



INTRODUCTION TO Z-TREE

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SCHEDULE

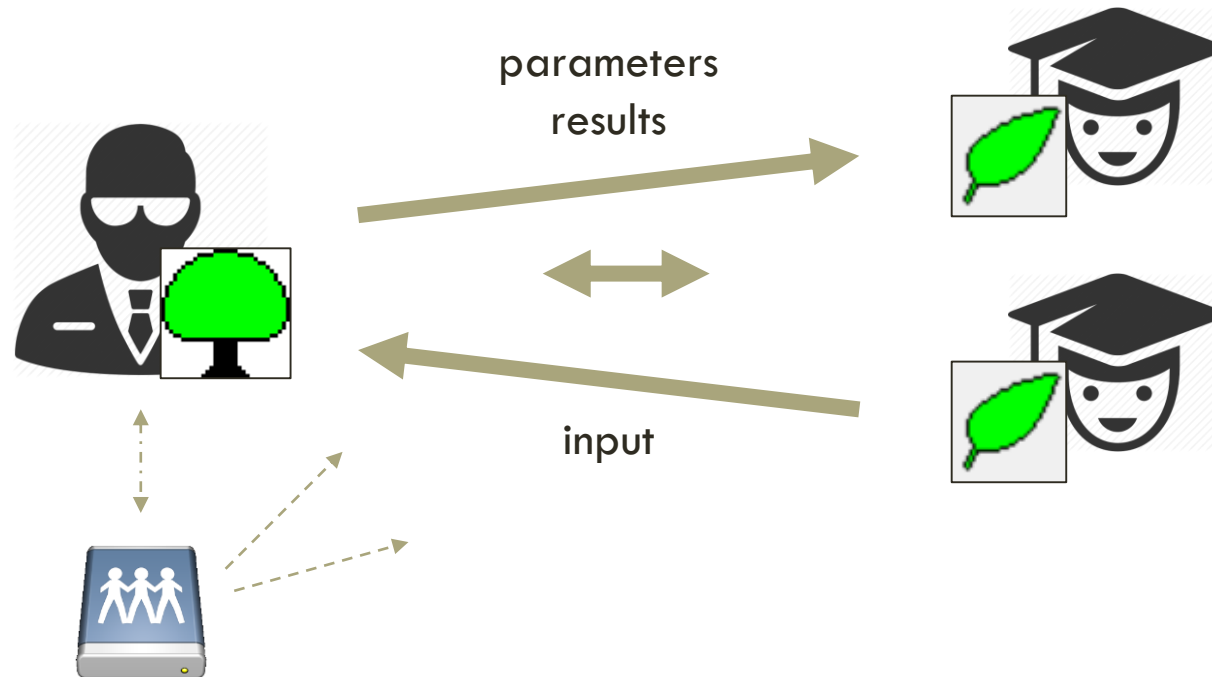
- **Interactive games**
- **Sequential games**
- **Advanced Topics**
- **Frontiers**

INTERACTIVE GAMES

1. How z-Tree works
2. Treatments
3. Questionnaires
4. Setting up a testing environment
5. Example: Prisoner's dilemma
6. z-Tree generated files










HOW Z-TREE WORKS

- Client-server architecture that is great for complex matching protocols
- Server: z-Tree | Client: z-Leaf



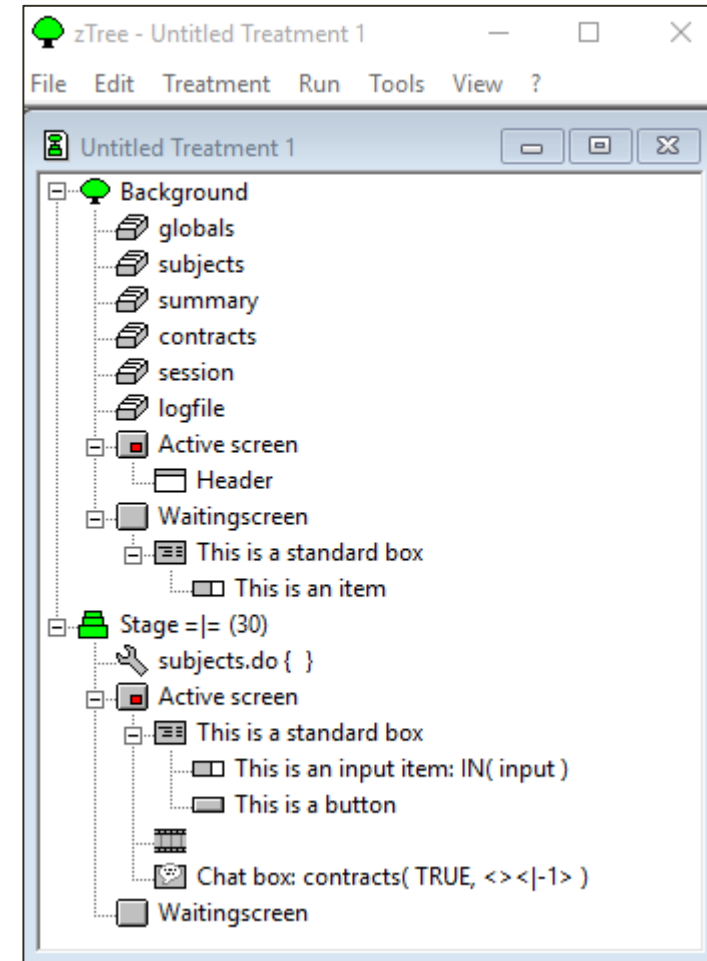
HOW Z-TREE WORKS

- An *experiment* consists of one or more *sessions*
- Each session consists of one or more *treatments* and *questionnaires*
- Treatments are *ztt* files where the rules of the game are set and run
- Questionnaires are *ztq* files that conclude a session and usually collect demographics

Name	Date modified	Type	Size
 Quest_En	11/8/2013 9:29 AM	ZTQ File	26 KB
 Quest1	9/26/2008 11:42 AM	ZTQ File	14 KB
 Quest2	9/26/2008 2:33 PM	ZTQ File	14 KB
 Questionario_largo	5/18/2011 8:36 PM	ZTQ File	14 KB
 Lies_en	10/29/2013 7:40 AM	ZTT File	12 KB
 N_16	11/6/2013 6:22 AM	ZTT File	12 KB
 N_20	10/29/2013 7:30 AM	ZTT File	13 KB
 N-experiment	5/18/2011 8:55 PM	ZTT File	11 KB
 N-experiment_Granada	11/9/2011 9:00 AM	ZTT File	11 KB

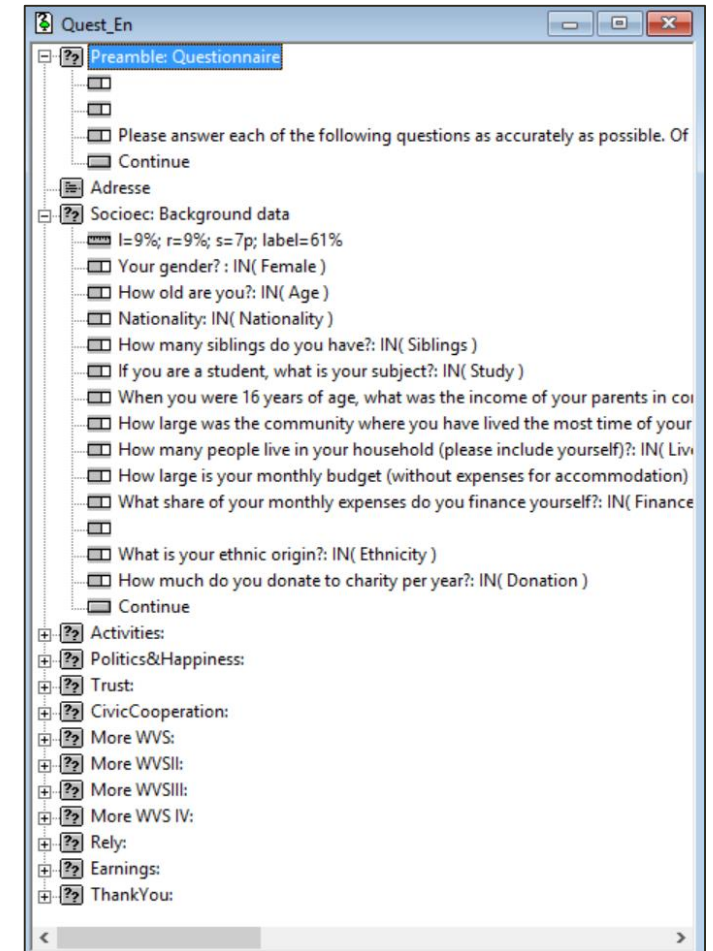
TREATMENTS (ZTT)

- z-Tree starts with an empty *treatment*
- A treatment is represented by a *stage tree*
- In *Background* we control *general parameters*
- Stages have two screens: *Active* and *Waiting*
- Screens can display different types of *boxes*
- Standard boxes can hold *items* and *buttons*
- Specific parameters are defined in *Programs*
- Stages can be repeated multiple times (*periods*)
- Data is stored in tables



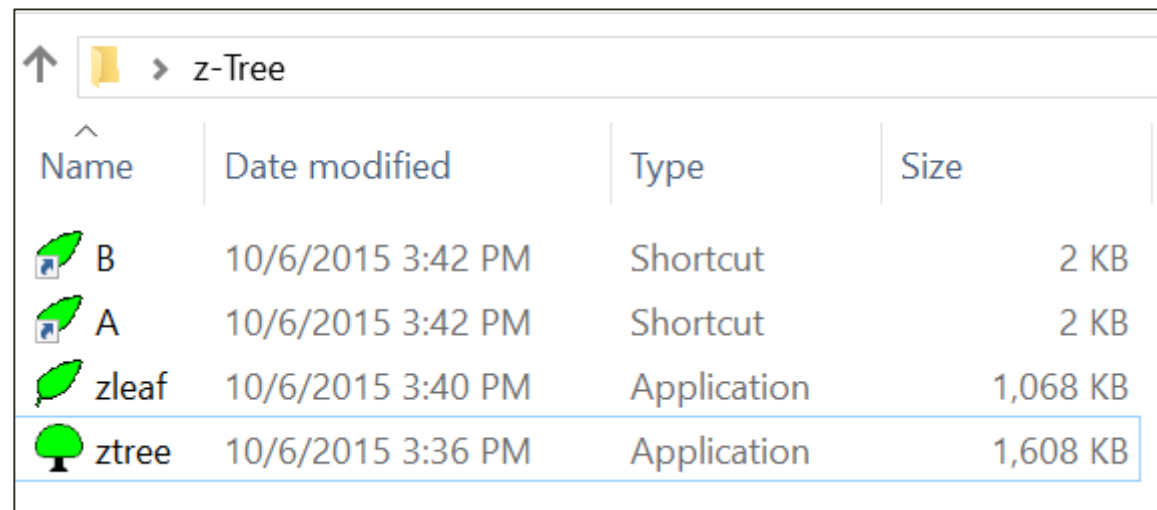
QUESTIONNAIRES (ZTQ)

- Each session ends with a questionnaire
- Questionnaires usually start with the *address form*
- Next, additional *question forms* (stages) can be inserted
- Each question form can have questions (items) and a button
- Questionnaires use rulers, not boxes



SETTING UP A TESTING ENVIRONMENT

- Everyone should register and download z-Tree from here: [//www.ztree.uzh.ch/index.html](http://www.ztree.uzh.ch/index.html)
- Create a folder called z-Tree on our desktop and place both files there
- Create two shortcuts to zleaf.exe and name them **A** and **B**

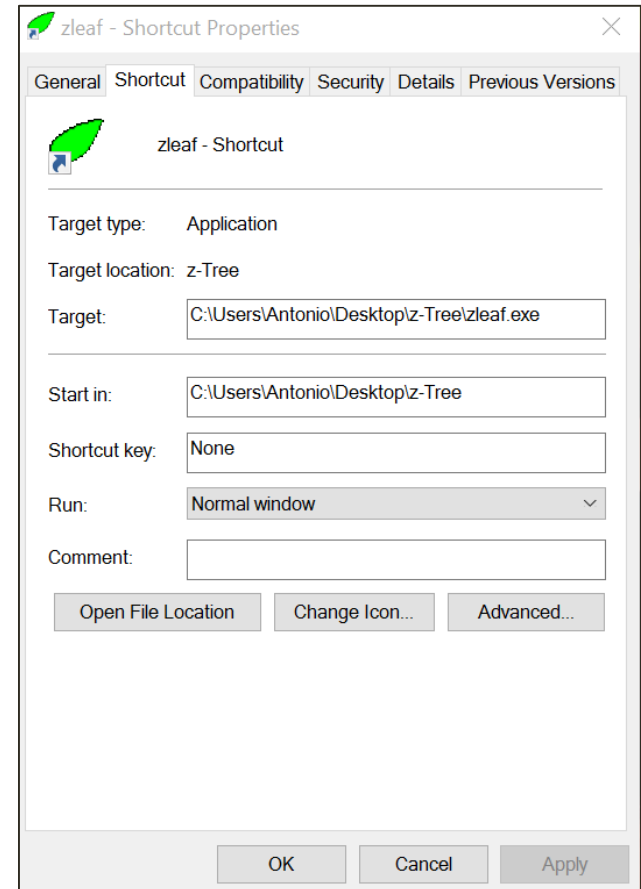


The screenshot shows a Windows File Explorer window with the address bar displaying 'z-Tree'. The main area contains a table of files and folders. The table has four columns: Name, Date modified, Type, and Size. The files listed are B, A, zleaf, and ztree. B and A are shortcuts, while zleaf and ztree are applications. The ztree file is highlighted with a blue selection bar.

Name	Date modified	Type	Size
B	10/6/2015 3:42 PM	Shortcut	2 KB
A	10/6/2015 3:42 PM	Shortcut	2 KB
zleaf	10/6/2015 3:40 PM	Application	1,068 KB
ztree	10/6/2015 3:36 PM	Application	1,608 KB

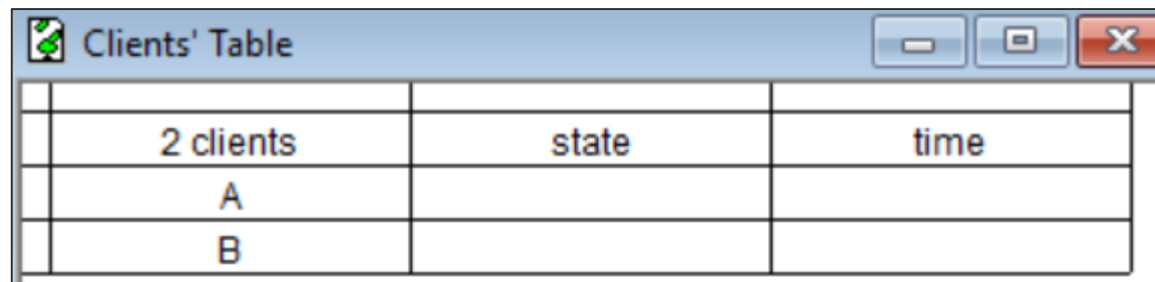
SETTING UP A TESTING ENVIRONMENT

- Right click on the **A** shortcut and then select *Properties*
- Go to the end of the *Target* field and add the following:
/name A /language en
- Repeat for **B**



SETTING UP A TESTING ENVIRONMENT

- Open z-Tree
- Set language to English by selecting **Treatment** → **Language**
- Close the *Untitled Treatment 1* window and select **File** → **New Treatment**
- Open z-Leafs (they will only work if z-Tree is open)
- z-Leafs start in full-screen mode, to close (switch) press Alt+F4 (Alt+Tab)
- Back on z-Tree you can see the clients logged if you select Run → Clients table



	state	time
2 clients		
A		
B		

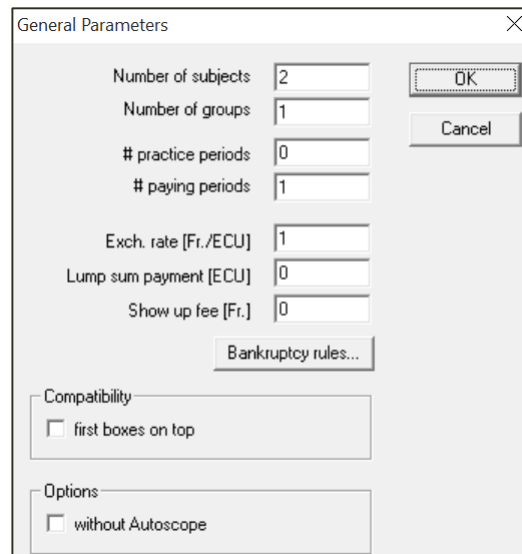
EXAMPLE: PRISONER'S DILEMMA (PD)

- The Prisoner's dilemma can be represented as follows:
 - If both players cooperate (C), they both receive the reward R
 - If both players defect (D), they both receive the punishment P
 - If **A** defects while **B** cooperates, then **A** gets the Temptation payoff T , while **B** gets the sucker's payoff S
 - *PD will occur whenever $T > R > P > S$*

		B	
		Cooperate	Defect
A	Cooperate	R R	S T
	Defect	T S	P P

EXAMPLE: PRISONER'S DILEMMA (PD)

- Let's program!
- In *Background* we control *general parameters*
- If you double-click on **Background** you can set up the following:



The screenshot shows a dialog box titled "General Parameters" with a close button (X) in the top right corner. The dialog contains several input fields and buttons:

- Number of subjects: 2
- Number of groups: 1
- # practice periods: 0
- # paying periods: 1
- Exch. rate [Fr./ECU]: 1
- Lump sum payment [ECU]: 0
- Show up fee [Fr.]: 0

Buttons include "OK", "Cancel", and "Bankruptcy rules...".

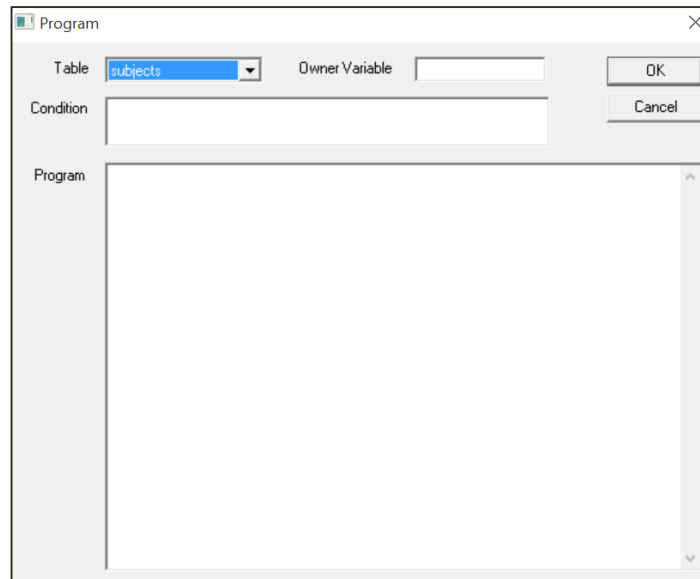
There are two sections with checkboxes:

- Compatibility: first boxes on top
- Options: without Autoscope

EXAMPLE: PRISONER'S DILEMMA (PD)

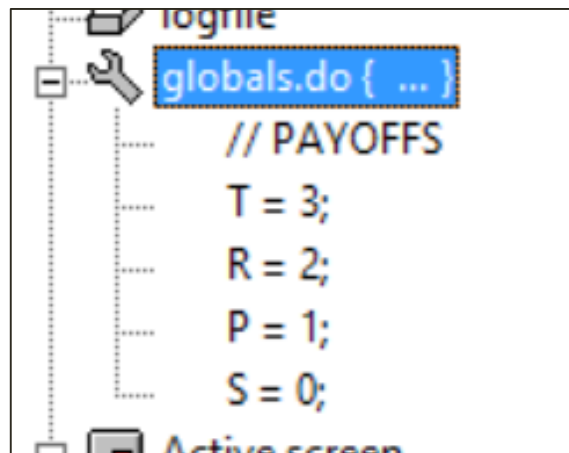
- To create a **program**, select **logfile** and then go to **Treatment** → **New Program**
- It's a good idea to start defining **global variables** that affect everyone equally:

T R P S



EXAMPLE: PRISONER'S DILEMMA (PD)

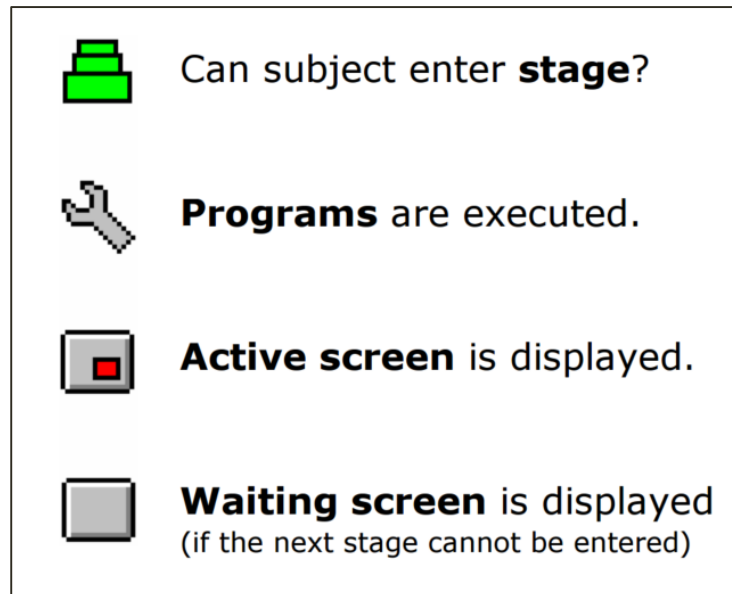
- Notice that there are different types of tables, **globals** is ideal to store payoffs:
 - It holds a single record or row
 - Values are stored are the same for all subjects
 - Freshly set up for each period
 - Holds default variables: `Period`, `NumPeriods`, `RepeatTreatment`



```
globals.do { ... }  
// PAYOFFS  
T = 3;  
R = 2;  
P = 1;  
S = 0;
```

EXAMPLE: PRISONER'S DILEMMA (PD)

- We now need to get some input from **A** and **B**
- Stages have two screens: *Active* and *Waiting*
- A **stage** goes through the following path:



EXAMPLE: PRISONER'S DILEMMA (PD)

- Let's go to the top of the tree on **Background** and select **Treatment** → **New Stage**

Stage

Name

Start

Wait for all

Start if possible

Start if...

Number of subjects in Stage

At most one per group in stage

Leave stage after timeout

If no input Yes No

Timeout

EXAMPLE: PRISONER'S DILEMMA (PD)

- We now need to show something in the active screen
- Screens can display different types of *boxes*
- We select our active screen and then **Treatment** → **New Box** → **Standard Box**

The image shows a dialog box titled "Standard Box" with a close button (X) in the top right corner. The dialog contains the following fields and options:

- Name:** A text field containing "Standard" and a checked checkbox labeled "with Frame".
- Width [p/%]:** An empty text field.
- Height [p/%]:** An empty text field.
- Distance to the margin [p/%]:** A group box containing four empty text fields for top, bottom, left, and right margins.
- Adjustment of the remaining box:** A group box containing four checkboxes: "left", "top", "right", and "bottom", all of which are currently unchecked.
- Display condition:** A large empty text area.
- Buttons:** A group box containing two sub-sections:
 - Position:** A 3x3 grid of radio buttons. The bottom-right radio button is selected.
 - Arrangement:** Two radio buttons: "In rows" (selected) and "In columns".
- OK** and **Cancel** buttons are located on the right side of the dialog.

EXAMPLE: PRISONER'S DILEMMA (PD)

- Let's get their decisions!
- Standard boxes can hold *items* and *buttons*
- Select the active screen and then **Ctrl + Alt + I**
- Note that an item can be input or not (output)
- z-Tree offers multiple layouts...

The screenshot shows the 'Item' dialog box in the z-Tree software. The dialog has a title bar with a close button (X) in the top right corner. It contains several fields and checkboxes:

- Label:** A text box containing the text "What is your decision?".
- Variable:** A text box containing the text "Decision".
- Layout:** A text box containing the text "Iradio: 1 = 'Cooperate'; 0 = 'Defect';".
- Input:** A checkbox that is checked, with the label "Input".
- Minimum:** A text box containing the value "0".
- Maximum:** A text box containing the value "1".
- Show value (value of variable or default):** An unchecked checkbox.
- Empty allowed:** An unchecked checkbox.
- Default:** An empty text box.

On the right side of the dialog, there are two buttons: "OK" and "Cancel".

EXAMPLE: PRISONER'S DILEMMA (PD)

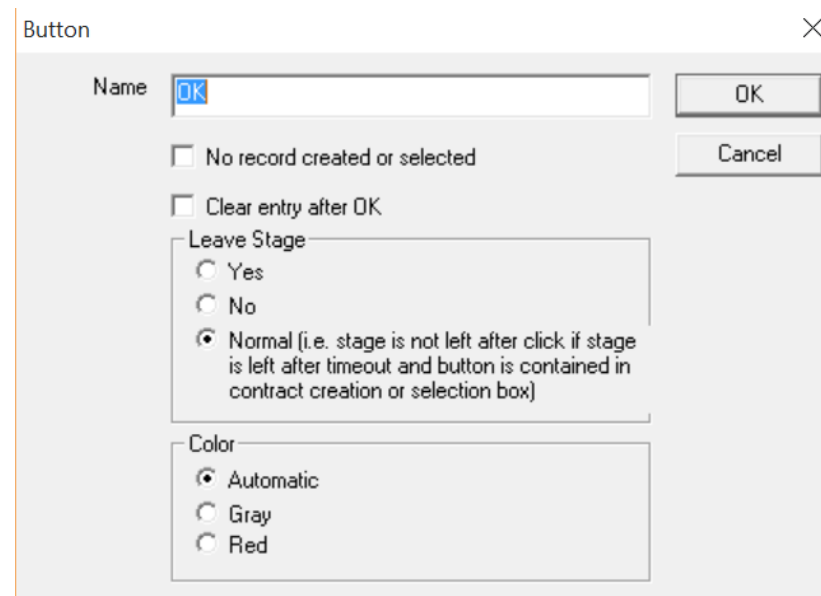
- z-Tree offers multiple layouts...

Examples of item layouts

Layout	Input variable	Output variable
2	<input type="text" value="6"/>	6
!text: 7 = "seven"; 8 = "eight"; 9 = "nine";	<input type="text" value="seven"/>	seven
!radio: 1 = "86.8"; 24 = "102.8";	<input checked="" type="radio"/> 86.8 <input type="radio"/> 102.8	<input checked="" type="radio"/> 86.8 <input type="radio"/> 102.8
!radioline: 0="zero";5="five"; 6;	zero <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> five	zero <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> five
!radiosequence: 7="seven";8="eight";9="nine";	<input type="radio"/> seven <input type="radio"/> eight <input type="radio"/> nine	<input type="radio"/> seven <input checked="" type="radio"/> eight <input type="radio"/> nine
!slider: 0 ="A"; 100= "B"; 101;	A <input type="range"/> B	A <input type="range"/> B
!scrollbar: 0="L";100= "R";101;	L <input type="range"/> R	L <input type="range"/> R
!checkbox:1="check me";	<input checked="" type="checkbox"/> check me	<input checked="" type="checkbox"/> check me
!button: 1 = "accept"; 0 = "reject";	<input type="button" value="accept"/> <input type="button" value="reject"/>	accept
!string	<input type="text"/>	
20		Hello World

EXAMPLE: PRISONER'S DILEMMA (PD)

- Let's add a button!
- Without one participants can't continue
- Select the item and then **Treatment** → **New button**

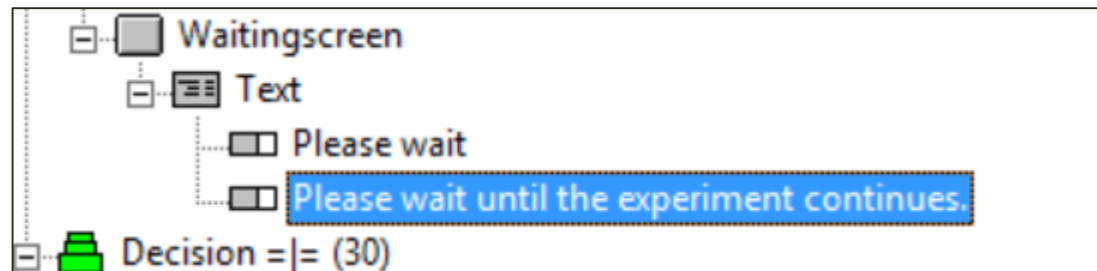


The image shows a dialog box titled "Button" with a close button (X) in the top right corner. The dialog contains the following elements:

- A "Name" text field containing the text "OK".
- Two buttons: "OK" and "Cancel".
- Two unchecked checkboxes:
 - No record created or selected
 - Clear entry after OK
- A "Leave Stage" section with three radio button options:
 - Yes
 - No
 - Normal (i.e. stage is not left after click if stage is left after timeout and button is contained in contract creation or selection box)
- A "Color" section with three radio button options:
 - Automatic
 - Gray
 - Red

EXAMPLE: PRISONER'S DILEMMA (PD)

- We now have an active screen and an input variable
- Stages have two screens: *Active* and *Waiting*
- To complete our stage we just need to get the *Waiting* message
- Let's add a Standard box and an (output) item saying "Please wait"
- Waiting screens are usually similar across stages, let's move it to Background!
- Looks like z-Tree was ahead of us and preset a message, let's delete box and item



EXAMPLE: PRISONER'S DILEMMA (PD)

- Note that Background has also another thing preset: **Header Box**

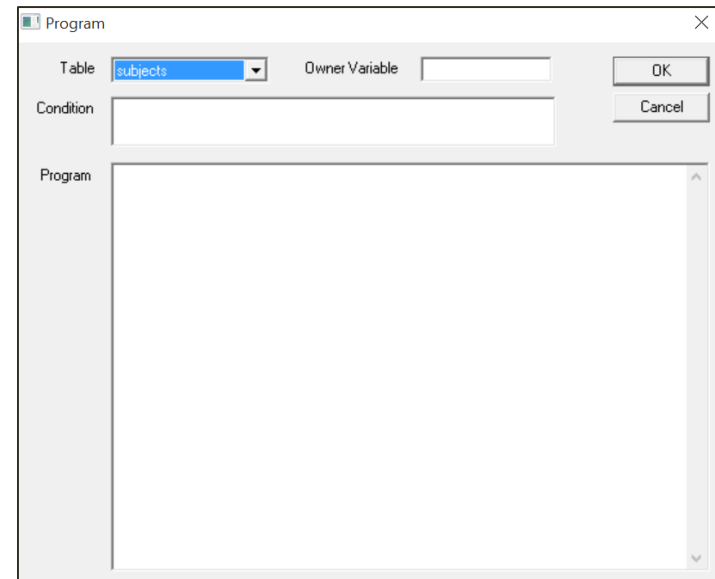
The image shows a dialog box titled "Header Box" with a close button (X) in the top right corner. The dialog is used to configure the appearance and content of a header box. It contains the following fields and options:

- Name:** A text field containing "Header".
- With frame:** A checked checkbox.
- Width [p/%]:** An empty text field.
- Height [p/%]:** A text field containing "10%".
- Distance to the margin [p/%]:** A text field containing "0p".
- Adjustment of the remaining box:** A group of four checkboxes: "left" (unchecked), "top" (checked), "right" (unchecked), and "bottom" (unchecked).
- Display condition:** A large empty text area.
- Show current period number:** A checked checkbox.
- Show total number of periods:** A checked checkbox.
- Name of "Period":** A text field containing "Period".
- Term for "out of":** A text field containing "of".
- Prefix for trial periods:** A text field containing "Trial".
- Display time:** A checked checkbox.
- Term for "Remaining time":** A text field containing "Remaining time [sec]:".
- Term for "Please reach a decision":** A text field containing "Please reach a decision."

Buttons for "OK" and "Cancel" are located in the top right area of the dialog.

EXAMPLE: PRISONER'S DILEMMA (PD)

- What do we do with the input? Let's calculate payoffs!
- Specific parameters are defined in *Programs*
- Let's create a new Stage called **Results** and add a Program for the **Subjects** table
 - One row per subject (each can have different values)
 - When subjects enter a stage, programs get executed
 - Freshly set up for each period
 - Programs are executed row by row
 - Holds default variables:
Period, Subject, Group, Profit,
TotalProfit, Participate **and** LeaveStage



EXAMPLE: PRISONER'S DILEMMA (PD)

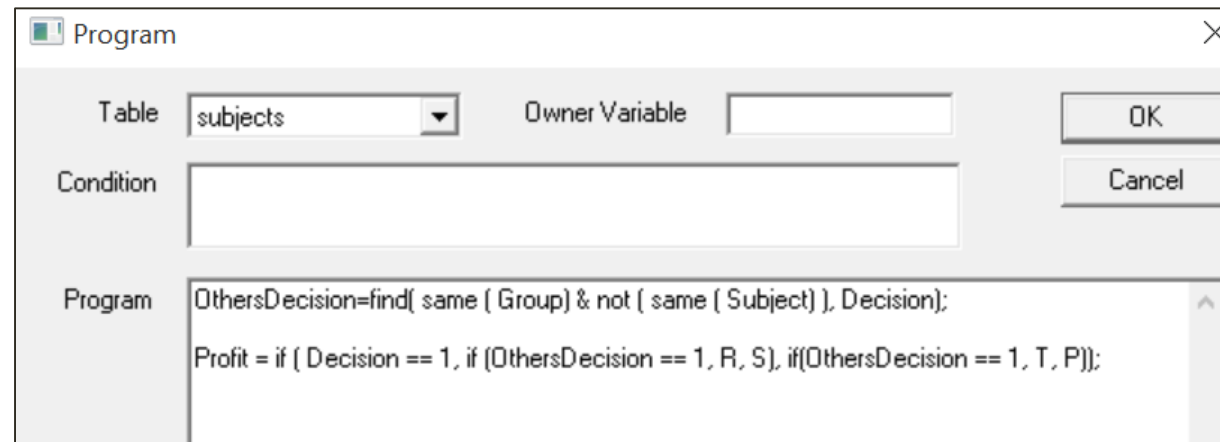
- We need to find the partner's decision and calculate payoffs using two functions:

`find(x), find(a, x)`

The first value of the variable (where a is satisfied).

`if(a, x, y)`

If a, then the value of the function is x, otherwise y



EXAMPLE: PRISONER'S DILEMMA (PD)

- Let's now give some feedback on the active screen
- Select a Standard box and add items showing own decision, other's decision and profit
- Add a button!

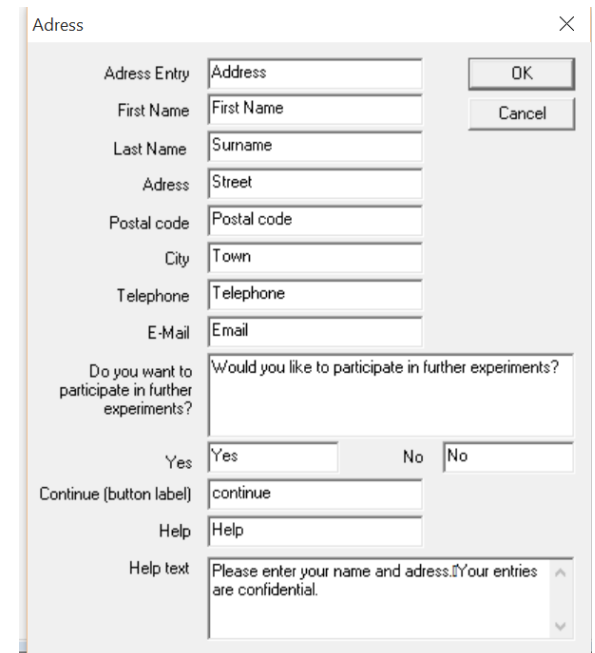
The image shows a dialog box titled "Item" with a close button (X) in the top right corner. The dialog is divided into three main sections: "Label", "Variable", and "Layout".

- Label:** A text field containing "Your decision".
- Variable:** A text field containing "Decision".
- Layout:** A text field containing the code: `!text: 1 = "Cooperate"; 0 = "Defect";`

At the bottom left, there is a checkbox labeled "Input" which is currently unchecked. On the right side of the dialog, there are two buttons: "OK" and "Cancel".

EXAMPLE: PRISONER'S DILEMMA (PD)

- The treatment is complete but we still need to set up a questionnaire
- Select **File** → **New Questionnaire**
- Add an Address form with **Questionnaire** → **New Address Form**
- Note that the only mandatory field is *button label*
- An empty address form will simply not show
- Add a Question form with **Questionnaire** → **New Question Form**
- Name the Question form *Questionnaire*



The image shows a screenshot of a software interface titled "Address" with a close button (X) in the top right corner. The form contains several input fields and a confirmation section:

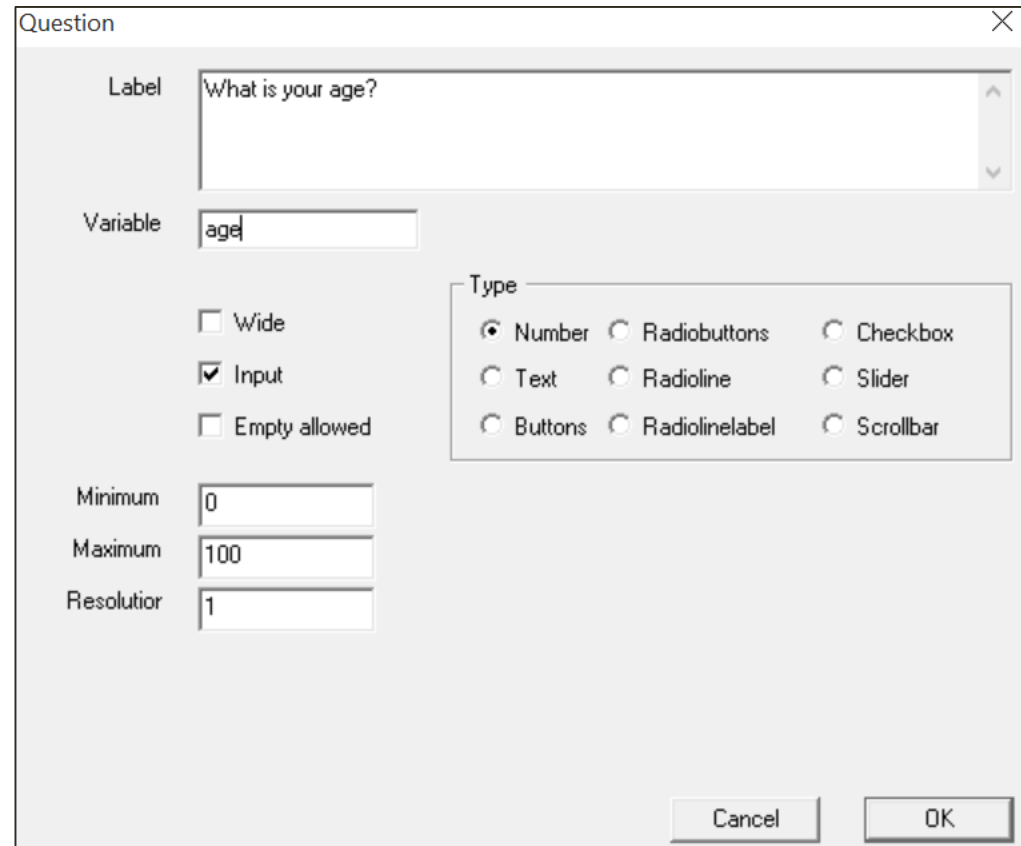
- Address Entry:** Address
- First Name:** First Name
- Last Name:** Surname
- Address:** Street
- Postal code:** Postal code
- City:** Town
- Telephone:** Telephone
- E-Mail:** Email

Below the input fields, there is a confirmation question: "Do you want to participate in further experiments?". The answer options are "Yes" and "No", with "No" selected. There are also fields for "Continue (button label)" with the value "continue" and "Help" with the value "Help".

The "Help text" field contains the text: "Please enter your name and address. Your entries are confidential."

EXAMPLE: PRISONER'S DILEMMA (PD)

- Add a new question for *age*...
- ...and another one for *gender*
- The form finishes with a **button**
- The session finishes with an **empty Form**
- We are now ready to test!
- **If you wish, you can save your PDE**

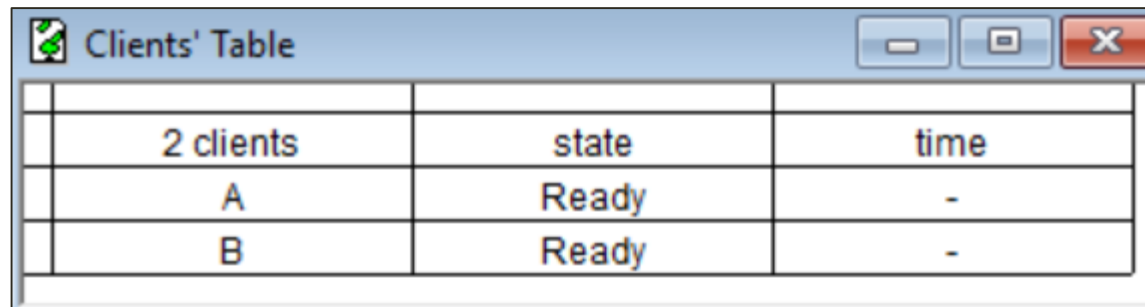


The screenshot shows a 'Question' dialog box with the following fields and options:

- Label:** A text area containing 'What is your age?'.
- Variable:** A text field containing 'age'.
- Wide:**
- Input:**
- Empty allowed:**
- Minimum:** A text field containing '0'.
- Maximum:** A text field containing '100'.
- Resolution:** A text field containing '1'.
- Type:** A group box containing radio buttons for:
 - Number (selected)
 - Radiobuttons
 - Checkbox
 - Text
 - Radioline
 - Slider
 - Buttons
 - Radiolinelabel
 - Scrollbar
- Buttons:** 'Cancel' and 'OK' buttons at the bottom right.

EXAMPLE: PRISONER'S DILEMMA (PD)

- To test, open the Clients table and make sure that **A** and **B** are present
- Go to **Run** → **Start treatment (F5)**
- Once the interaction is over participants will remain in the waiting screen
- If you see the client's table you will notice when participants are ready
- The state column also shows in which stage participants are if active (*) or waiting (-)
- You can also try and see other tables



The screenshot shows a window titled "Clients' Table" with a table containing three columns: "2 clients", "state", and "time". The table has three rows: a header row, a row for client "A", and a row for client "B". Both clients "A" and "B" are in the "Ready" state, and the "time" column shows a hyphen "-" for both.

2 clients	state	time
A	Ready	-
B	Ready	-

EXAMPLE: PRISONER'S DILEMMA (PD)

- Once participants are ready we select the Questionnaire and run it with **F5**
- After the last participant completes the questionnaire the session is complete
- Close z-Leafs and then z-Tree
- Look at the files produced in the z-Tree folder
 - ADR file
 - Copies of the treatments and questionnaires (timestamp)
 - Server.ecc
 - Back up gsf file
 - Data from treatments (xls) and questionnaires (.sbj)
 - PAY file
 - Two temporary files @db and @prevdb

<input type="checkbox"/>	Name	Date modified	Type
<input type="checkbox"/>	151006_2210.adr	10/6/2015 10:11 PM	ADR File
<input type="checkbox"/>	zleaf	10/6/2015 4:13 PM	Application
<input type="checkbox"/>	ztree	10/6/2015 9:44 PM	Application
<input type="checkbox"/>	server.ecc	10/6/2015 10:10 PM	EEC File
<input type="checkbox"/>	151006_2210.gsf	10/6/2015 10:12 PM	GSF File
<input checked="" type="checkbox"/>	151006_2210	10/6/2015 10:12 PM	Microsoft Excel
<input type="checkbox"/>	151006_2210	10/6/2015 10:11 PM	PAY File
<input type="checkbox"/>	151006_2210.sbj	10/6/2015 10:12 PM	SBJ File
<input type="checkbox"/>	A	10/6/2015 4:13 PM	Shortcut
<input type="checkbox"/>	B	10/6/2015 4:13 PM	Shortcut
<input type="checkbox"/>	@db	10/6/2015 10:11 PM	Text Document
<input type="checkbox"/>	@prevdb	10/6/2015 10:11 PM	Text Document
<input type="checkbox"/>	@1	10/6/2015 10:11 PM	ZTQ File
<input type="checkbox"/>	@1	10/6/2015 10:11 PM	ZTT File

Z-TREE GENERATED FILES

- The spreadsheet produced by z-Tree appends all tables
- Hard to read in large sessions with many periods
- z-Tree has a built in function to break the file into smaller versions for each table
- Open z-Tree and select **Tools** → **Separate Tables**

A	B	C	D	E	F	G	H	I	J	K	L	M	
151006_2210	1	globals	Period	NumPeriods	RepeatTreatment	T	R	P	S				
151006_2210	1	globals	1	1	0		3	2	1	0			
151006_2210	1	subjects	Period	Subject	Group	Profit	TotalProfit	Participate	Decision	TimeOKDecisionOK	OthersDecision	TimeOKResultsOK	
151006_2210	1	subjects	1	1	1		2	2	1	1	23	1	30
151006_2210	1	subjects	1	2	1		2	2	1	1	28	1	28
151006_2210	1	summary	Period										
151006_2210	1	summary	1										
151006_2210	1	session	Subject	FinalProfit	ShowUpFee	ShowUpFeeInvested	MoneyAdded	MoneyToPay	MoneyEarned				
151006_2210	1	session	1	2	0		0	0	2	2			
151006_2210	1	session	2	2	0		0	0	2	2			

Z-TREE GENERATED FILES

- Note also that the data from the questionnaire is in a separate file
- z-Tree has also a built in function that merges both files
- Select **Tools** → **Join *.sbj file** and select the spreadsheet with the subjects' data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	SessionID	Treatment	subjects	Period	Subject	Group	Profit	TotalProfit	Participate	Decision	TimeOK	OthersDec	TimeOK	Re client	age	gender
2	151006_2		1 subjects	1	1	1	2	2	1	1	23	1	30	A	25	Female
3	151006_2		1 subjects	1	2	1	2	2	1	1	28	1	28	B	33	Male