E-nstructions:
A Tool for Electronic Instructions in Laboratory Experiments[*]

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Abstract

E-nstructions facilitates the use of electronic instructions in computerized laboratory experiments in social sciences. In this article I provide a set of guidelines for the installation and the use of E-nstructions.

KEYWORDS: Experiments, Experimental software, Instructions

JEL CLASSIFICATION: C91, C92

1 Introduction

E-nstructions facilitates the use of electronic instructions in computerized laboratory experiments. This tool has been primarily designed to be used in combination with z-Tree (Fischbacher, 2007), but it should work in combination with other experimental softwares which help developing and conducting experiments. In this article I describe the features of E-nstructions and I provide a set of guidelines for its installation and use.

E-nstructions consists of two small programs. First, the settings program allows the experimenter to easily configure the assignment of instructions to participants as well as their navigation through the instructions. Second, the E-nstructions program enables participants to toggle between their instructions and the client application of the experimental software (e.g. z-Leaf) according to the configured settings.

Henceforth, I denote by "server" the computer operated by the experimenter and by "clients" the computers used by participants.

2 What E-nstructions offers

E-nstructions offers a timesaving and eco-friendly alternative to paper instructions. I summarize its features below.

- The tool is designed to display experimental instructions on the clients in PdF format.

- E-nstructions enables participants to toggle with a simple button between the instructions and the experimental screen, while other programs on the clients can be locked. Unless the experimenter closes E-nstructions, participants can access their instructions during the entire experiment.

- The experimenter defines how participants navigate through their instructions. To limit distractions from the experiment itself, minimal but sufficient options are offered.

- The buttons of the client application are currently available in English, German, Italian, and Spanish.

- The current version of E-nstructions supports up to 32 clients.

- A core feature of E-nstructions is the assignment of instructions from the server to the clients. The experimenter has several options for assigning different sets of instructions. A particular option is based on a random role assignment in z-Tree.

3 Installation

After some preliminaries, I explain how to get E-nstructions and how to install it first on a personal computer as a test version and second in a computerized laboratory.

3.1 Preliminaries: System requirements

- E-nstructions displays the experimental instructions in PdF format. A PdF reader has therefore to be installed on the clients. Note that for the current version, Adobe Reader (at least 9.2.0) is required.

- E-nstructions functions properly under Microsoft Windows XP and Windows 7. Compatibility with other operating systems is unknown, feedback is appreciated.

- E-nstructions is optimized for a screen resolution of 1280×1024 pixels.

3.2   How to get E-nstructions

The tool is available for free on the E-nstructions web page.[1] In the future, this web page will also provide some additional information (E-nstructions Wiki, troubleshooting, etc.).

3.3   Installation on a personal computer (for testing)

The following steps describe how to install a test version of E-nstructions on your personal computer.

- Unpack the file `E-nstructions.zip` that you downloaded. The installation procedure creates three items: the two folders `Experimenter` and `Participants`, and a program file `Get Started`.

- Double click on `Get Started` and install.

3.4   Installation in the laboratory

- Unpack the file `E-nstructions.zip` that you downloaded. The installation procedure creates two folders: `Experimenter` and `Participants`.[2]

- Save the folder `Experimenter` on the server. Ideally, the server is the computer where z-Tree is installed.

- In the folder `Participants`, you can delete the buttons folder of the languages you do not need. Save the folder `Participants` including the buttons folder you want to use (`buttons_English`, `buttons_German`, `buttons_Italian`, or `buttons_Spanish`) on each of the clients.

- On each client, open the file `conf_P.txt` which is located in the folder `Participants`, modify the four rows of the file as indicated below and save your changes.

  1. Enter in the first row the cabin number of the client.
  2. Enter in the second row the full network path of the location of the file `conf_E` which is located in the folder `Experimenter` on the server.
  3. The third row is optional. If the clients fail to access the location specified in the second row, E-nstructions follows the path of the third row. Save the folder `Experimenter` on an alternative server and enter the alternative network path of `conf_E.txt` in the third row. If you do not want to use this option, you can enter '. . .' in the third row.
  4. Enter in the fourth row the full path of the location of the buttons folder you want to use (`buttons_English`, `buttons_German`, `buttons_Italian`, or `buttons_Spanish`).

- Note that usually the local path starts with `C:` or `D:` and the network path starts differently (e.g. `X:`). However, the network path of the folder `Experimenter` has to equal the path of the folder `Experimenter` on the server. To match the path names, either rename the partition where you saved the folder `Experimenter`, or open the folder `Experimenter` with a link assigning a new partition name.

- Grant reading rights to the clients for the folder `Experimenter`, its subfolders and the location where your instructions will be saved.

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[1]The domain is www.e-nstructions.de. In case you cannot download the package from this page, please contact me and I will send it to you.

[2]The program file `Get Started` also appears but is only meant for local test installation.

4 Using E-nstructions

Before guiding the reader through the tool itself, I start with some recommendations on how to construct the electronic instructions. The main body of this section explains the components of E-nstructions, how the experimenter configures the settings, and how participants can use their instructions in combination with the experimental software. I close with some recommendations for running sessions with E-nstructions.

4.1 Preliminaries: Properties of your instructions

The tool we use partly shapes the work we do. I agree with the sceptical reader that there are drawbacks of electronic compared to paper instructions (e.g., participants cannot [yet] make notes in their electronic instructions). But electronic instructions open new possibilities for the design of instructions.

- Since E-nstructions is designed to display PdF files, you have to produce a PdF file of your instructions.

- To exploit the size of the entire instructions frame on a monitor with a resolution of 1280×1024 pixels, create a PdF file in the format 34.8×29.7 cm (henceforth E-nstructions format, see Figure 5).[3] However, you can also keep the usual paper format A4.

- You can easily use colors and graphics to structure the instructions, emphasize important parts and visualize their content.

- E-nstructions supports links in PdF files.[4]

- For multi-page instructions, I suggest to show page numbers of the style "Page 1 (of 3)".

4.2 Components of E-nstructions

Components required to configure the settings (used by the experimenter) are separated from components required to display the instructions (used by participants).

The folder `Experimenter` contains the program `Settings.exe` and the two files `path` and `conf_E`. The program `Settings.exe` provides the interface to configure the settings. Your entries in `Settings.exe` are saved in the files `path` and `conf_E`.

The folder `Participants` contains the program `E-nstructions.exe`, a file `conf_P.txt`, and a language-specific folder with buttons. The program `E-nstructions.exe` is the client application of the instructions software. The client number as well as the directories of the settings and the buttons are stored in the file `conf_P.txt`. The buttons folder contains the graphical elements participants can use for navigation within the instructions.

4.3 Experimenter: Configuring the settings

To configure your settings, open the folder `Experimenter` and double click on `Settings.exe`. The dialog *Settings* appears with two tabs, one to *Assign instructions* and a second one to modify *Optional settings*.

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[3]In case you produce your instructions in LaTeX, copy the following commands in the preamble of your document:
\pdfpageheight 34.8cm
\pdfpagewidth 29.7cm
[4]In case you create your instructions in Microsoft Word, you have to save the document as PdF (instead of printing it as PdF). Links loose their functionality when printed as PdF.
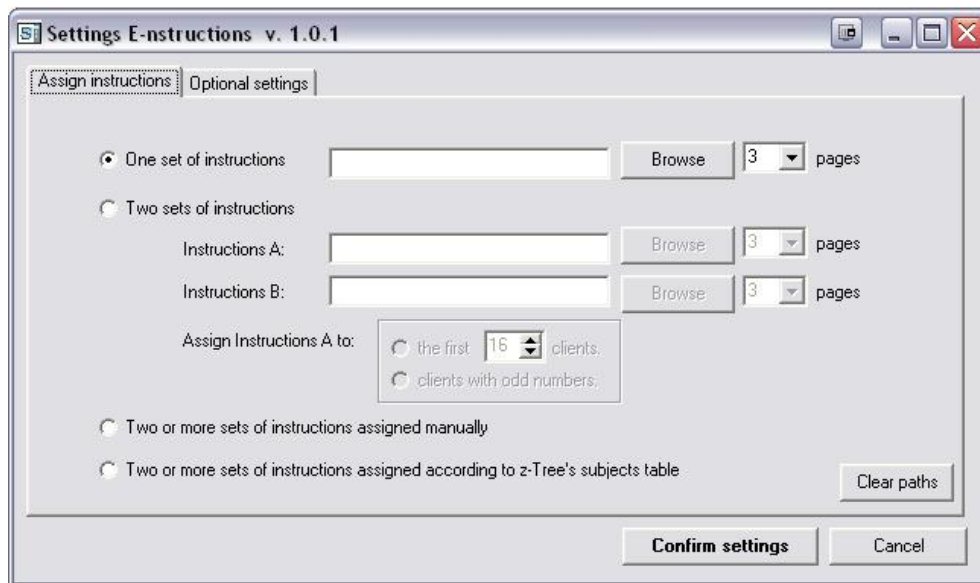
Figure 1: In the dialog *Settings*, instructions are assigned and optional settings can be defined.

4.3.1 Assign instructions

As shown in Figure 1, the tab *Assign instructions* offers four options of how to assign instructions to clients: (1) One set of instructions; (2) Two sets of instructions; (3) Two or more sets of instructions assigned manually; (4) Two or more sets of instructions assigned according to z-Tree's subjects table.

For each set of instructions you want to implement in your experiment, perform the following two steps:

- Browse for the directory of the PdF file with your instructions.

- Enter the number of pages of this PdF file.

Option 1: One set of instructions.   Select this option to assign the same instructions to all clients.

Option 2: Two sets of instructions.   Select this option to assign two sets of instructions automatically. Two simple rules are pre-defined: You can either assign Instructions A to the first n clients and Instructions B to the remaining clients, or you can assign Instructions A to odd clients and Instructions B to even clients.

Options 1 and 2 should suffice for most experiments. Please note that in order to use Options 2, 3 or 4, the subjects of z-Tree need to be sorted according to the clients in your laboratory (subject 1 corresponds to client 1, subject 2 to client 2 etc.).

Option 3: Two or more sets of instructions assigned manually.   Select this option to define an assignment of two sets of instructions which is different from the pre-defined assignments offered by Option 2, or to assign more than two sets of instructions. By clicking the corresponding radio button, you are redirected to the dialog shown in Figure 2. In this dialog, you can define any assignment for up to 32 different sets of instructions. Note that *C 01* corresponds to client 1, *C 02* to client 2, etc.
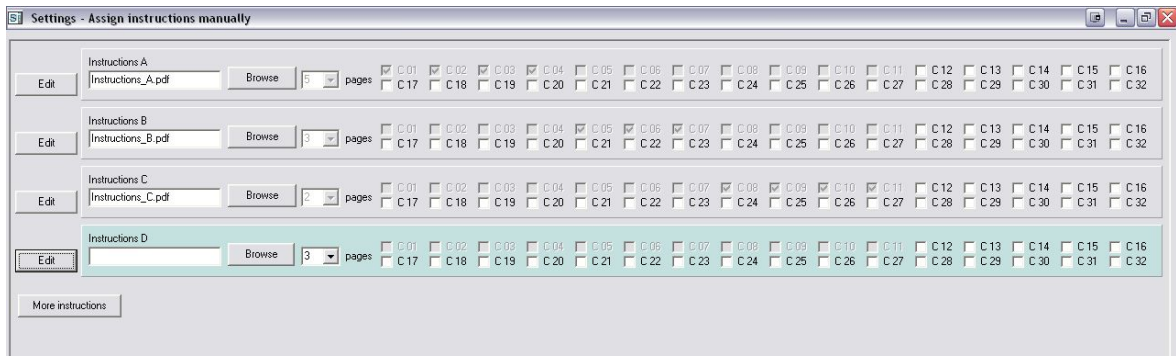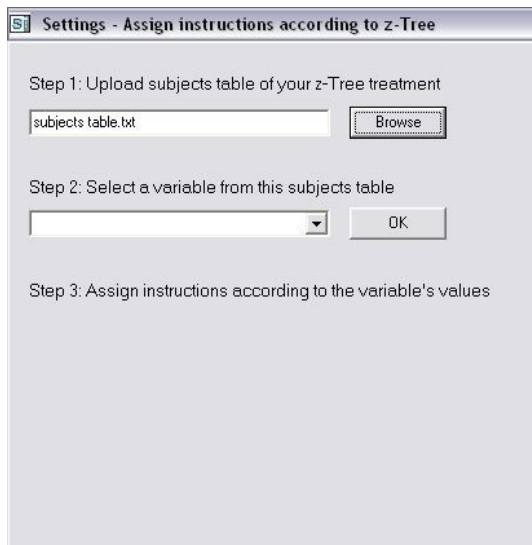
Figure 2: *Settings - Assign instructions manually.*

By default, three panels are displayed on this dialog, each corresponding to one set of instructions (Instructions A, B, and C). The panel you are about to edit is highlighted. In the first panel, browse for the directory of your `Instructions_A.pdf` and enter the number of pages. Select all clients to whom you want to assign `Instructions_A.pdf`. The checkboxes you have ticked become inactive for all other sets of instructions in the remaining panels.

To edit Instructions B, click the `Edit` button of the second panel and proceed as described above. Repeat this procedure for all sets of instructions you want to implement. You can add panels for more sets of instructions by clicking the `More instructions` button. To make changes in a panel, first activate it with the `Edit` button.

Click `OK` to save your input. You can re-access your settings in this dialog by selecting the third radio button on the tab *Assign instructions*.

Option 4: Two or more sets of instructions assigned according to z-Tree's subjects table. Select this option to assign different sets of instructions according to a random role assignment in z-Tree. By clicking the corresponding radio button, you are redirected to the dialog shown in Figure 3(a):

(a) Before selecting a variable
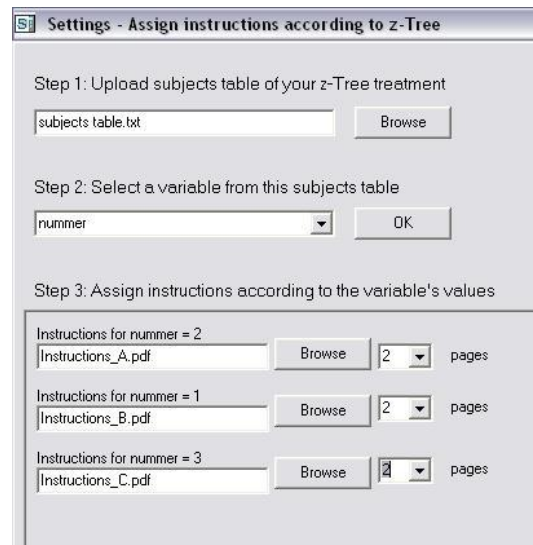
(b) After selecting a variable

Figure 3: *Settings - Assign instructions according to z-Tree.*

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Now perform the following three steps: Export and upload the subjects table of your z-Tree treatment (Step 1).[5] Select a variable from this subjects table (Step 2). Note that only variables with integers are valid. Once you have selected a variable, a panel for each value of this variable is generated as shown in Figure 3(b). In each panel, browse for the directory of your `Instructions_X.pdf` and enter the number of pages (Step 3). Click `OK` to save your input. You can re-access your settings in this dialog by selecting the fourth radio button on the tab *Assign instructions*.

Save your input by clicking the `Confirm settings` button. If all paths of your instructions are valid, the message "Your settings have been saved..." pops up.

At the end of your experimental session, you might want to delete the paths of your instructions in `Settings.exe` so that they are not used erroneously in later sessions. To do so, click the button `Clear paths` on the *Assign instructions* tab.

4.3.2 Optional settings

Figure 4 shows the tab *Optional settings* of the *Settings* dialog. On this tab, you can specify how the instructions are displayed on the clients and which actions participants are allowed to perform. The terminology used in this section concerning the appearance of E-nstructions on the clients is visualized in Figure 5.
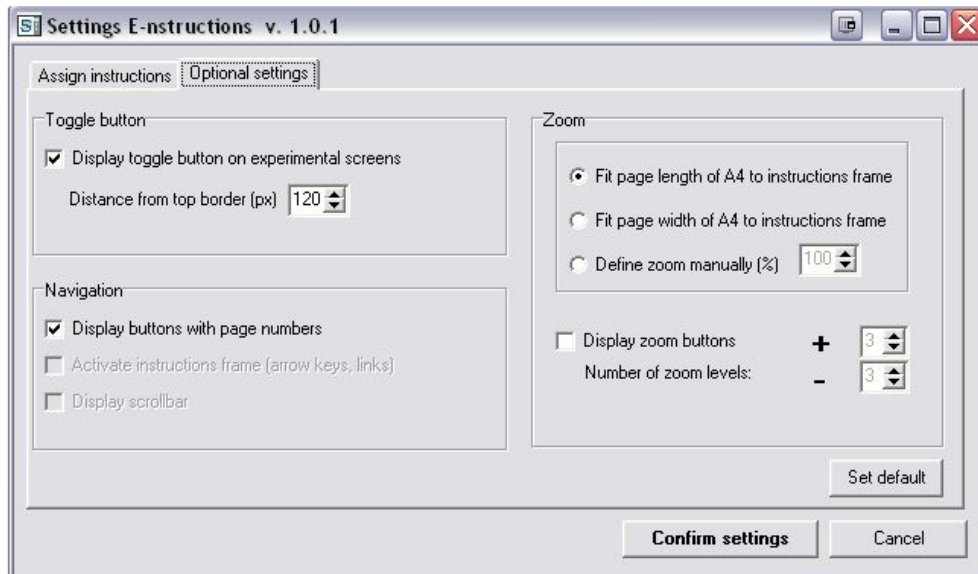

Figure 4: You can change defaults on the tab *Optional settings*.

Toggle buttons. By default, a toggle button `Experiment` is displayed on the E-nstructions screen and a toggle button `Instructions` is displayed on the experimental screen (e.g. z-Leaf) so that participants can toggle between both screens during the experiment (see Figures 5 and 6.

- If you do not want the toggle button `Instructions` to be displayed on the experimental screen, deselect this option. Now participants can toggle by pressing `[ctrl]+[T]` (it still works when you use a tool to lock the clients' keyboards). Obviously, you should inform participants about this key combination. The toggle button `Experiment` on the E–nstructions screen is shown anyway.

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[5]Start your experiment in z-Tree and go to `Run` → `subjects table`. Export the table via `File` → `Export` → `Table` and enter a file name. The table will be saved in a *.txt format.

- If you want the toggle button `Instructions` to be displayed but it coincides with an element of the experimental screen, you can move it up or down. The default value is 120 pixels distance from the top border of the screen. Modifications of this value only affect the position of the `Instructions` button whereas the toggle button `Experiment` is not affected.

Navigation. You can define how participants will navigate through their instructions.

- By default, E-nstructions displays buttons with page numbers for instructions with up to 10 pages (this option is not available for instructions with more than 10 pages).

  Please note that if this option is selected, the instructions frame is locked. Accordingly, links in PdFs do not work and scrollbars are not shown. Participants can only navigate with the help of the number buttons on the navigation bar. Make sure that an entire page of your instructions fits the instructions frame on the clients (see the paragraph on Zoom below).

- If you activate the instructions frame, participants can navigate via links that you created in the instructions PdF. Participants can also use the mouse wheel, the arrow keys and the page-up and page-down keys of the clients' keyboards to flip pages and to scroll through the pages (even if you use a tool to lock the clients' keyboards).

- A scrollbar can be displayed.

Note that you can either display buttons with page numbers or activate the instructions frame, the two options are incompatible.

Zoom. The default zoom is optimized to client screens with a resolution of 1280×1024 pixels.

- By default, the page length of A4 (portrait) fits the instructions frame. Keep this option selected if you create instructions in E-nstructions format (e.g. the format of your instructions is optimized to fill the entire instructions frame).

- Alternatively, you can fit the width of A4 (portrait) to the width of the instructions frame. In this case, you should activate scrollbars (see the paragraph on Navigation above).

- If the resolution of your client screens is not 1280×1024 pixels or if the two previous options do not suit the format of your instructions, you can define the default zoom manually.

- Display zoom buttons to allow participants to zoom in/out their instructions. After having checked the corresponding box, define the number of zoom levels. For instructions in E-nstructions format I recommend to not display zoom buttons.

You can restore the default settings with the button `Set default`. Once all settings are configured, save your input by clicking `Confirm settings`.

4.4   Participants: E-nstructions on the clients

This section details the use of E-nstructions on the clients depending on your settings (see Subsection 4.3). When `E-nstructions.exe` is run, a screen as illustrated in Figure 5 appears on each client:

The instructions frame displays the PdF file you assigned to a given client according to the zoom you defined. If you assigned more than one set of instructions, different PdF files are displayed in the instructions frame of different clients depending on their number.[6] The navigation bar

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[6]To test this feature on your local PC, change the client number in the first row of `conf_P.txt` and save.

Figure 5: The E–nstructions screen consists of two parts, an instructions frame covering most of the screen area and a vertical navigation bar on the right margin. Note that the instructions in this example are in E-nstructions format.

illustrated in Figure 5 entails all button classes which are offered:

- The **toggle button** `Experiment` is displayed in the language you selected, whatever settings you configured. This button directs participants to the experimental screen.

- A column of **buttons with page numbers** and two arrows above these buttons are displayed if you selected the first option in the Navigation box of the *Optional settings* tab. When clicking the arrow to the right (left), the next (previous) page of the instructions is shown. When clicking one of the number buttons, the corresponding page is shown. The button with the current page number is highlighted. To prevent participants from skipping pages when they read their instructions for the first time, not all number buttons are displayed immediately. Instead, they appear one after the other by clicking the arrow to the right.

- The two buttons + (zoom in) and − (zoom out) are displayed if you selected **Display zoom buttons** in the Zoom box of the tab *Optional settings*. Participants can zoom according to the number of zoom levels you entered.

Figure 6 exemplifies an experimental screen. Only a toggle button `Instructions` is displayed. This button directs participants to the E-nstructions screen. As explained earlier, the `Instructions` button can be relocated or removed in the Toggle button box of the tab *Optional settings*.

Close `E-nstructions.exe` by pressing `[alt]+[F4]`.

4.5 Some comments on running sessions with E-nstructions

I conclude with some comments derived from our experience with E-nstructions at the Experimental Laboratory of the Max Planck Institute of Economics in Jena.
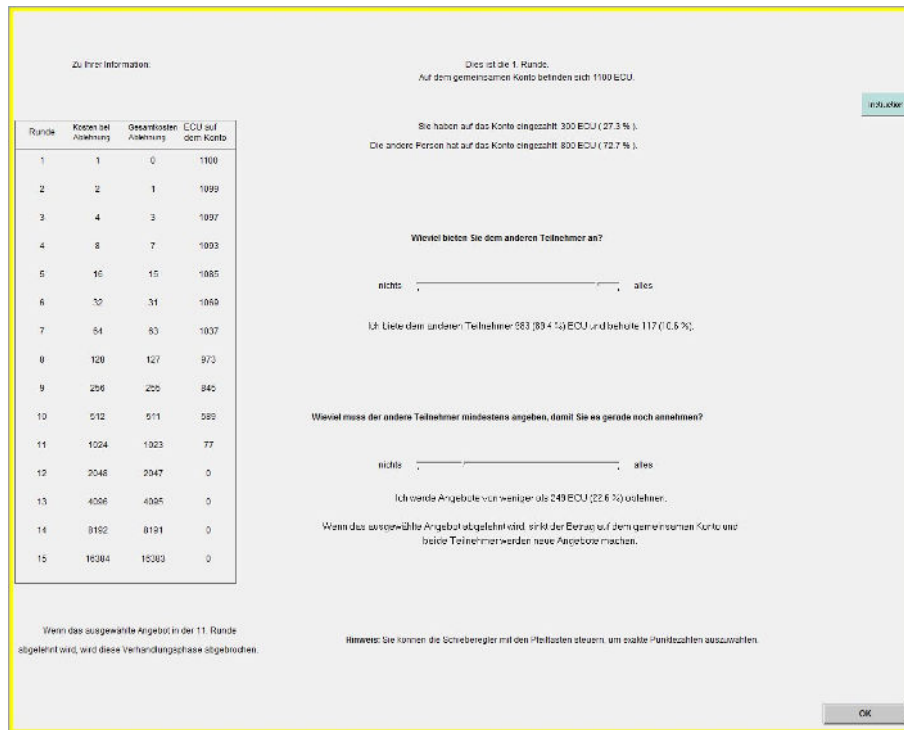
Figure 6: Experimental screen (z-Leaf) with a toggle button in the upper right corner.

- To balance server load, `E-nstructions.exe` will start on the clients in (quick) succession, and in ascending order by their number. This causes a small delay for high-numbered clients.

- Please note that the current version of E-nstructions does not send information from clients to the server. Thus, you cannot monitor the clients' status of E-nstructions from the server PC.

  To know when participants are done with reading the instructions, you could include a button "Instructions completed" in your z-Tree treatment, or you just ask participants.

- The software does not switch between the E-nstructions screen and the experimental screen automatically. Therefore, mention to participants that they should click the toggle button `Experiment` once they have read and understood the instructions.

  During the experiment, participants might go to the instructions while waiting for other participants. You should announce whenever the experiment continues.

- In case you activated the instructions frame for navigation, inform participants which tools they can use to navigate trough their instructions. To use the arrow, page-up, and page-down keys, participants need to click in the instructions frame first.

- In case you do not display the toggle button `Instructions` on the experimental screen, participants obviously should learn that they can toggle by pressing `[ctrl]+[T]`.

- You can distribute more than one set of PdF instructions during your sessions. Exit `E-nstructions.exe` to close the first set of instructions. Then configure your new settings, confirm and restart `E-nstructions.exe`. To save time, you can also prepare the alternative settings before closing the first set of instructions. They take effect only when `E-nstructions.exe` is restarted.

4.6 Known bugs

- **E-nstructions does not display open PdF files.** Instead, the instructions frame is just white.

  Workaround: Make sure that the PdFs with your instructions are closed when you run E-nstructions.

- **When you reopen `Settings.exe`, your previous settings are not saved properly.** On the tab *Assign instructions*, the first option will be selected, and a previously selected path to a PdF might be inserted. On the tab *Optional settings*, the defaults will be set.

  Workaround: After having configured and confirmed your settings, leave the settings program open as long as `E-nstructions.exe` is in use with the current settings. When you are done, first close `E-nstructions.exe` and then click the button `Clear paths` on the *Assign instructions* tab. By that, the paths you browsed will not be inserted erroneously later.

5 Final remarks

This article refers to the first release of E-nstructions, which is still in need of improvements. In the future, (i) More PdF readers than only the Adobe Reader will be compatible; (ii) The clients' E-nstructions will send information to the server, so that experimenters can monitor participants' status; (iii) etc. I would be very grateful for your feedback.

References

FISCHBACHER, U. (2007): "z-Tree: Zurich Toolbox for Ready-made Economic Experiments," *Experimental Economics*, 10(2), 171–8.