User Manual

for

ELRIS2D

Version 1.0

Electrical Resistivity Inversion Package

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1. Program info

ELRIS2D is an open source two-dimensional inversion program for direct current resistivity data. Program source is written in MATLAB (7.10). Program is tested on a PC with 4GB RAM operated by Microsoft Windows 7.

2. Installation

ELRIS2D may be installed by copying the content of the compressed folder into a working directory. It is suggested to create a folder under the MATLAB root directory named “elris” as in the example below:

```
C:\Documents\MATLAB\elris
```

There are three subfolders in the program root. These folders and their content are required for the functionality of the program. **Therefore they should not be modified or deleted**.

\img includes the image files used in the GUI of the program.
\cptmaps folder contains some GMT color tables used in the program.
\tboxfunc contains required auxiliary files used in the program.

3. User Interface

The graphical user interface of the program is designed for ease of use and simplicity. All available options are located on the main figure window. Any change in the options is applied immediately. A view of the user interface is given in Figure 1.

File Explorer

The file list is populated by scanning the current folder for supported data files. The directories in the current folder are listed as well enclosed with brackets. File list box permits some interactions:

1. Double clicking on a folder name (example: [data files]) opens and scans it for supported files. All supported files in the folder are listed and contents of the files are read into memory. Unsupported files are not listed.
2. A single click on a data file graphs the content of file as a pseudosection and updates the Data Info panel.

3. Double clicking on a data file recalls and graphs the result of a previous inversion if one is already done before. This may be identified from the “Inverted?” row of Data Info panel.
4. Arrow keys and return button may be used when the list box is active.

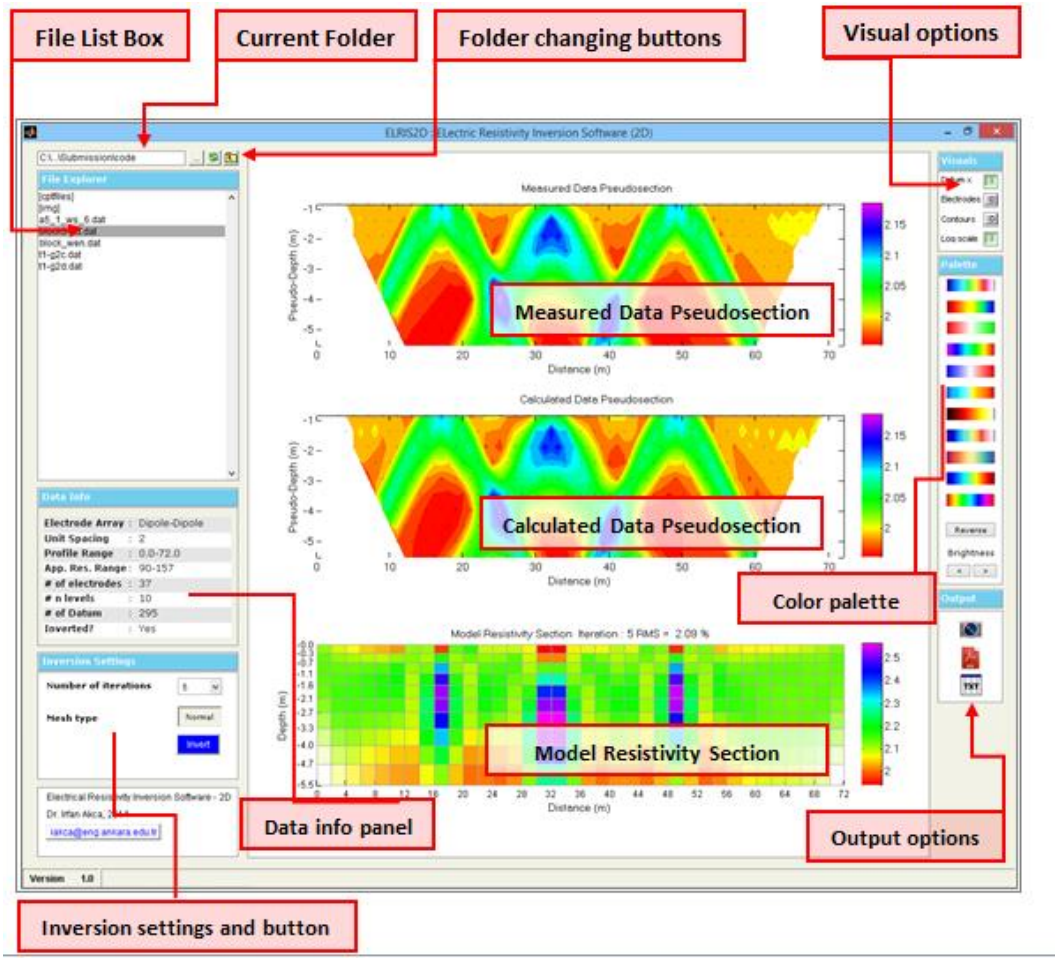

Figure 1. User interface of ELRIS

Visual Options

The user interface includes some visual options can be reached from the buttons located in the right panels. User can toggle between displaying and hiding some features like: electrode locations, contour lines and datum points. A logarithmic scale is usually preferrable to see a better picture of the sections. Logarithmic and linear scales may be switched by clicking the toggle butoon with caption **Log scale**.

Color Palette

A plenty of color maps are given in Color Palette. Selection of one of the color maps cause an immediate change in the colormap of currently displayed sections. The color map may reversed by clicking the Reverse button located below the colormap previews. In addition an

option is given for adjusting the birghtness/darkness of the color map at the bottom of the panel.

Output

It is essential to produce an aoutput for a program of this kind for further use of the results. Therefore three tools are provided to the user to save the output of an inversion. These options are only available when inverse model is displayed. The first button is a shortcut to activate the Microsoft Snipping Tool. This button starts the tool to select a region of the screen to save as an image file. Second option is for saving the sections as a seperate pdf file. The pdf file is saved into current folder with the name of the data file. Finally numeric results of the inversion may be saved to a text file by clicking the last button in the output panel. Tooltip strings may be helpful to identify the buttons.

4. Inversion

ELRIS uses a smoothness constrained least squares algorithm for the inversion of DCR data. Most of parameters used in the algorithm are optimized for near surface surveys. Therefore there are only limited options for inversion in the GUI of the program. However, user can modify these parameters going deep into the code running behind the GUI. Short explanations are given in the source files if needed. Available options that can be modified from the GUI are the number of iterations and the mesh type. The algorithm usually converges after 5 to 8 iterations.

Model is parameterized using rectangular blocks. Each rectangular block is handled as a model parameter to be estimated. User has the option of selecting type of model mesh. There are two options:

1. Normal: A rectangular block is placed between each adjacent electrode pair.
2. Fine: Model mesh is refined so that two rectangular blocks are placed between subsequent electrodes. This option doubles the number of parameters. Therefore the inversion process will be slower compared to Normal mesh. On the other hand the convergence speed will also decrease so that the number of iterations should be increased.

An inversion process may be started using the blue invert button located in the Inversion Settings panel. A fresh inversion should be restarted after changing the mesh type.

5. Data format

The data file format supported by ELRIS2D is identical to the format of well-known program RES2DInv. Program currently supports Pole-Dipole, Dipole-Dipole, Wenner and

Schlumberger arrays. The data are assumed to be measured by equally spaced electrodes. Example data files with explanations are as follows:

Wenner Array

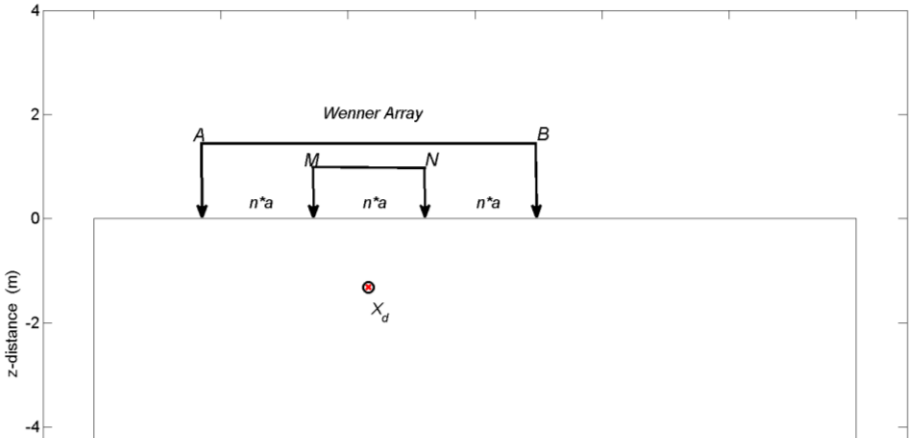

Figure 2. Schematic view of Wenner array and the x-location of datum

Data File Content			*Explanation*
Test Data			*Survey Name*
2			*Unit spacing*
1			*Array type,* *1: Wenner* *3: Dipole-Dipole* *6: Pole-Dipole* *7: Schlumberger*
205			*Number of Data*
1			*X location* *1: midpoint of electrodes used in the measurement*
0			*Flag for IP data (not supported by ELRIS2D) set to 0*
3	2	99.8174	*x-location of datum, MN spacing, apparent resistivity*
5	2	99.8476	*Second datum*
7	2	99.8549	…
9	2	99.862	…
11	2	99.8757	…
13	2	99.9109	…
15	2	100.0196	…
17	2	100.4188	…

Pole-dipole array

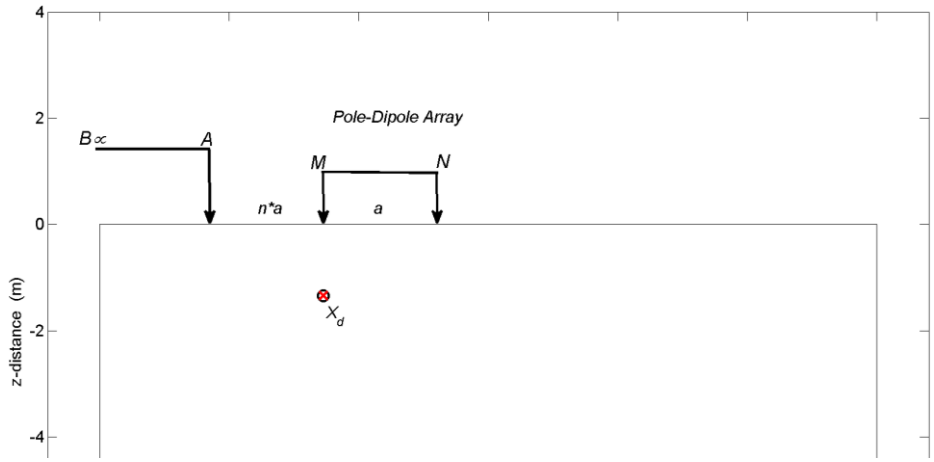

Figure 3. Schematic view of Pole-Dipole array and the x-location of datum

	Data File Content			*Explanation*
Test Data				*Survey Name*
2				*Unit spacing*
6				*Array type,* *1: Wenner* *3: Dipole-Dipole* *6: Pole-Dipole* *7: Schlumberger*
147				*Number of Data*
1				*X location* *1: midpoint of electrodes used in the measurement*
0				*Flag for IP data (not supported by ELRIS2D) set to 0*
2	2	1	99.8174	*x-location of datum, MN spacing, n (level) apparent resistivity*
3	2	2	99.8476	*Second datum*
4	2	3	99.8549	…
5	2	4	99.862	…
6	2	5	99.8757	…
7	2	6	99.9109	…
4	2	1	100.0196	…
5	2	2	100.4188	…

Dipole-dipole Array

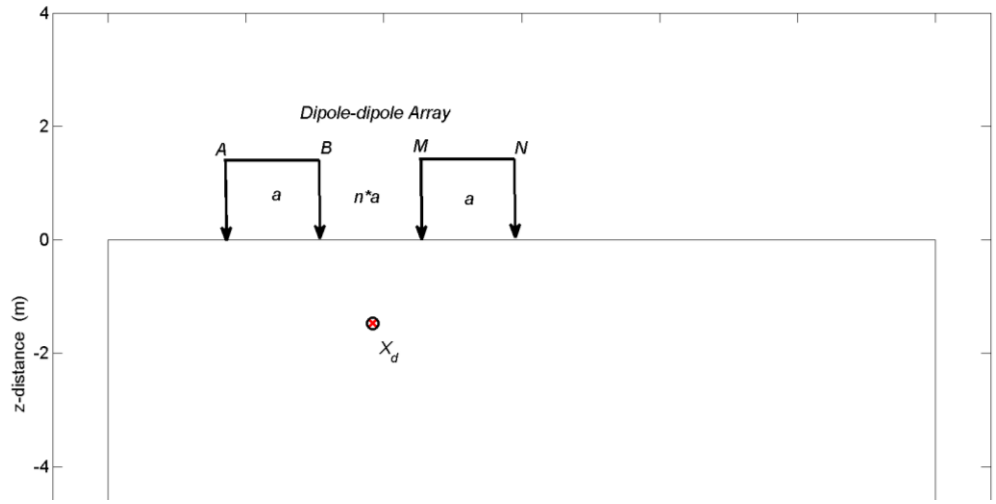

Figure 4. Schematic view of Dipole-Dipole array and the x-location of datum

	Data File Content			*Explanation*
Test Data				*Survey Name*
2				*Unit spacing*
3				*Array type,* *1: Wenner* *3: Dipole-Dipole* *6: Pole-Dipole* *7: Schlumberger*
295				*Number of Data*
1				*X location* *1: midpoint of electrodes used in the measurement*
0				*Flag for IP data (not supported by ELRIS2D) set to 0*
3	2	1	99.8174	*x-location of datum, MN spacing, n (level) apparent resistivity*
5	2	1	99.8476	*Second datum*
7	2	1	99.8549	…
9	2	1	99.862	…
11	2	1	99.8757	…
13	2	1	99.9109	…
15	2	1	100.0196	…
17	2	1	100.4188	…
..	..	..	..	…
4	2	2	118.490	
..	..	..	..	…

Wenner-Schlumberger Array

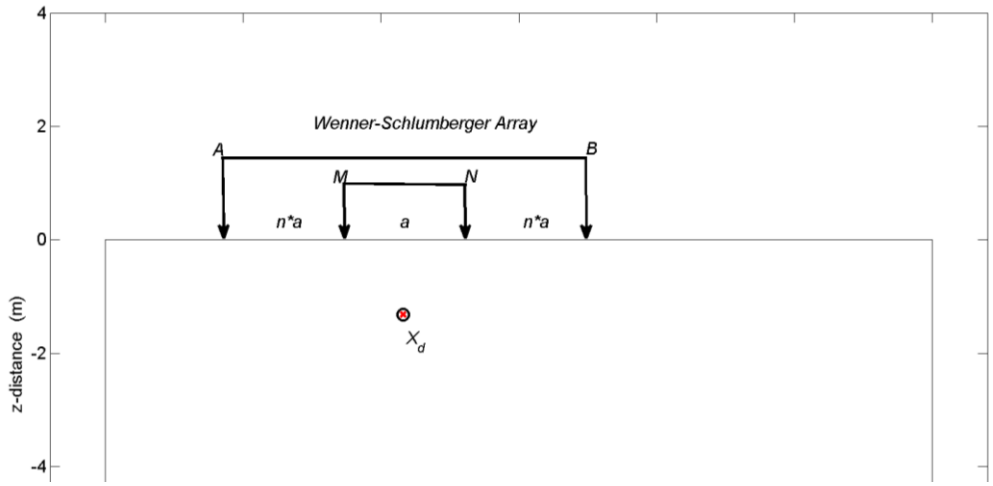

Figure 5. Schematic view of Wenner-Schlumberger array and the x-location of datum

	Data File Content			*Explanation*
Test Data				*Survey Name*
2				*Unit spacing*
7				*Array type,* *1: Wenner* *3: Dipole-Dipole* *6: Pole-Dipole* *7: Schlumberger*
76				*Number of Data*
1				*X location* *1: midpoint of electrodes used in the measurement*
0				*Flag for IP data (not supported by ELRIS2D) set to 0*
3	2	1	99.8174	*x-location of datum, MN spacing, n (level) apparent resistivity*
5	2	2	99.8476	*Second datum*
7	2	3	99.8549	…
9	2	4	99.862	…
5	2	1	99.8757	…
7	2	2	99.9109	…
9	2	3	100.0196	…
11	2	4	100.4188	…
..	..	..	..	…
..	..	..	..	…