INTRODUCTION TO Z-TREE

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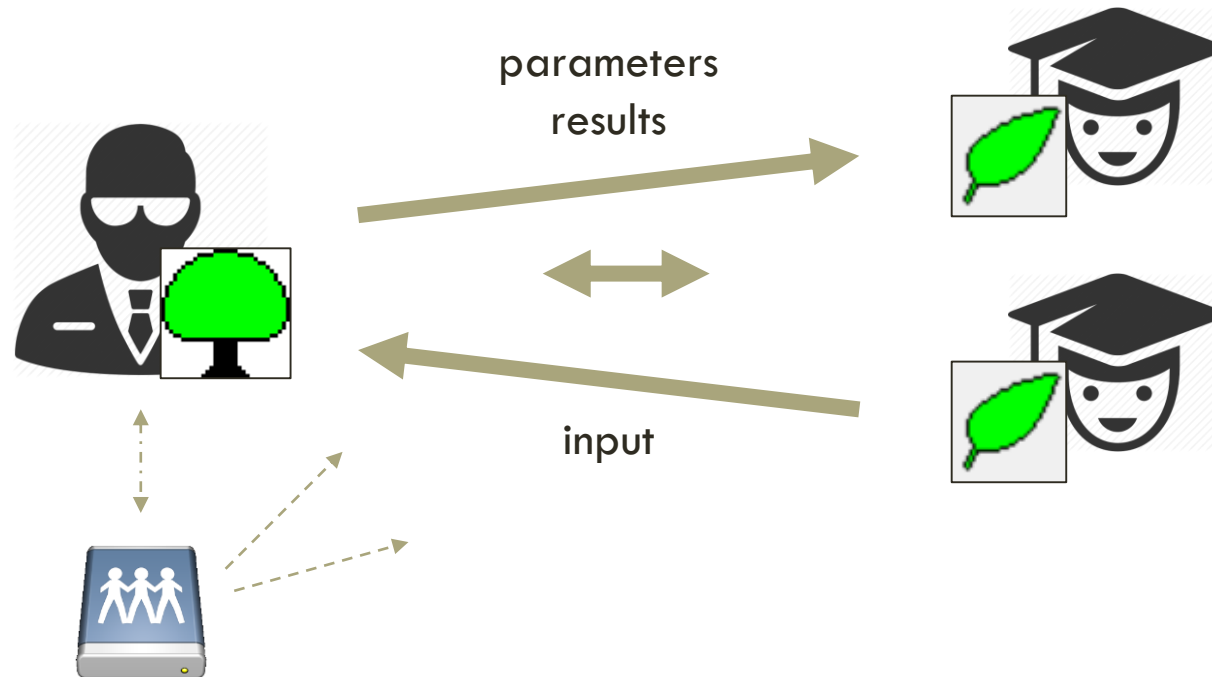# SCHEDULE

- **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*)
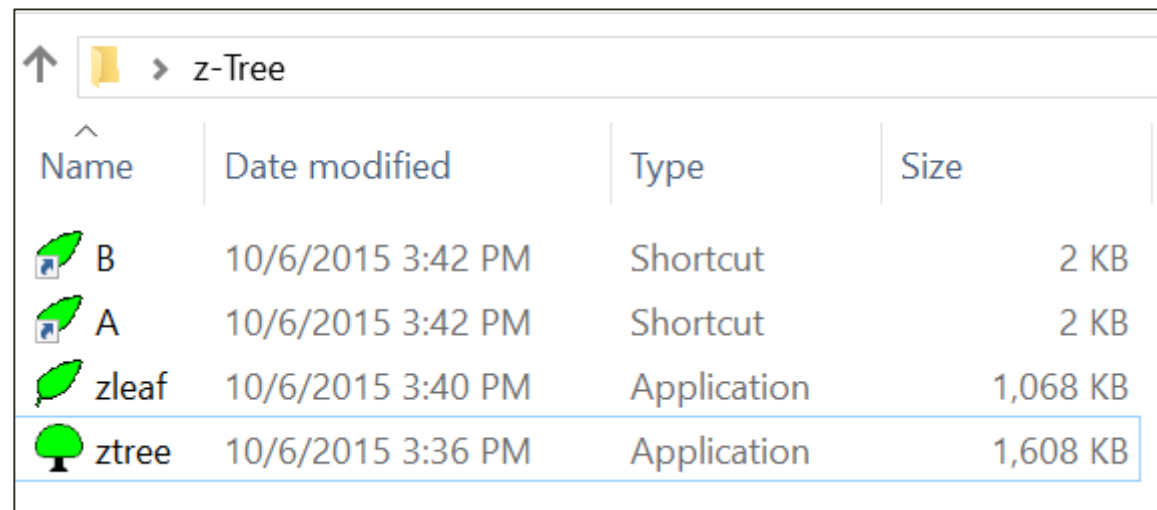
- Data is stored in tables
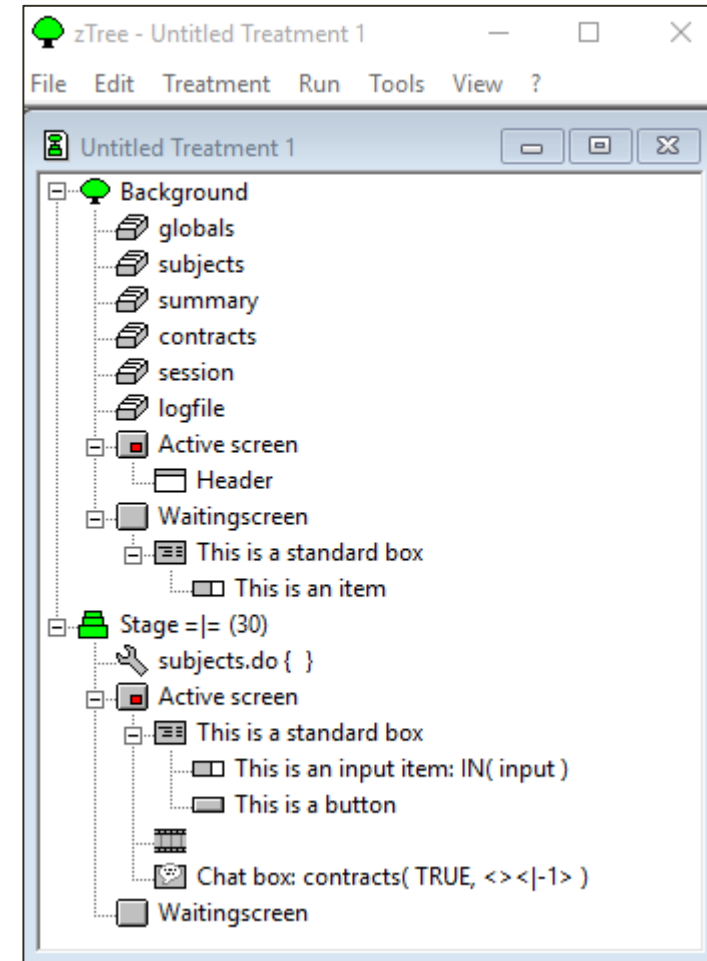
QUESTIONNAIRES (ZTQ)

- 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
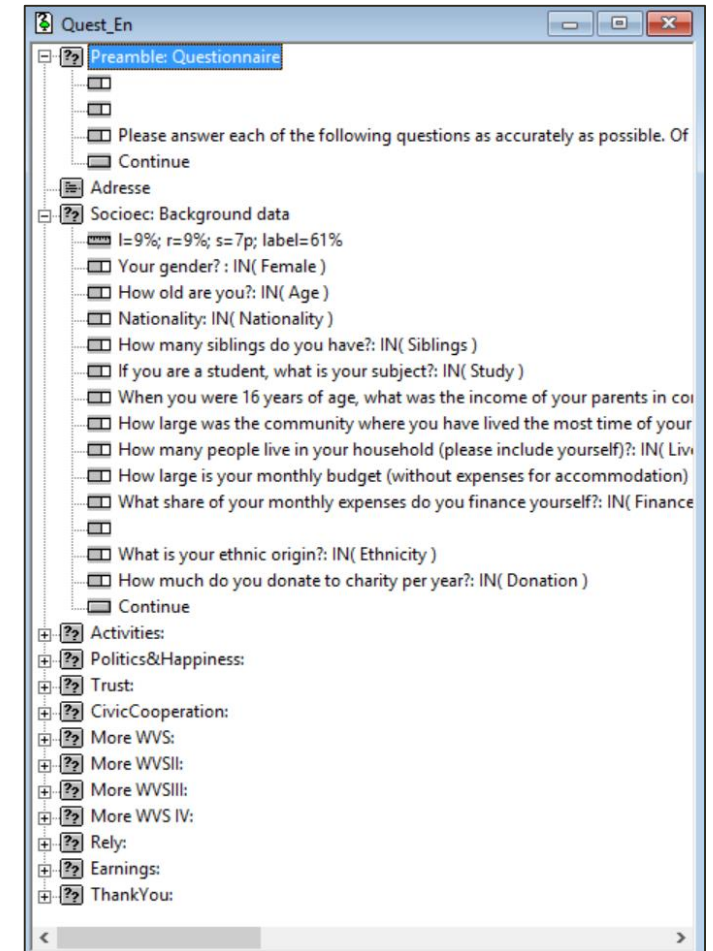
SETTING UP A TESTING ENVIRONMENT

- Everyone should register and download z-Tree from here://www.ztree.uzh.ch/index.html

- 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**

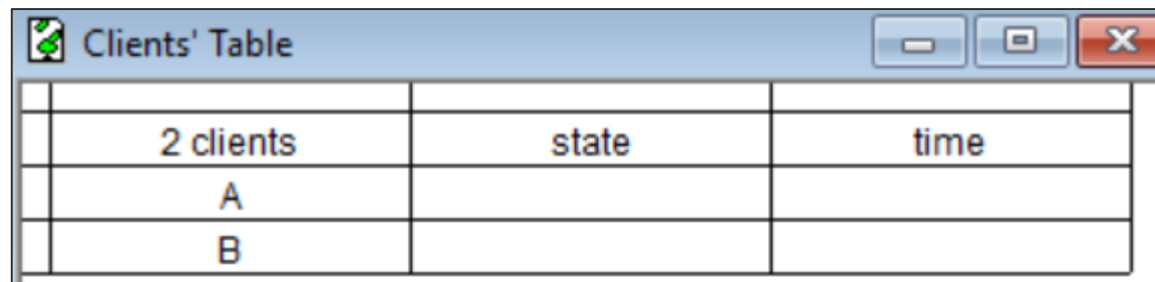| Name	Date modified	Type	Size
B	10/6/2015 3:42 PM	Shortcut	2 KB
A	10/6/2015 3:42 PM	Shortcut	2 KB
zleaf	10/6/2015 3:40 PM	Application	1,068 KB
ztree	10/6/2015 3:36 PM	Application	1,608 KB

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**
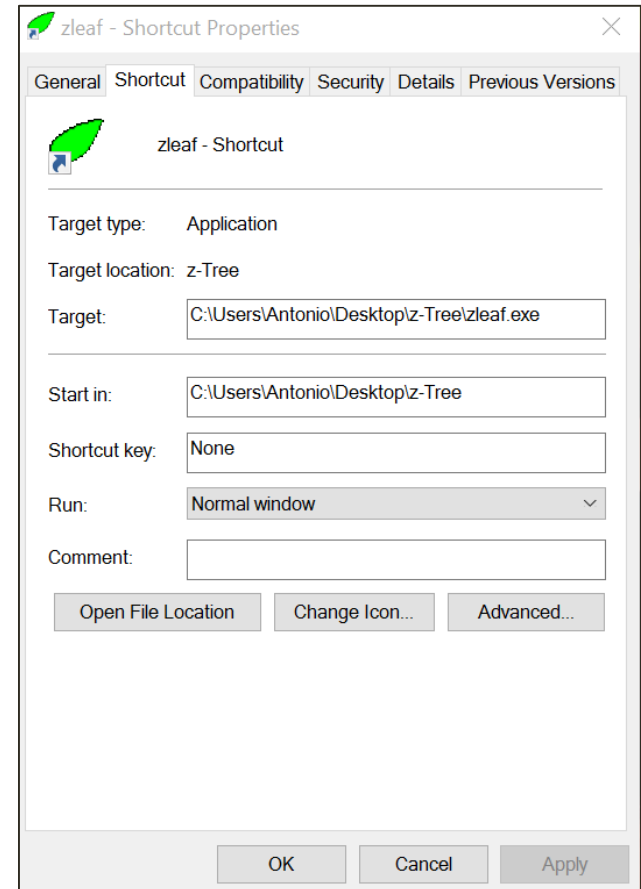
SETTING UP A TESTING ENVIRONMENT

- 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

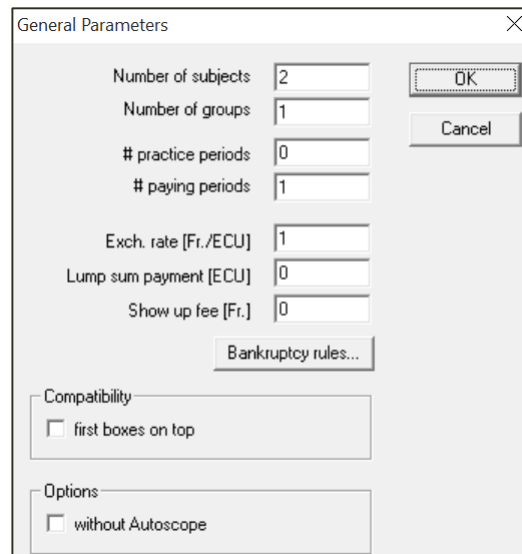| Clients' Table		
2 clients	state	time
A		
B		

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:
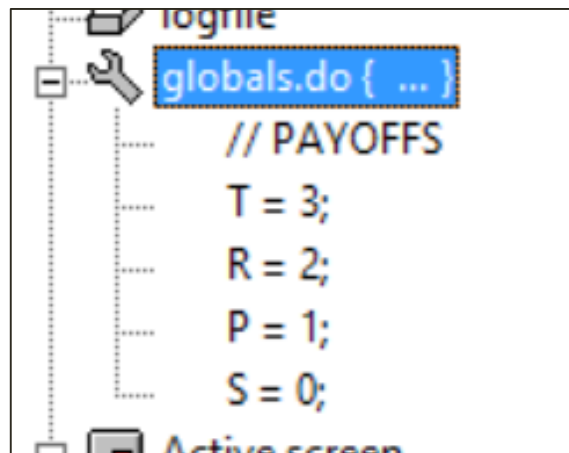
EXAMPLE: PRISONER'S DILEMMA (PD)

- 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
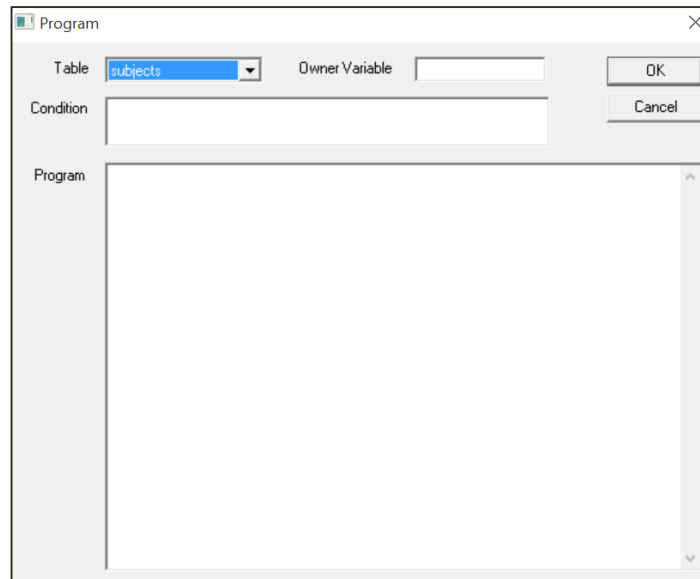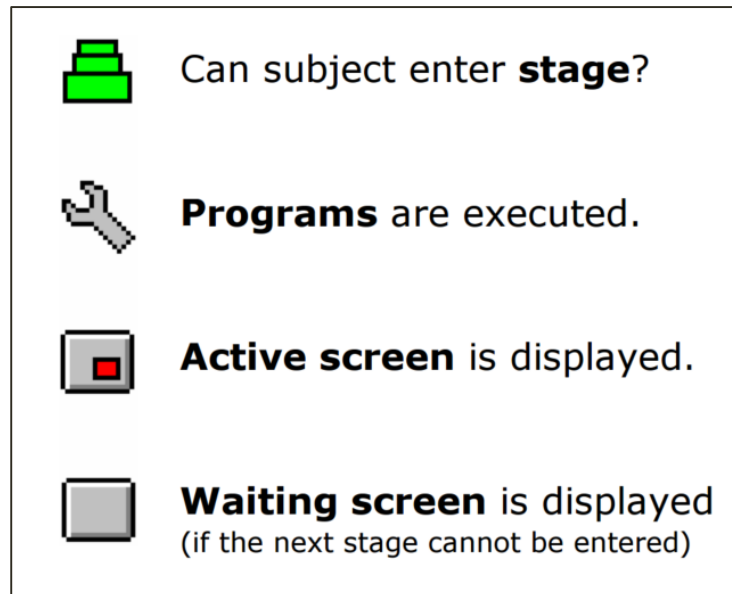
EXAMPLE: PRISONER'S DILEMMA (PD)

▪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 <u>the same for all subjects</u>

- Freshly set up for each period

- Holds default variables: `Period, NumPeriods, RepeatTreatment`

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:

Can subject enter **stage**?

Programs are executed.

Active screen is displayed.

Waiting screen is displayed
(if the next stage cannot be entered)

EXAMPLE: PRISONER'S DILEMMA (PD)

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

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**

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…

EXAMPLE: PRISONER'S DILEMMA (PD)

- z-Tree offers multiple layouts...

Examples of item layouts

Layout	Input variable	Output variable
2	6	6
!text: 7 = "seven"; 8 = "eight"; 9 = "nine";	seven	seven
!radio: 1 = "86.8"; 24 = "102.8";	⊙ 86.8 ○ 102.8	⊙ 86.8 ○ 102.8
!radioline: 0="zero";5="five"; 6;	zero ○ ○ ⊙ ○ ○ ○ five	zero ○ ○ ⊙ ○ ○ ○ five
!radiosequence: 7="seven";8="eight";9="nine";	○ seven ○ eight ○ nine	○ seven ⊙ eight ○ nine
!slider: 0 ="A"; 100= "B"; 101;	A ____▭__ B	A _____▭ B
!scrollbar: 0="L";100= "R";101;	L ◂ ▭ ▸ R	L ◂ ▭ ▸ R
!checkbox:1="check me";	☑ check me	☑ check me
!button: 1 = "accept"; 0 = "reject";	accept reject	accept
!string	⎢	
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**

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
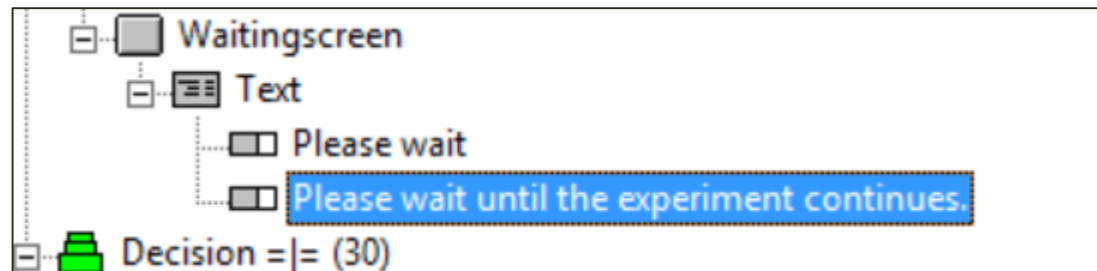
EXAMPLE: PRISONER'S DILEMMA (PD)

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

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`
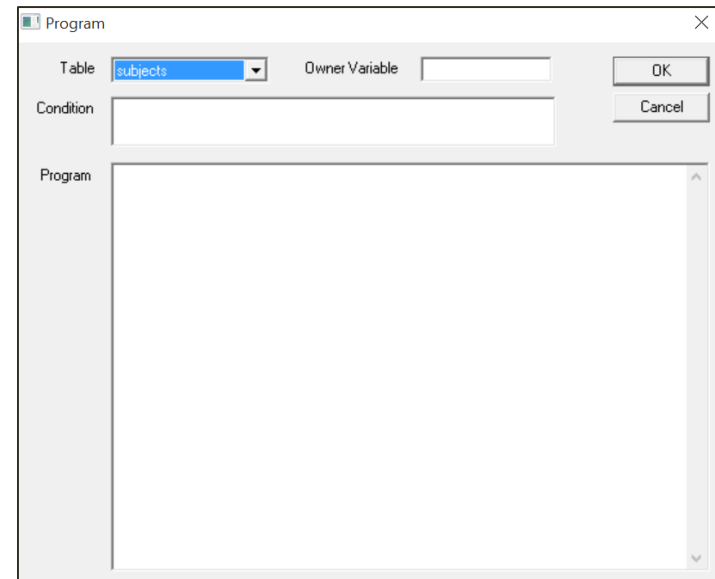
EXAMPLE: PRISONER'S DILEMMA (PD)

- 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

Program window:

Table: subjects

Owner Variable:

Condition:

Program:
```
OthersDecision=find( same ( Group) & not ( same ( Subject) ), Decision);

Profit = if ( Decision == 1, if (OthersDecision == 1, R, S), if(OthersDecision == 1, T, P));
```
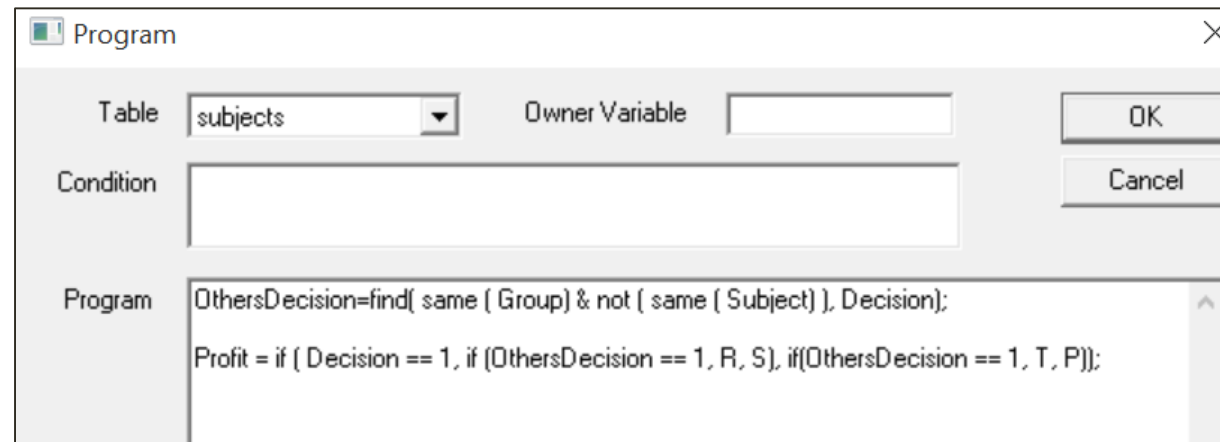
EXAMPLE: PRISONER'S DILEMMA (PD)

- 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!
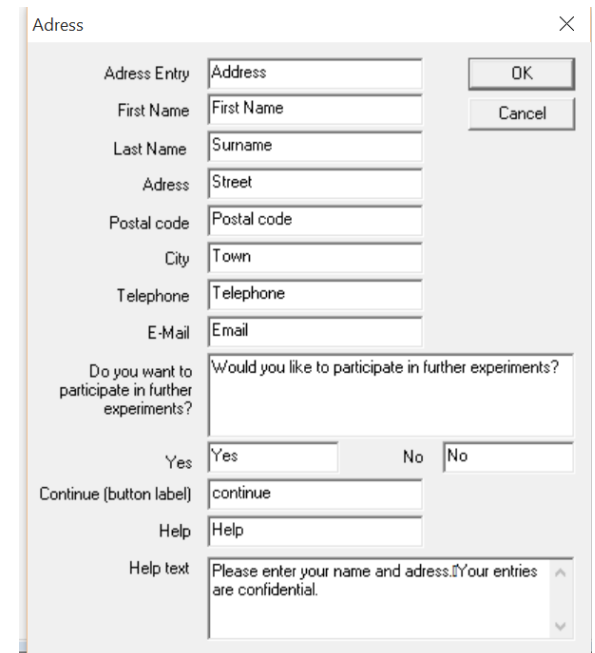
EXAMPLE: PRISONER'S DILEMMA (PD)

- 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*

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**
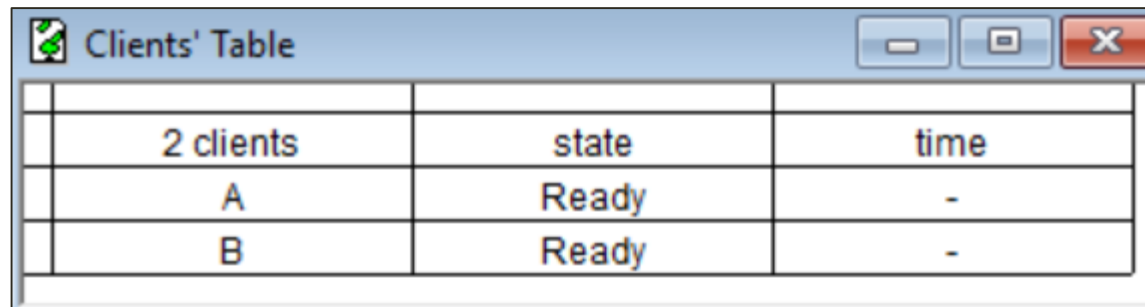
EXAMPLE: PRISONER'S DILEMMA (PD)

- 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

2 clients	state	time
A	Ready	-
B	Ready	-

Clients' Table

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

	Name	Date modified	Type
	151006_2210.adr	10/6/2015 10:11 PM	ADR File
	zleaf	10/6/2015 4:13 PM	Application
	ztree	10/6/2015 9:44 PM	Application
	server.eec	10/6/2015 10:10 PM	EEC File
	151006_2210.gsf	10/6/2015 10:12 PM	GSF File
☑	151006_2210	10/6/2015 10:12 PM	Microsoft Excel
	151006_2210	10/6/2015 10:11 PM	PAY File
	151006_2210.sbj	10/6/2015 10:12 PM	SBJ File
	A	10/6/2015 4:13 PM	Shortcut
	B	10/6/2015 4:13 PM	Shortcut
	@db	10/6/2015 10:11 PM	Text Document
	@prevdb	10/6/2015 10:11 PM	Text Document
	@1	10/6/2015 10:11 PM	ZTQ File
	@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	TimeOKDe	OthersDe	TimeOKRe	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