Seismic-radar toolbox GUI

User Guide

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User Guide, Version 1.0.0

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1. Introduction

1.1 Purpose of This Document

This document explains in detail the software created in the agreement between Team Penobscot and Dr. Christopher Gerbi. That agreement resulted in the creation of a graphical user interface for the software system SeiDarT. SeiDarT is a learning tool for both professors and students that simulates seismic and radar propagation. The software has been augmented by Team Penobscot with the goal of making the software more accessible to its desired users.

1.2 Intended Readership

This document is intended for reading by end users of SeiDarT, whether they are students using this themselves or administrators teaching students how to use the software second-hand. In both cases, the only assumed experience of the end user is a rudimentary understanding of how seismic and radar waves propagate through surfaces. At the moment SeiDarT has English as its only language option.

1.3 Applicability Statement

This document refers to the software delivered to Dr. Gerbi as of the end of the school semester of Spring 2020. This is considered Version 1.0 for the purpose of the rest of this document.

1.4 Purpose

The purpose of this document is to enumerate the steps to run simulations of seismic and radar activity. To do this, this document walks the user through the inputting of images and information into the software's user interface.

1.5 How to Use this Document

This document begins with an overview of the system as a whole. The Overview serves to give the user a grasp of the functionality of the system. From there this document goes into more in-depth instructions about the multiple functionalities of the system separately. The goal of this layout is that users looking for a simple summary can find what they need in the Overview, and the users needing to learn a specific functionality can find it in Instructions.

1.6 Related Documents

Document Number	Description
#1	*Team Penobscot's Github Repository for SieDarT*
#2	*A Slideshow Demonstrating SeiDarT*

1.7 Problem Reporting Instructions

At the time of the writing of this document, the administration and maintenance of SeiDarT is being performed by Dr. Gerbi. If one wishes to report an issue in the software, Dr. Gerbi can be contacted regarding issues and help with SeiDarT at earthclimate@maine.edu.

2. Overview

The SeiDarT GUI is based around a linear workflow to create simulations using data provided by the user. The user is assumed to understand how to use a file browser and where to properly store a resultant image.

SeiDarT uses user provided parameters to output a simulation of a seismic or radar event on a given cross section of material. This idea can be explored using the CLI or the GUI, however the program assumes the user has full knowledge of how each parameter effects the end result.

3. Instructions

This section will detail usage of the SeiDarT GUI. As such, it is highly recommended that users first familiarize themselves with the primary functionalities of SeiDarT. Additional resources for this application can be found at GitHub and slideshow.
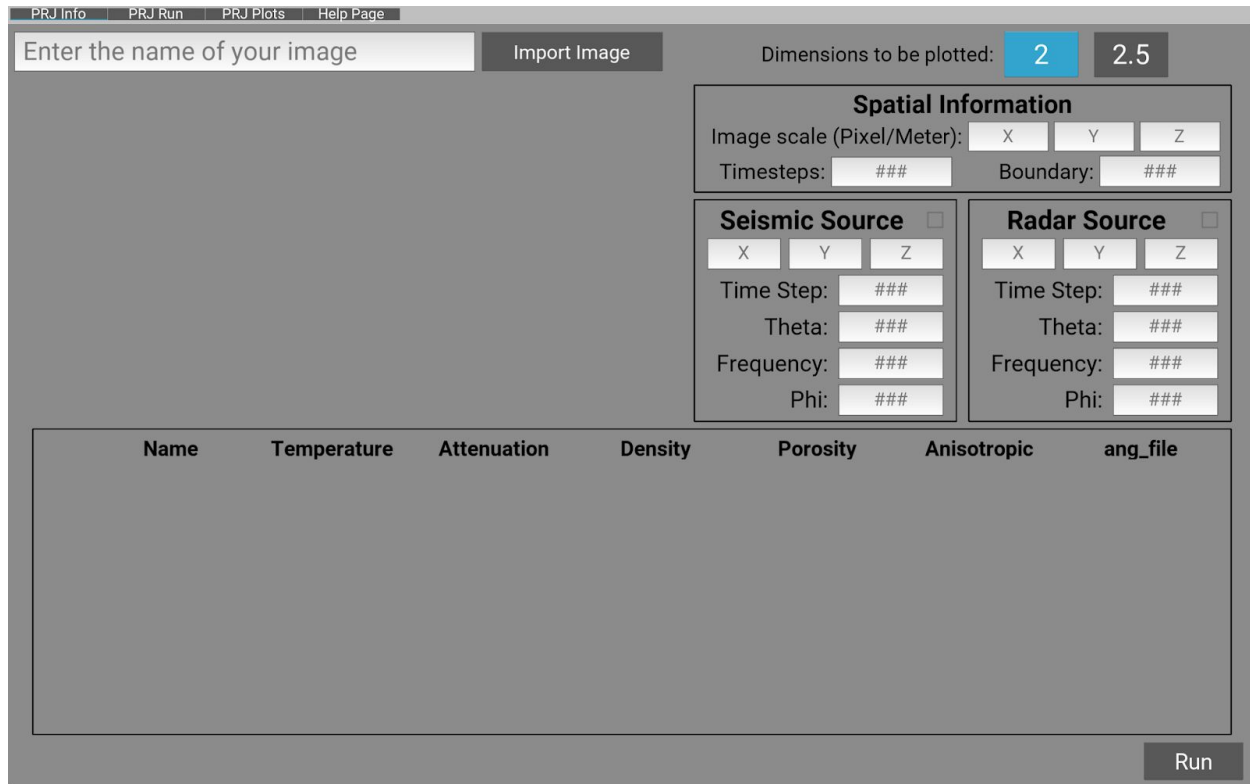
Figure 1

Once opened, the application will appear as in *figure 1* above. As seen at the top of the image, there are four tabs. The first three, labeled *PRJ Info*, *Multishot Run*, and *Plots*, contain the primary functionality of this application. The general workflow involves entering the requisite information in each of these three tabs, in sequence. As such, this guide will begin with a description of the *PRJ Info* tab, followed by the *PRJ Run* and *PRJ Plots* tabs, in that order. Prior to this though, the user must first take the .png image that they wish to process and place it within the GUI folder.

PRJ Info

The first step in the *PRJ Info* tab is importing the image. In the top left hand corner there is a text box. In this box type the name of the image, **excluding** the file extension. Below is an example where the image "*shapes.png*" is being processed.

Figure 2

Once the image has been entered, the user may choose which of the remaining fields to fulfill first. We will begin in the large box near the bottom. Once your image has been input, a series of input rows will appear. Note on the left hand side there are small rectangles which are colored similarly to the image input. Each of the rows corresponds to the requisite information about the material represented by that color of pixel. For instance, we might begin by naming the gray pixels "*air*" by typing "*air*" into the "*name*" box in the second row. After the name, temperature, attenuation, density, porosity, and the anisotropic nature of the materials have been entered, this section is complete. Next, we move to the dimensionality in the upper right hand corner. Users may elect for a 2 or a 2.5 dimensional plot by selecting which they desire. In the example image above, we have selected 2 dimensions. Moving downward now, we have three boxes to denote the scale of the image. If you have selected a 2-dimensional plot, the *y* box may be ignored. Each of the *x, y* and *z* boxes correspond to how many meters there are per pixel in that direction. Following this, the *timesteps* box denotes the number of steps the backend will compute before saving the contents. Finally, there are two similar boxes beneath the *spatial information* box. The left box contains information for a seismic simulation, while the right encapsulates a radar simulation. Users are to fill out the information for *x, y, z, time step, theta, frequency,* and *phi* per the SeiDarT requirements. Finally, there are checkboxes located to the right of "*Seismic Source*" and "*Radar Source*". By checking either, you choose to run the simulation in that manner.

Users may select neither, radar, seismic, or both for running. Once all information has been entered, users should click the button titled "*Run"* in the bottom left to generate a .prj file.

PRJ Run

Figure 3

The first aspect of note in the second tab is the upper left hand quadrant. This is identical to that of the first tab. This should *not* be changed, unless a user wishes to run a .prj different from the one that was just created. The text that appears in the text box in the top left is assumed to be the name of the *.prj* file being used. As such, changing this information can negatively impact your experience. With that in mind, there are three other quadrants, each of which denote a different method of running the *.prj,* as described in the SeiDarT documentation. Merely fill out the required fields and click the corresponding run button.
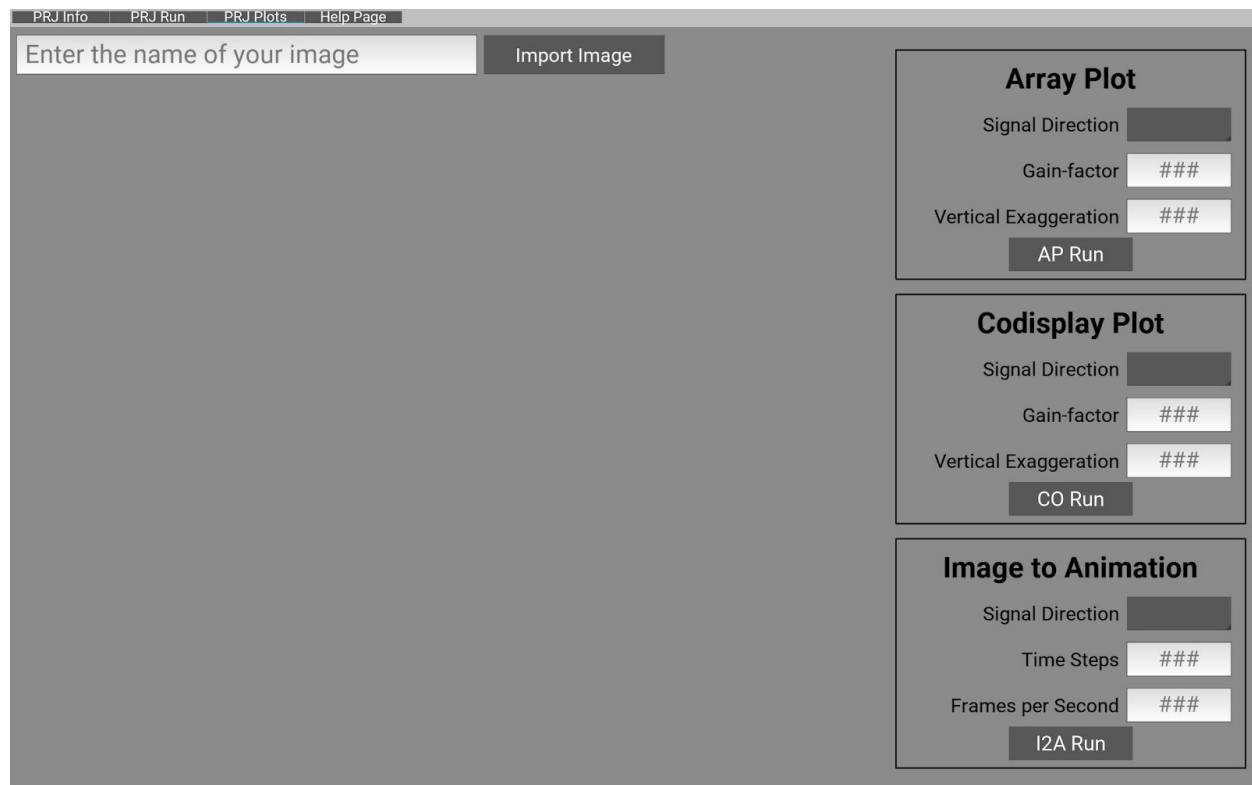
PRJ Plots

Figure 4

Finally, we have the *Plots* tab. This tab is meant to create and display the plots desired by the user. As noted in the above figure, the image region is again displayed. As above, this is not to be modified at this stage in the process. In the top right and bottom left quadrants are the *Array Plot* and *Codisplay Plot* regions. Using these, a user may generate a relevant plot (graphic) described by the run method chosen in the previous tab. Finally, a user might generate an animation using the region in the bottom right.

4. Error Messages and Recovery Procedures

The SeiDarT GUI is designed with the expectation that the user has the basic understanding of the backend SeiDarT software. The SeiDarT software currently does not give the user any error messages when problems occur. Below is a list of possible problems a user may experience while using the SeiDarT Software.

- Software goes unresponsive:
    - If the SeiDarT GUI goes unresponsive then force close the application and restart a new session. Some data from the previous session may be lost if

it had been entered before any operation (build, run, or plot) was completed. Note that some of the SeiDarT operations take time so some calculations may take a few minutes to complete depending on the scale of the entered data.

- Software GUI has a visual glitch:
  - If the SeiDarT GUI has a visual glitch that prevents use of any feature try to close and restart the software.
- Software crash:
  - If the SeiDarT GUI crashes unexpectedly simply restart the software. Some data from the previous session may be lost if it had been entered before any operation (build, run, or plot) was completed.
- Data related problems:
  - The SeiDarT GUI has basic input validation in the form of input restrictions. The software will not warn the user if any data fields are missing or in the wrong format. Please refer to the SeiDarT resources that can be found at the items listed in section 1.6.

If none of the above helps to fix the experienced issue and the issue is preventing proper use of the software please report the issue to earthclimate@maine.edu

Appendix A – Team Review Sign-off

By signing below all team members agree they have reviewed this document. Signing below, team members agree to all content in this document aside from any comments in the space provided below. Signing below, team members agree that the format used in this document is agreeable aside from any comments in the space provided below. Singers acknowledge that the comment area below is not a place to voice major points of contention, only minor points of disagreement in this document.

Team Member #1:

Name (Printed): Adam Farrington   Date: 4/28/2020

Comments: _____

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Signature: *Adam Farrington*

Team Member #2:

Name (Printed): Alex Thacker   Date: 4/28/2020

Comments: _____

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Signature: *Alexander Thacker*

Team Member #3:

Name (Printed): Jens Hansen   Date: 4/28/2020

Comments: _____

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Signature: *Jens Hansen*

Team Member #4:

Name (Printed): Nathan Gazey   Date: 4/28/2020

Comments: _____

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Signature: *Nathan Gazey*

Appendix B – Document Contributions

Below is the list of all contributions to the User Guide by each member of Team Penobscot.

Adam:
- Wrote section 1
- Reviewed and edited whole User Guide

Alex:
- Wrote section 4
- Copied over the Appendices A/B and Title Page
- General document formatting
- Reviewed and edited whole User Guide

Jens:
- Wrote section 3
- Reviewed and edited whole User Guide

Nathan:
- Wrote section 2
- Reviewed and edited whole User Guide