placed inside and outside the specified field of view	COMPLETED	Will Fenno
3.2.2.1.	Electrode Placement	Arcing does not occur across electrodes	Charge system to maximum voltage, visually confirm that no arc forms	TO BE TESTED	German Students
3.2.2.2.	Mounting	All components are secured properly	Visually inspect all connections to the robot or other platform, then attempt to move mounted components around to test strength of mounts	TO BE TESTED	Full Team
3.2.4.1.	Power Source	12V DC is converted to 5V, capable of 2A	Before powering on: Perform continuity test for all 12V points Power on board with 12V DC source and test voltage at output of power converters	COMPLETED	Conner Mullen
3.2.4.2.	Inputs	All control signals work as expected, as indicated by LEDs and relay clicking	Power system on, set to each combination and confirm that the proper LED indicators are on and listen for relay clicking	COMPLETED	Conner Mullen
3.2.4.3.	Outputs	LEDs all light up under correct circumstances Energy discharges through electrodes	Verify that proper LEDs light up under proper circumstances Voltage at electrodes reaches 80V	COMPLETED	Conner Mullen
3.2.4.4.	Interface Between Processor and Electronics	I2C signal sent from processor is received by MCU, correct output is observed (specific output and input signals will be updated as we finalize designs)	Send I2C commands from processor to microcontrollers, verifying that every necessary function is initiated properly	COMPLETED	Full Team
3.2.5.1.	Temperature (Thermal Resistance)	System functions in complete range of temperatures (10C to 45C)	Low end of temperature range exists outside in Texas, high end will be created with temperature chamber	TO BE TESTED	Full Team
3.2.5.2.	External Contamination	Large particles are kept out of the electronics casing	Bombard empty casing with dirt, grass, and other particles; open casing and visually inspect inside	TO BE TESTED	Full Team
3.2.6.1.	Built-In Test (BIT)	The system will activate a red LED in the case of camera failure during the startup process	Intentionally simulate camera failure via disconnection to verify LED activation response	TO BE TESTED	Will Fenno
3.2.6.2.	Isolation and Recovery	In the case of a BIT fault, the system will be reset and restore normal operations	Conduct a reset test in response to a camera detection failure	TO BE TESTED	Will Fenno
Note	Specific values and signals will be included as we continue to develop and finalize our designs				



Dwight Look College of

ENGINEERING
TEXAS A&M UNIVERSITY

Thank You!