Software Tutorial

Introduction

Welcome to the software tutorial! This guide will walk you through the steps of using the software's graphical user interface (GUI). We will provide detailed instructions along with accompanying images to help you navigate the software effectively.

Step 1: Hardware Set up

1.1 Hardware Introduction

Before diving into the software, let's take a look at the hardware included. The software requires the following hardware components:

1. Computer or laptop (Windows OS preferred, with ethernet port)
2. Thermal Camera (FLIR a700)
3. Switching Power Supply
4. Two Cables (one is an ethernet cable; another is a white cable that is in the camera packaging box, one port is an ethernet port, and another is a data/power port to the camera)
5. Arduino & relay module (connected already)

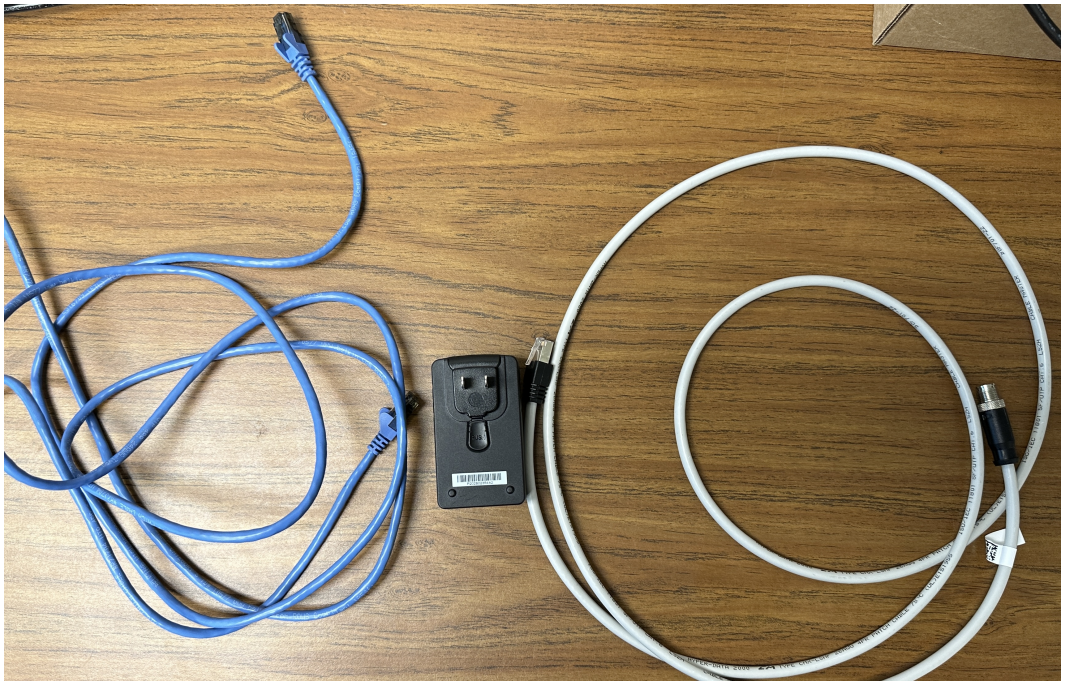

Figure 1: Left to Right: Ethernet Cable, Switching Power Supply, Cable between Switching Power Supply and Camera

Figure 2: the power panel for the Arduino & relay (power light will be on when the button is set to RESET)

1.2 Hardware Connection

To connect the hardware components, follow these steps:

1. Connect one end of the ethernet cable to your computer's ethernet port. [Figure 3]
2. Connect the other end of the ethernet cable to the ethernet port of the switching power supply.

3. Connect one end of the white cable (data/power cable) to the data/power port of the switching power supply.
4. Connect the other end of the white cable to the camera's data/power port.
5. Ensure that the Arduino and relay module are already connected.
6. Plug into the USB port connected from the relay into the ‘Port 3’ of the PC (which is on the right side of the laptop). [Figure 4]

Figure 3: Ethernet connection to PC

Figure 4: USB connection to PC

Once the hardware is connected, you can proceed to the next steps to install and launch the software.

Step 2: Software Set up

Now that we have the necessary hardware, let's move on to installing the software.

2.1 Login to the PC main page

Before diving into the software, you'll need to start the PC and log in to the main page. Follow these steps:

1. Choose the right OS option: Windows [Figure 5]
2. Use password “0000” to log in to the Windows account [Figure 6]

3. Open the software called “Anaconda Powershell” which lies in the bottom left corner of the Main page [Figure 7]

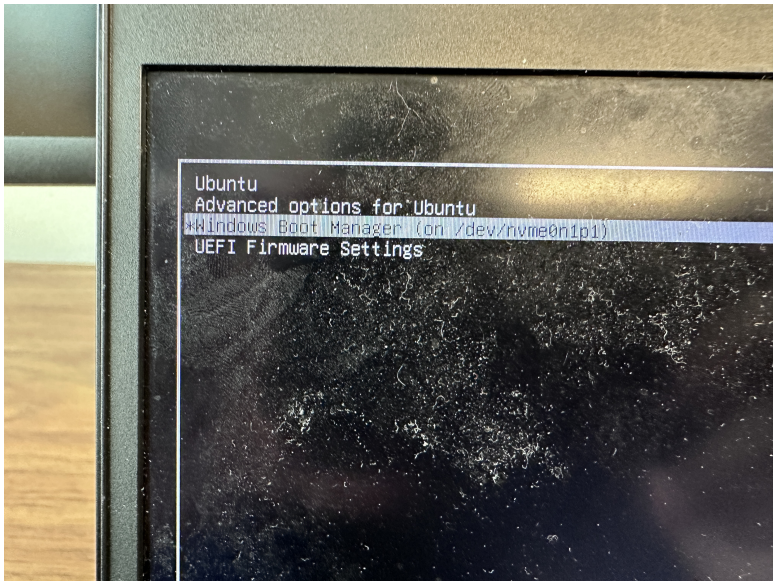

Figure 5: OS choosing page

Figure 6: Login page

Figure 7: Main Page

2.2 Launching the Software

Once the Powershell is opened, it's time to launch the software. Here's how:

1. cd to the code directory

```
cd \Desktop\Thermography_for_Grape_Mortality\code
```

2. Run the data acquisition GUI or the data validation GUI (tips: could use Button Tab to autocomplete)

```
python .\dataAcquisitionGUI.py
```

```
python .\dataValidationGUI.py
```

Step 3: Data Acquisition GUI

This GUI is majorly for collecting the data. Let's explore its main components on the main window:

1. **Image Window**: This window displays the live thermal image captured by the FLIR a700 camera.
2. **Button Window**: The button window contains various buttons that allow you to control the data acquisition process, such as starting and stopping the acquisition.
    a. **Connect <button>:** Connect the camera to the image video in streaming mode.
    b. **Cut <button>:** Cut the camera input and display "No Thread Found" in the image window.
    c. **Auto <button>:** Activate auto-focus to adjust the camera focus and enhance image clarity.
    d. **+ <button>:** Increase the focus value using a given step (default: 100).
    e. **- <button>:** Decrease the focus value using a given step (default: 100).
    f. **Coarse <option>:** Select the auto-focus option: Coarse or Fine. Coarse is faster while Fine is slower but more precise.
    g. **Focus Step <TextInput>:** Set the focus step value. Press "enter" to apply the change.
    h. **t0 <TextInput>:** Set the duration (in seconds) to turn on the heating lamp. Press "enter" to apply the change.
    i. **t1 <TextInput>:** Set the duration (in seconds) to turn off the heating lamp. Press "enter" to apply the change.
    j. **t2 <TextInput>:** Set the duration (in seconds) to end the data acquisition process. Press "enter" to apply the change.
    k. **filename <TextInput>:** Set the filename for the saved data. It will be updated when a new filename is set.

l. **Data Saving Folder <Button>:** Click to browse and select a folder in the local space to save the data.

m. **Cultivar <TextInput>:** Set a customized cultivar name. Press "enter" to apply the change.

n. **Branch <TextInput>:** Set a customized branch name. Press "enter" to apply the change.

o. **Node <TextInput>:** Set a customized node name. Press "enter" to apply the change.

p. **Start DAQ <Button>:** Click to start the data acquisition process. The button will change to "Stop DAQ" and can be clicked to stop the process and return to streaming mode.

q. **Set Parameters <Button>:** Click to access several textInputs and set customized values for parameters.

3. **Terminal Logs Window**: This window displays the logs and messages related to the data acquisition process.

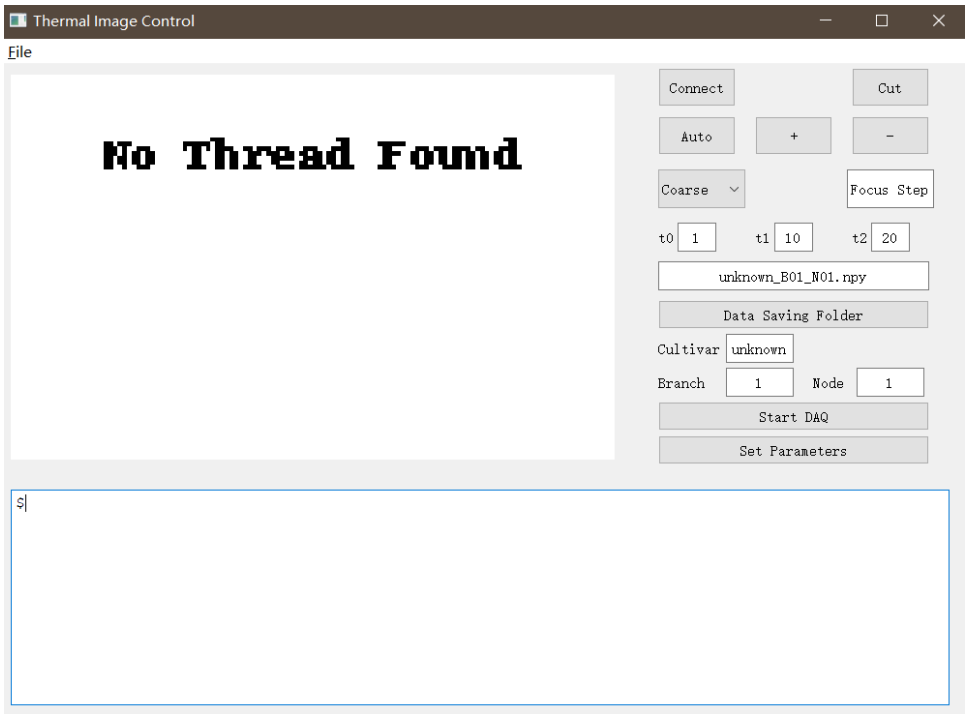

Figure 8: Initial State for the DataAcquisition GUI

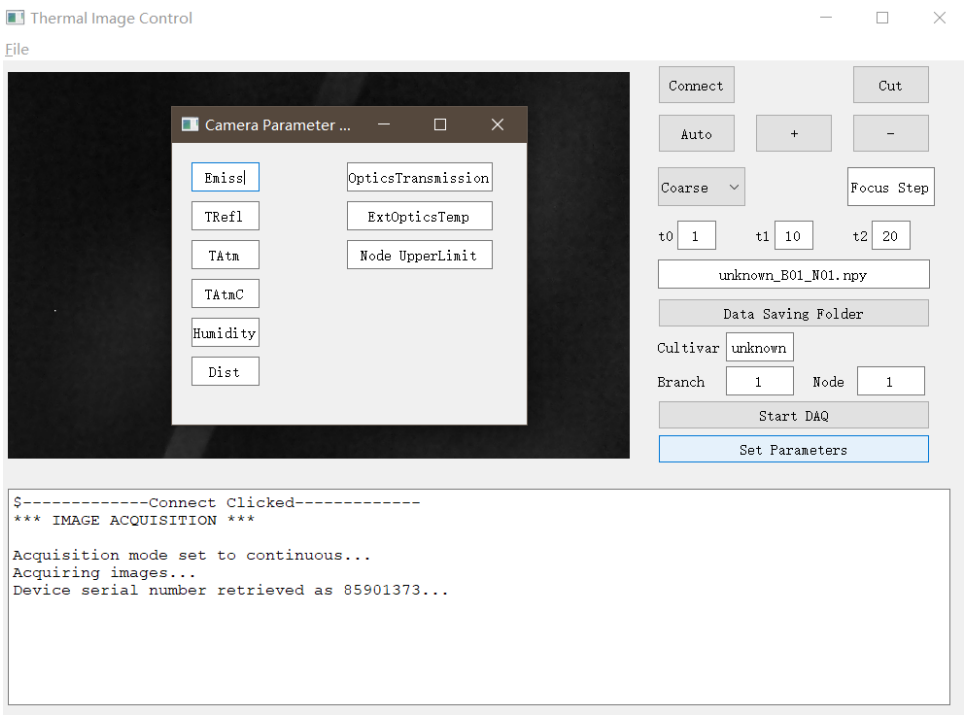

Figure 8: Parameter Window

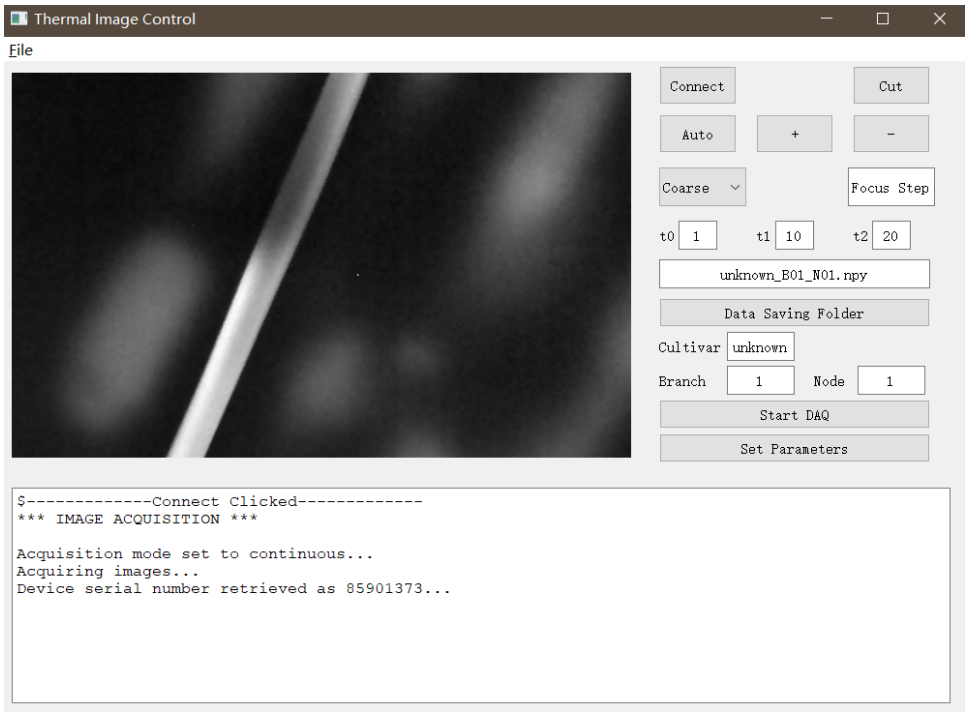

Figure 9: streaming mode

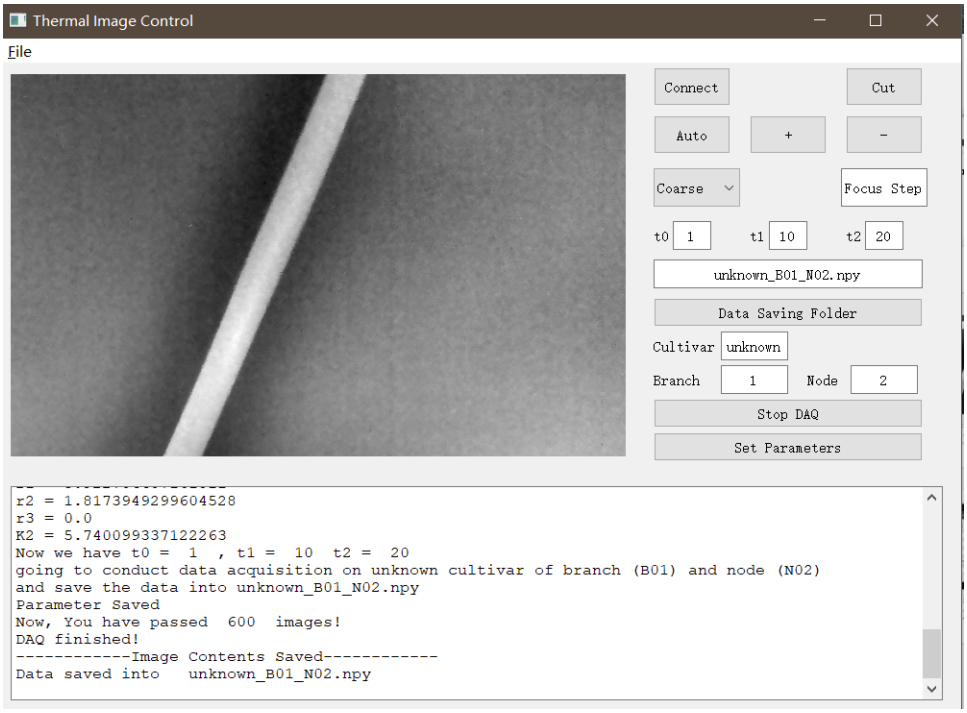

Figure 10: When DAQ is finished, the logs screen will show “Data saved into …”, and the user could press “Stop DAQ”

Step 4: Data Validation GUI

This GUI is majorly for displaying & validating & tagging the collected data from .npy files. Let's explore its main components on the main window:

1. Image Window: This window displays the live thermal image read from the data.
2. Button Window: Contains different functions.
    a. Folder Path <Text & Path>: It allows browsing folders to choose where the collected data is located.
    b. File List <Text>: It lists all the files inside the chosen path.
    c. Cultivar <Text>: It displays the cultivar name.
    d. Branch <Text>: It displays the branch name.
    e. Node <Text>: It displays the node name.
    f. Primary Bud Damaged <CheckBox>: It indicates whether the primary bud is damaged or not.

g. Secondary Bud Damaged <CheckBox>: It indicates whether the secondary bud is damaged or not.

h. Tertiary Bud Damaged <CheckBox>: It indicates whether the tertiary bud is damaged or not.

i. Playing Bar <Text>: It indicates the video playing process.

j. Run <Button>: It controls the video play and pause.

k. Add Results <Button>: Clicking it will save down the damage results.

l. Generate CSV <Button>: Clicking it will use the saved results data to generate a .csv file.

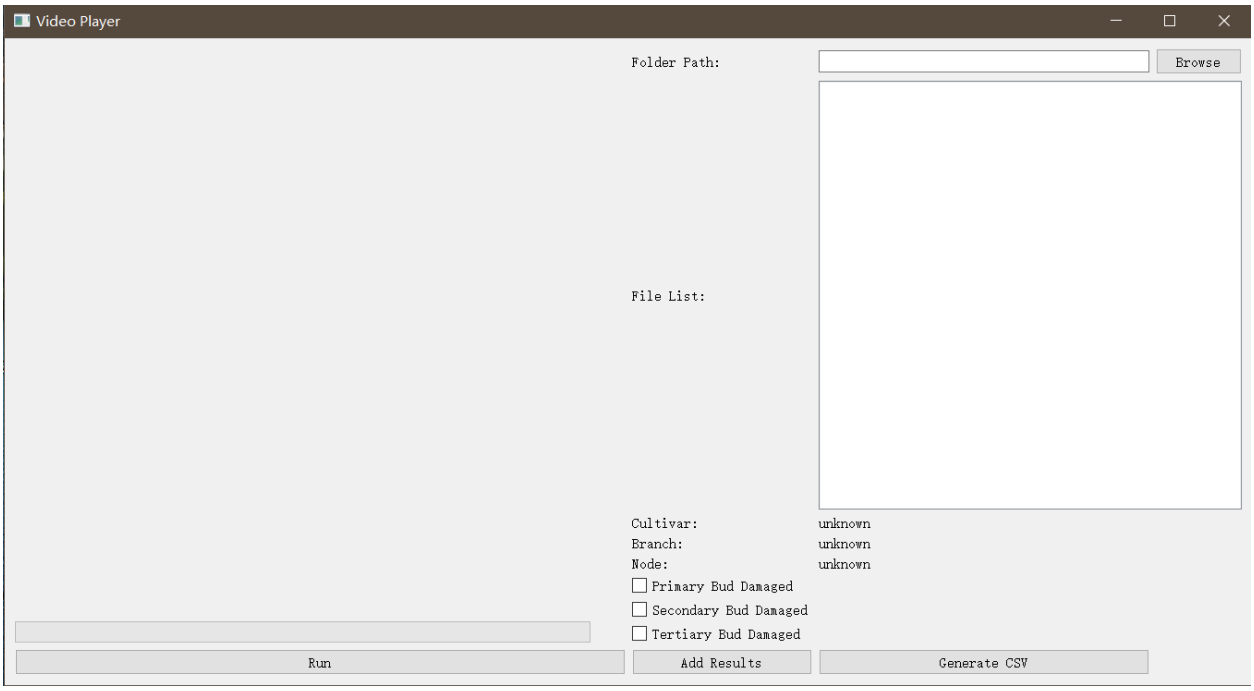

Figure 11: initial state for the data validation GUI

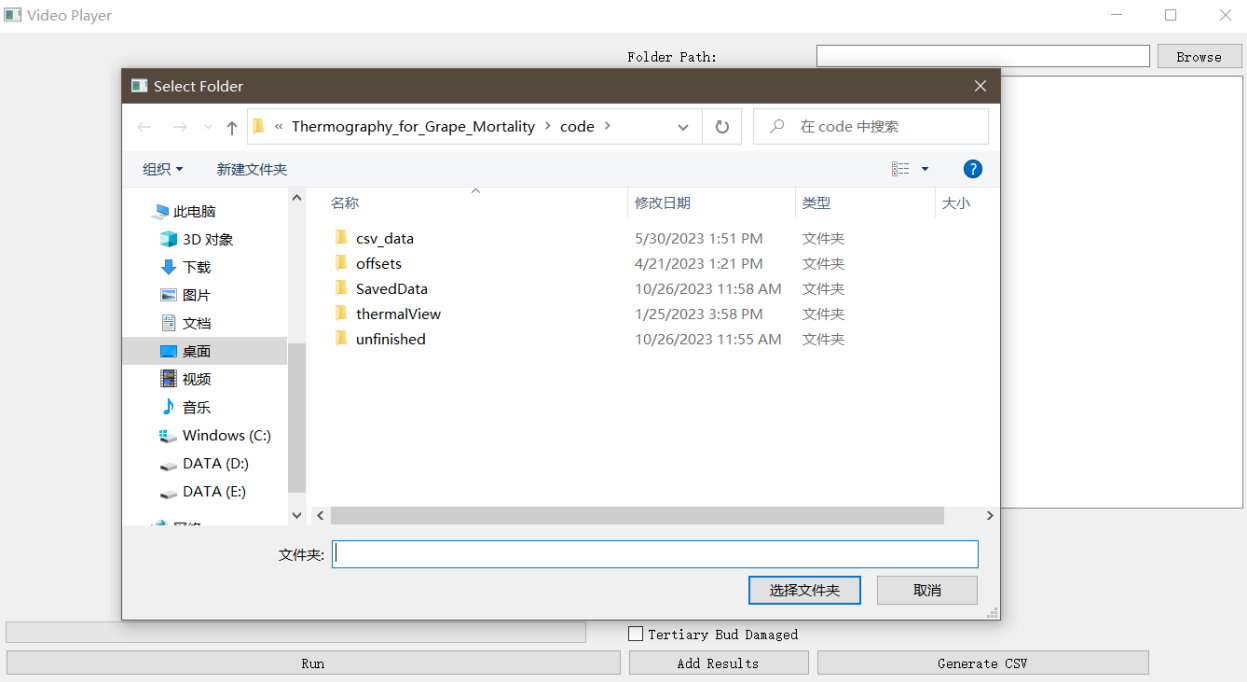

Figure 12: browse the folders to find where data is located

Figure 13: after selecting the file in the list from the left, right image window will show the first image of the video, ready to play

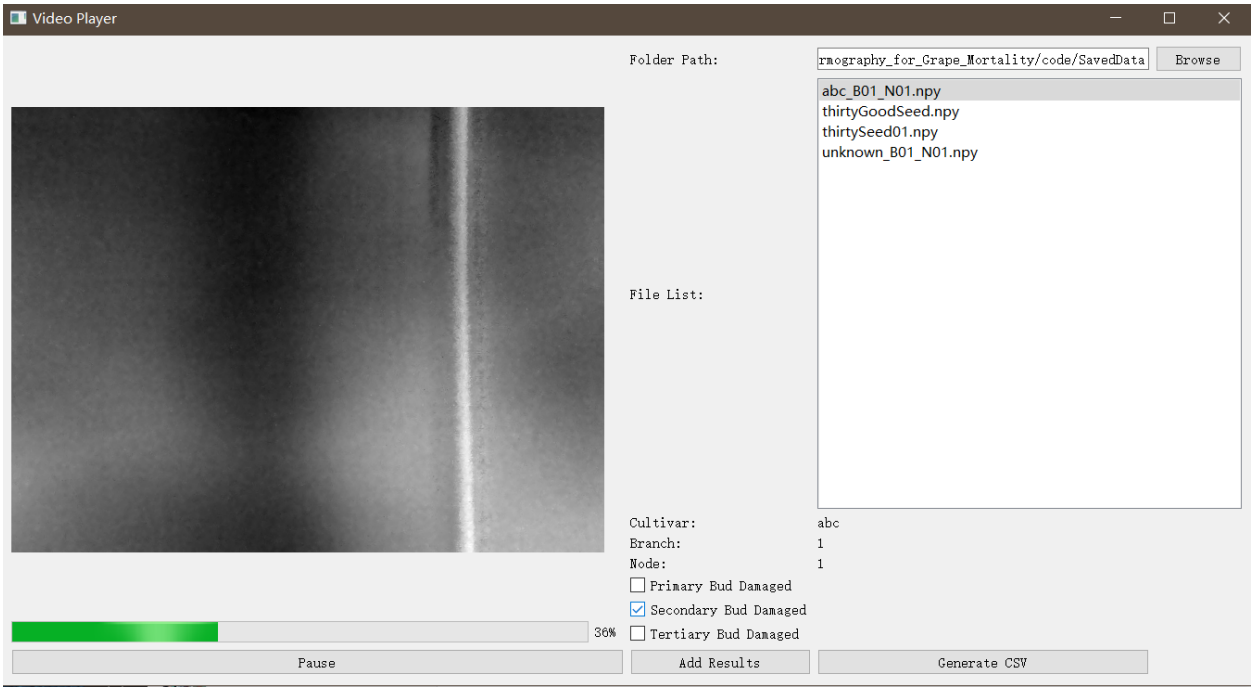

Figure 14: During video play, user can pause, can check the damage boxes, add results, generate csv, or choose the next file