Testing Plan

Senior Design 491: Soybean Parasitic Cyst Detector

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Problem Statement

- Develop a deep learning algorithm designed for small object detection to determine how many parasitic cysts are on the roots of soybean plants.
- Will also create a device to integrate image capturing with the machine learning algorithm.
- Increases productivity in farms.
- Reduces the amount of unnecessary pesticides.
- Helps farmers accurately fertilize their crops.

Unit Testing

- Parasitic Cyst Detector ML Algorithm
  - 50% Accuracy
- Image Capturing Device
  - Camera- High resolution
  - Raspberry Pi- Memory, speed
  - Image Capturing Environment- Controlled, doesn’t cause damage to the plants

Interface Testing

- Hardware objectives:
  - Raspberry Pi can communicate with both the camera and the LCD output screen.
  - Wires are securely connected between the various components.
  - Background environment is suitable for image capture.
- Software objectives:
  - ML Model can run on a Raspberry Pi.
  - Errors will not occur during operation.
  - Results are observable by the user.

Integration Testing

- Electronic Components
  - Raspberry Pi
  - LCD Screen
  - Camera
- Image Capturing Device
  - Electronic Components
  - Image Capturing Environment
- Hardware/Software Integration

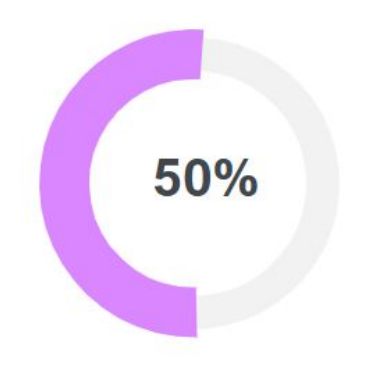
System Testing

- Composition of previous testing strategies
- Unit tests:
  - Establish baseline ML Model Accuracy
  - Confirm the camera's resolution is adequate
- Interface Tests:
  - Confirm the Raspberry Pi can interface with both the camera and the LCD output screen.
  - Confirm the ML Model can run on a Raspberry Pi
- Integration Tests:
  - Confirm the raspberry pi can acquire an image and then run it through the machine learning model
  - Confirm we can retrieve output from the ML Model and display it to the screen.
- System Tests:
  - Compare accuracy to baseline established in the Unit Tests
  - Ensure runtime is adequate

Regression Testing

- **Key to success: iterative process for development.**
- Hardware is a universal platform for any implementation of the parasitic cyst detector algorithm. Should not need refinement beyond user interface optimization.
- Each algorithm implementation will be tested and evaluated before deployment.
- Only algorithm implementations that are progressive additions will be deployed.
- Regressive implementations will be reverted back to the previous deployment.
- Database grows over time which improves future model training and accuracy.

Acceptance Testing



Accuracy

Easy to Use

Affordable

https://www.flaticon.com/kr/free-icons/pictogram/5

Acceptance Testing

Sturdy

Few Interaction

Undamaged

No Error

https://www.flaticon.com/kr/free-icons/pictogram/5