Programming experiments in oTree

You have a choice

Remixed from material by Ali Seyhun Saral & Philipp Chapkovski

Installing oTree

- What do you need?
  - Python3 installation
  - A virtual environment (optional but **STRONGLY** recommended)

Virtual Environment

A directory that contains

- Python installation
- a number of additional packages.

Virtual environments are useful for “isolated” python developments with different packages & dependencies.

Especially important if you want to run experiments in the DICE Lab

Virtual Environment 1
myvenv1

python 3.7
otree 2.5
numpy 1.18

windows
c:\ot\myvenv1

macos/linux
/home/seyhun/ot/myvenv1

Virtual Environment 2
myvenv2

python 3.6
otree 2.3
numpy 1.0

windows
c:\old\ot\myvenv1

macos/linux
/home/seyhun/old/myvenv1

oTree Installation (a recommendation)

We would like to have this structure:

```
ot
├── oTree
|    ├── app1
|    ├── app2
|    ├── ...
└── vpy37
```

- **ot**: Parent folder for oTree project and virtualenv
- **oTree**: oTree project folder. That contains necessary files and “apps”
- **vpy37:** virtual environment. A copy of python and necessary packages (as well as otree-base)

oTree Installation

- **Create a folder for oTree**

```
mkdir ot
```

- **Go to the folder**

```
cd ot
```

- **Create the virtual environment**

```
python3.7 -m venv vpy37
```

(vpy37 is a name I gave for "virtualenv python")

- **Activate the virtual environment**

```
source vpy37/bin/activate (linux/macos)
vpy37\Scripts\activate (windows)

(vpy37) ~/ot>
```

- **Install oTree**

```
pip3 install otree
```

Creating oTree project and app

- Create an oTree project

```
otree startproject oTree
```

- Go to oTree folder

```
cd oTree
```

- Check if oTree is running properly

```
otree devserver
```

- Go to http://localhost:8000

- Stop the server with Ctrl-C

- Create an app

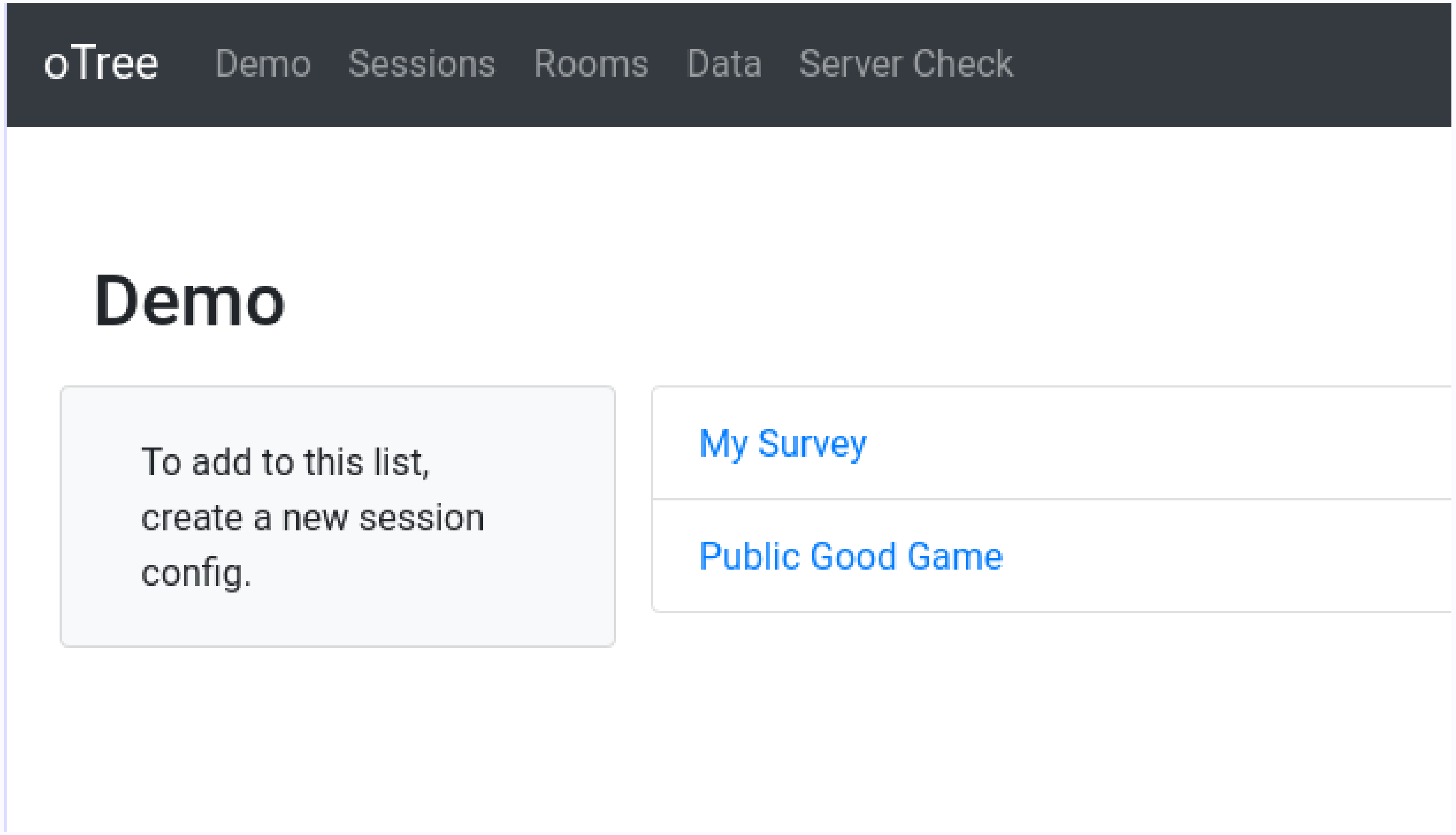
```
otree startapp my_survey
```

Command Line Mini Cheatsheet

print working directory	cd (Windows) pwd (Linux/ MacOS)
list directories in the current directory	dir (Windows) ls (Linux/MacOS)
go to directory	cd FOLDERPATH (absolute or relative) cd c:\ot\oTree cd ot
create directory	mkdir FOLDERNAME
activate virtualenv	venvpath\Scripts\activate.bat (windows) source VENVPATH/bin/activate (linux, macos)
deactivate virtualenv	deactivate
run Otree server (developing)	otree devserver
create app	otree startapp APPNAME

oTree Admin Interface

- http://localhost:8000



Demo

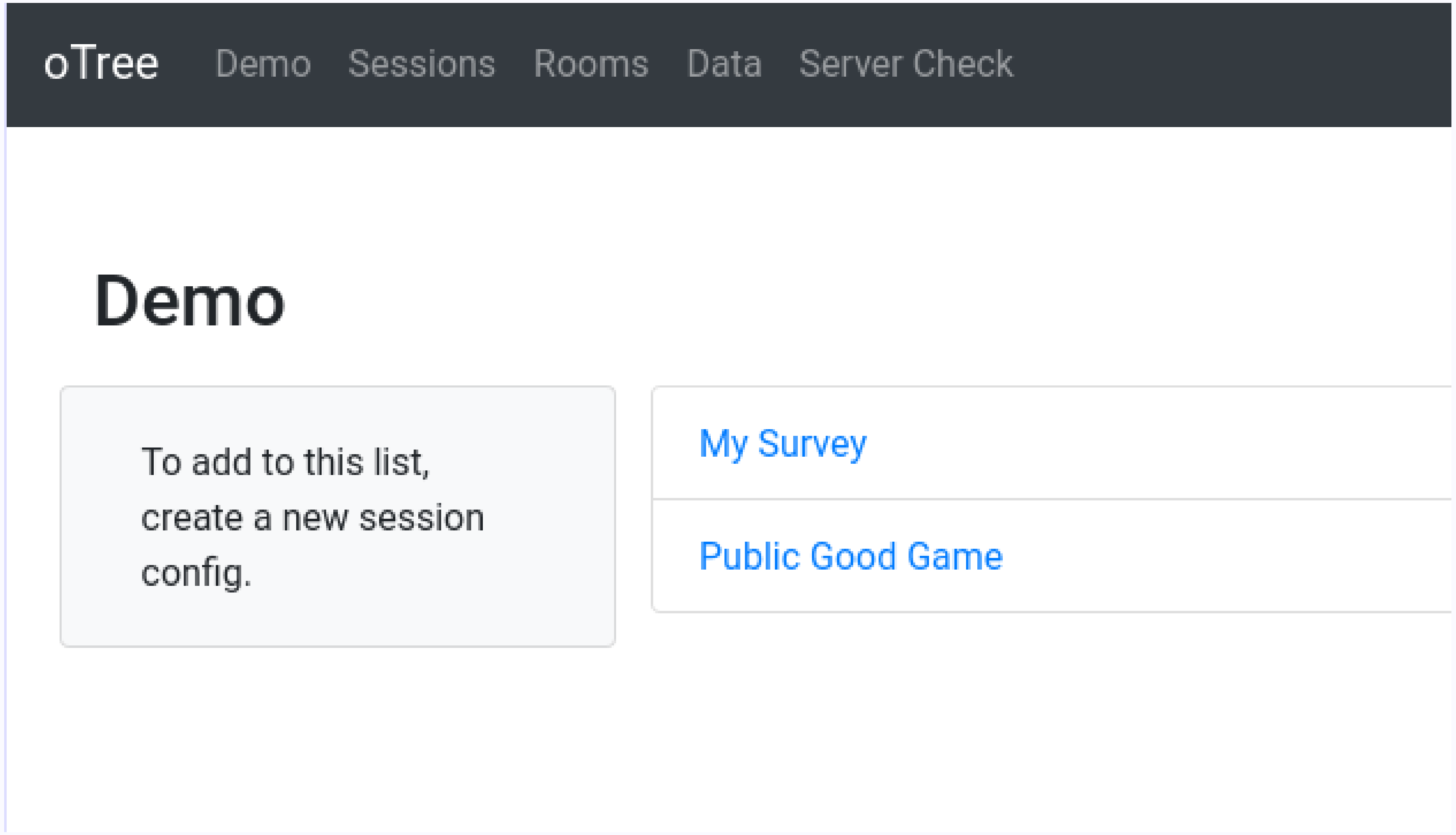
To add to this list, create a new session config.

My Survey

Public Good Game

oTree Admin Interface

- Demo: A quick way to test experiments



Demo

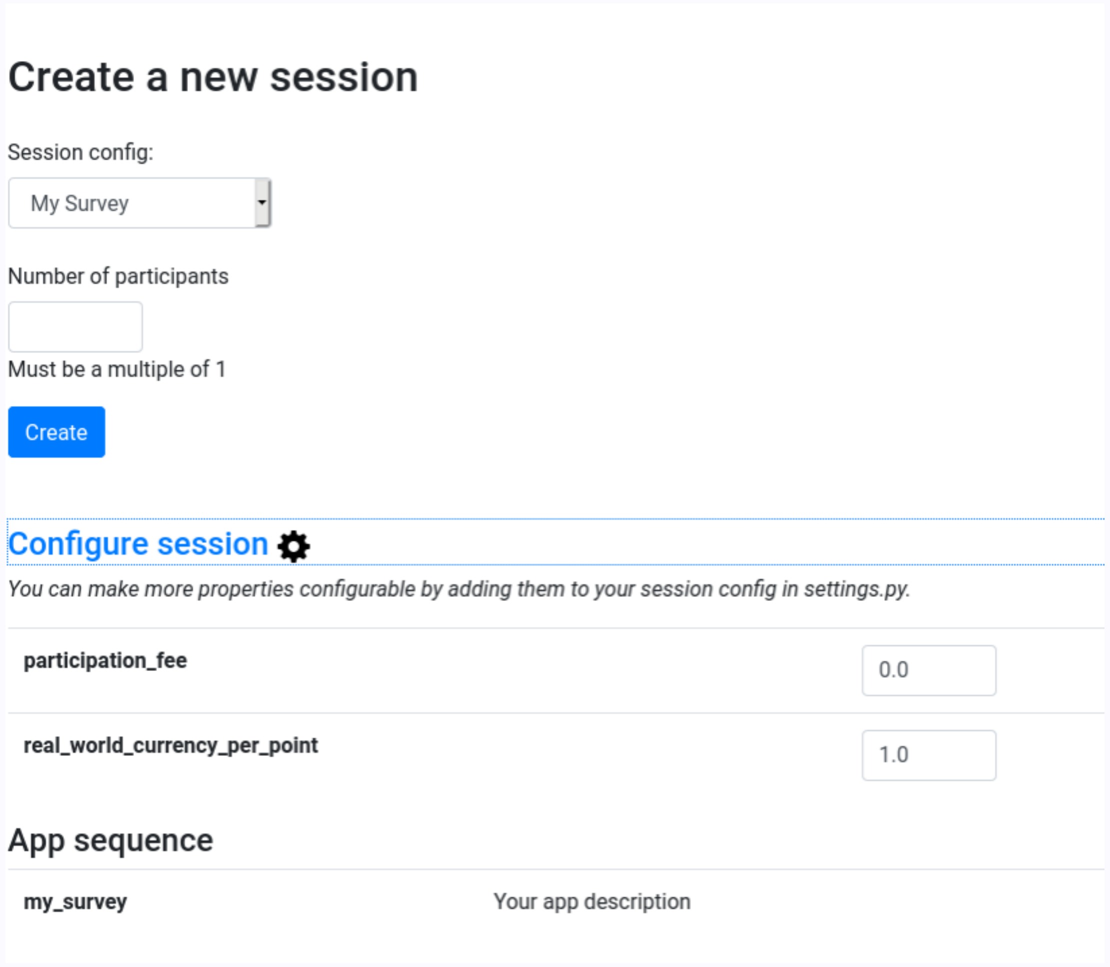
To add to this list, create a new session config.

My Survey

Public Good Game

oTree Admin Interface

- Session: To create and manage sessoins



Create a new session

Session config:

My Survey

Number of participants

Must be a multiple of 1

Create

Configure session

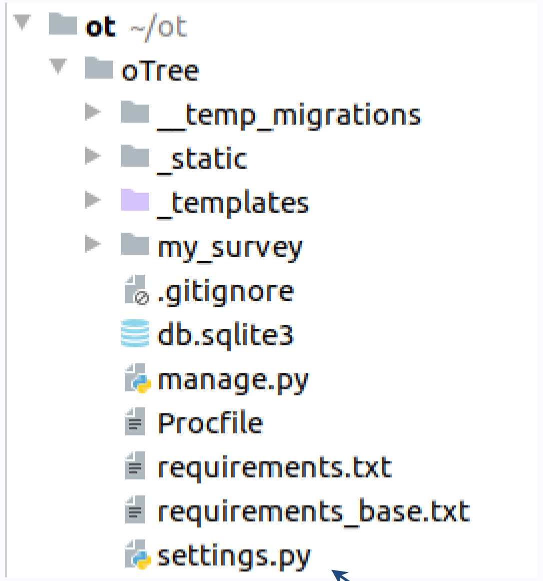
You can make more properties configurable by adding them to your session config in settings.py.

participation_fee	0.0
real_world_currency_per_point	1.0

App sequence

my_survey	Your app description

oTree File Structure



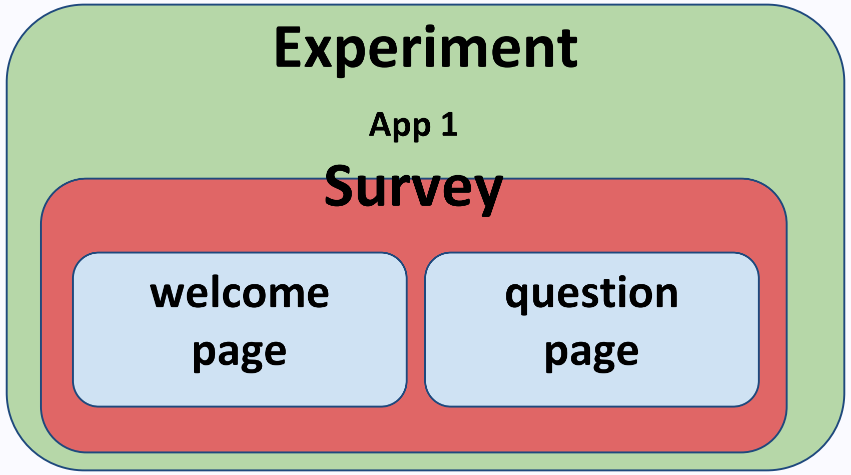
```
ot ~/ot
  oTree
    __temp_migrations
    _static
    _templates
    my_survey
    .gitignore
    db.sqlite3
    manage.py
    Procfile
    requirements.txt
    requirements_base.txt
    settings.py
```

we access settings of oTree here

What is an app in oTree?

App is a basic unit of an experiment. An app consists one or more pages of an experiment.

Each experiment should consist at least an app.



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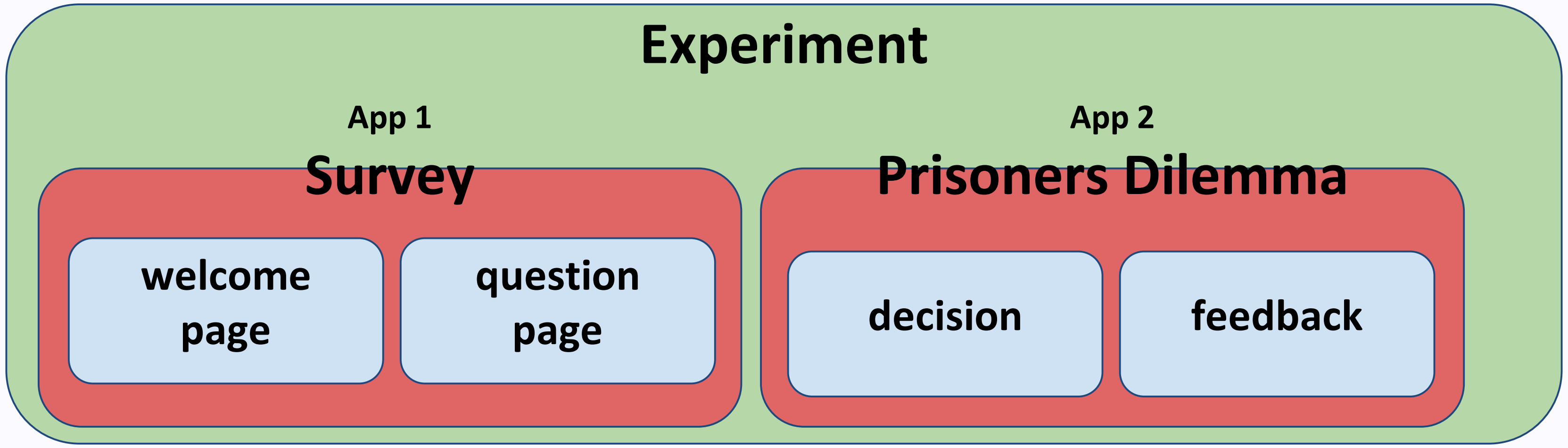
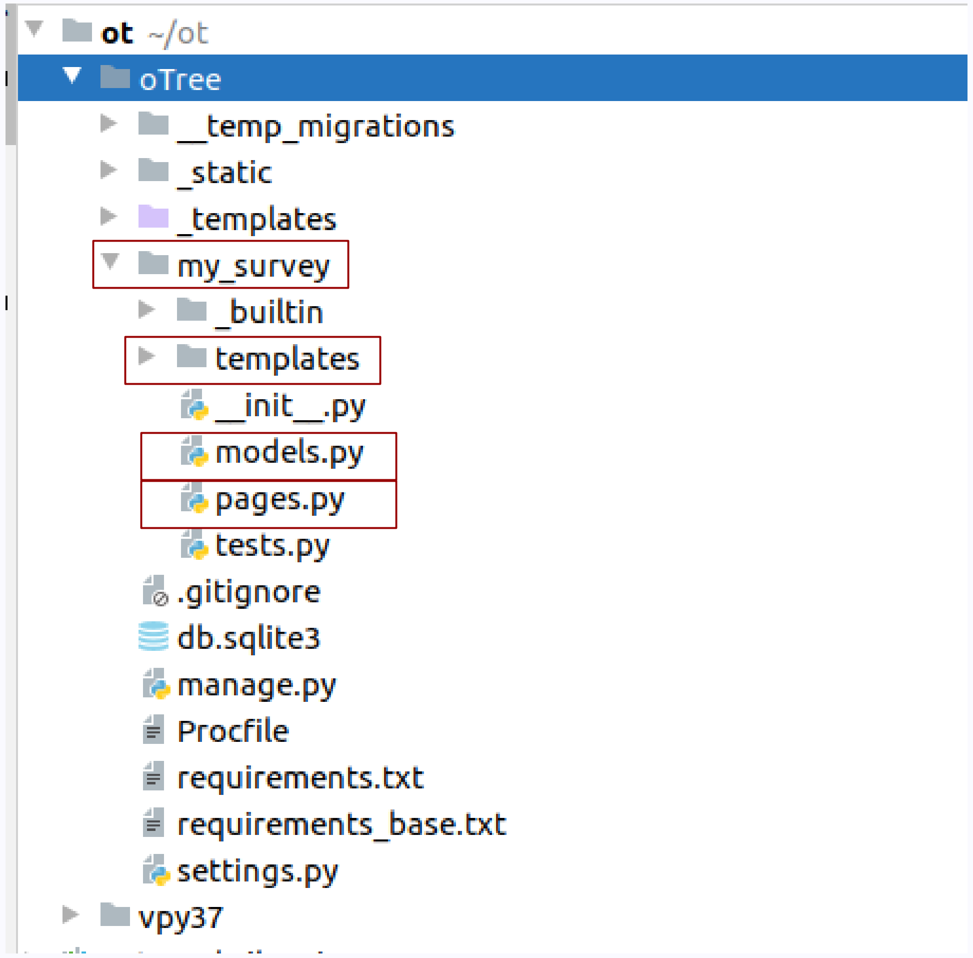


Create & register an app

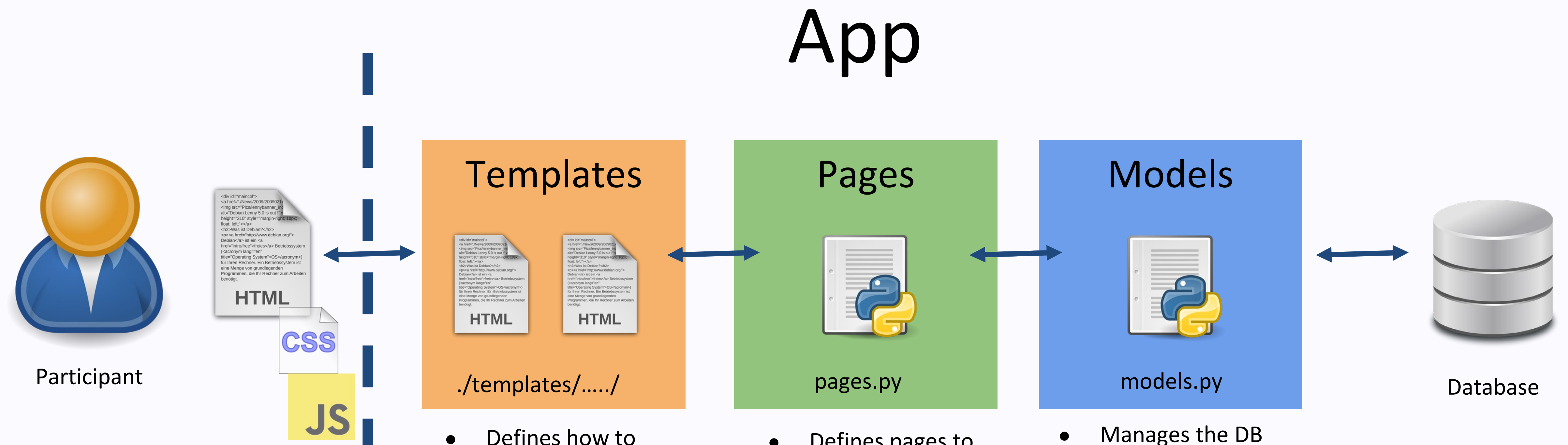
- Go to oTree project folder
  cd ot/oTree

- Create the app
  otree startapp my_survey



```
ot ~/ot
  oTree
    __temp_migrations
    _static
    _templates
    my_survey
      _builtin
      templates
      __init__.py
      models.py
      pages.py
      tests.py
    .gitignore
    db.sqlite3
    manage.py
    Procfile
    requirements.txt
    requirements_base.txt
    settings.py
  vpy37
```

oTree (django) architecture



- Defines how to show things to user
- Connecting user with pages.py
- Partially HTML/, partially with some programmable chunks of code

- Defines pages to show
- Connecting templates and models
- Calculations, rules
- Functions

- Manages the DB
- Defines what to be stored
- Sets up the structure
- Functions on them

A model means a particular data structure on an object. Player, Group …

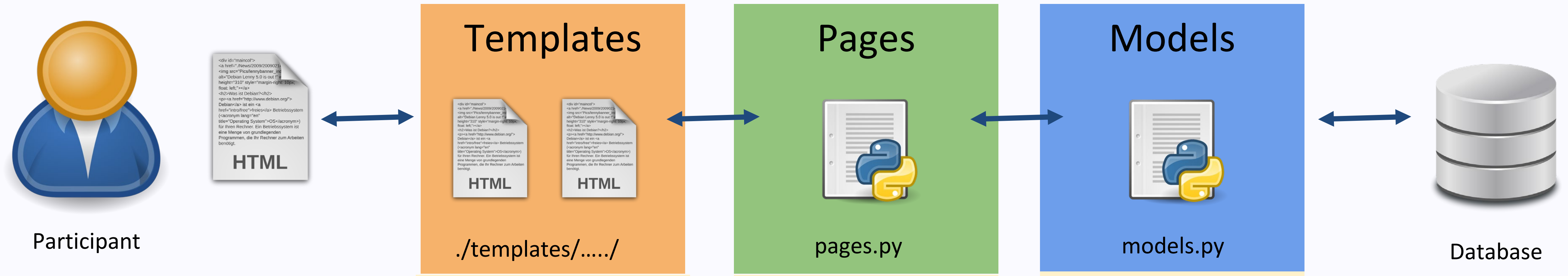
A variable defined in a model is a field

App should be added to settings.py

```
SESSION_CONFIGS = [
    dict(
       name='survey',
       display_name='My Survey',
       num_demo_participants=1,
       app_sequence=['my_survey']
    ),
    dict(
       name='pgoods',
       display_name='Public Good Game',
       num_demo_participants=3,
       app_sequence=['pgoods', ‘my_survey’]
    ),
]
```

A simple survey

Task: Asking users their name, age and if they are student or not.
Page 0: Welcome Page
Page 1: Show the form to fill and get the data
Page 2: Show the data



Templates:
Welcome
Ask
Results

Pages:
Welcome
Ask
Results

Player model:
name
age
is_student

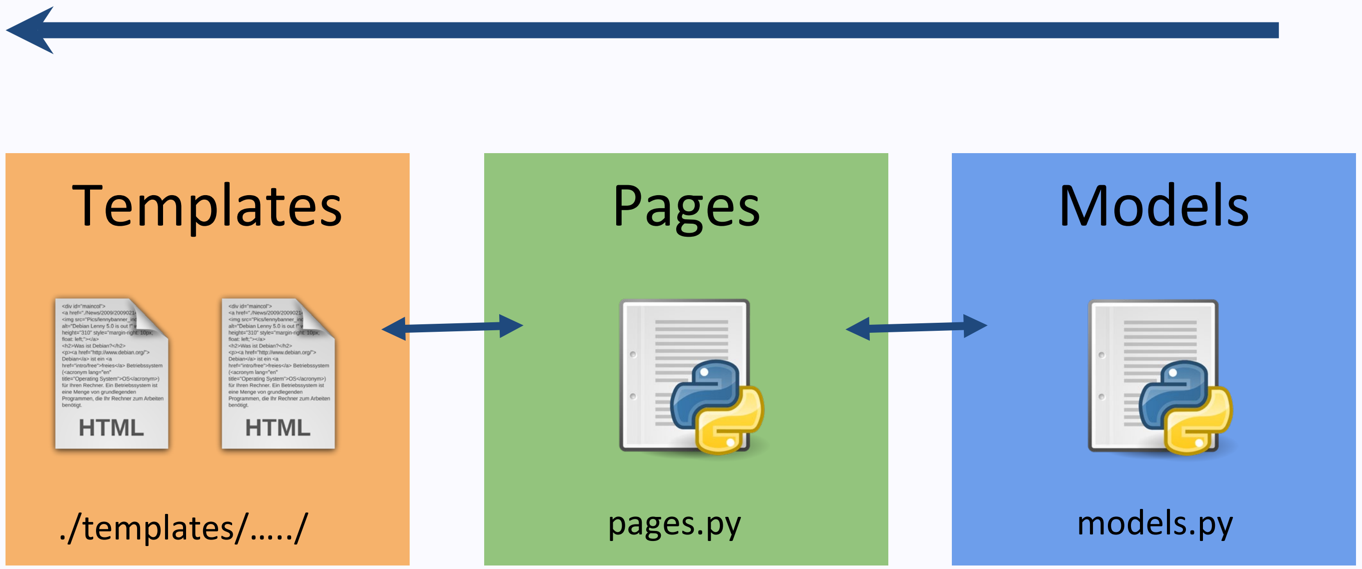
Each template is a separate file matches the page class

Each page is a class

Each model is a class (Player)

Each variable is a field(column)

Adding a new page



Models

Models

models.py

- Manages the DB
- Defines what to be stored
- Sets up the structure
- Functions on them
- A model means a particular data structure on an object. Player, Group …
- They should inherit from base models (BasePlayer, BaseGroup …)

A variable defined in a model is a field.

```
class Player(BasePlayer):
    somevariable = models.StringField()
```

Fields

- Fields create the data structure to record the data. They can be thought as “columns” in a spreadsheet.
- They are placed in Player or Group class in models.py
- You can create a field for form input, or to save the data without an explicit input
- They are created from built-in Models object by defining them in a Model (Group, Player)

Field name	**What for?**	**Example**
StringField	Short text, Categories	department = Models.StingField()
IntegerField	Integers (whole numbers)	age = Models.IntegerField()
FloatField	Decimals	percentage = Models.FloatField()
BooleanField	True or False	is_dictator = Models.BooleanField()
CurrencyField	Numbers in currency (or point) format	earned_stage1 = Models.CurrencyField()
LongStringField	Long text	diary_entry = Models.LongStringField()

Building plan - Survey

Models

models.py

Manages Data Structure

Player class

- **name: Text (StringField)**
- **age: Number (IntegerField)**
- **is_student: True/False (BooleanField)**

```
class Player(BasePlayer):
   name = models.StringField()
   age = models.IntegerField()
   is_student = models.BooleanField()
```

you can set:
max()
min()
label()
initial()
Choices() -> models.IntegerField(choices=[1,2,3])

Pages

Pages

pages.py

Manages "backend" of the pages

Page class: Welcome page
Page class : Ask page
- **Set up the forms name, age, is_student**

Page class : Results page

```
class WelcomePage(Page):
    pass


class Ask(Page):
    pass



class Results(Page):
    pass
```

Pages - Forms

Pages

pages.py

Manages "backend" of the pages

Page class: Welcome page
Page class : Ask page

- **Set up the forms name, age, is_student**

Page class : Results page

- oTree handles the form generation internally by two variables in a Page class
  - **form_model** : tell which model you use from your models.py
  - **form_fields** : tell which fields you want the input from

Pages - Forms

Pages

pages.py

Manages “backend” of the pages

Page class: Welcome page
Page class : Ask page

- **Set up the forms name, age, is_student**

Page class : Results page

```
class WelcomePage(Page):
  pass

class Ask(Page):
  form_model = 'player'
  form_fields = ['name', 'age', 'is_student']

class Results(Page):
  pass

page_sequence = [WelcomePage, Ask, Results]
```

Methods of an oTree Page

- BEFORE page is shown:
    - is_displayed() (should return True if page is to be shown)
    - vars_for_template() (should return variables in a form of dictionary)

- AFTER page is shown:
    - before_next_page() (Everything you want to compute/do after the participant has made choices)

Templates

Templates

Manages “frontend” of the pages

- **WelcomePage.html**
- **Ask.html**
- **Results.html**

  Show variables.

Adding a Welcome page - Step III - Add the template

my_survey/templates/my_survey/WelcomePage.html

```
{% extends "global/Page.html" %}
{% load otree static %}

{% block title %}
   Welcome to the experiment
{% endblock %}

{% block content %}
   Please click next to continue
   {% next_button %}

{% endblock %}
```

Load otree default styling
Load static files
(Do not alter here)

Place for the title of the page

between {% block titlle %} and {% endblock %}

Place for everthing else
between {% block content %} and {% endblock %}

{% next_button %} creates the next button

Templates in oTree

- Generally extend global/Page.html
  - Title block and content block

- Django template language
  - {% stuff %}   or {{ stuff }}
  - Also if-conditions and other constructs possible

    {% if xyz %}

    {% else %}

    {% endif %}

- Everything else is html
  - <h1> BIG TITLE </h1>
  - <a href =”https://dice.hhu.de”> DICE</a>

Adding a Page - Step III - Add the templates

my_survey/templates/my_survey/Ask.html

```
{% extends "global/Page.html" %}
{% load otree static %}

{% block title %}
  Please answer the following questions
{% endblock %}

{% block content %}
  {% formfields %}
  {% next_button %}

{% endblock %}
```

Adding a Page- Step III - Field form(s) on a template

```
{% fieldform player.my_field label= ‘Enter something’ %}
```

OR:

```
{% for field in form %}
                {% formfield field %}
{% endfor %}
```

OR:

```
{% formfields %}
```

OR:

```
{% formfield ‘my_field’ %}
```

Adding a Page- Step III - Add the templates

my_survey/templates/my_survey/Results.html

```
{% extends "global/Page.html" %}
{% load otree static %}

{% block title %}
   Thank you
{% endblock %}

{% block content %}
Thank you very much for your participation.

   {% next_button %}
{% endblock %}
```

Adding a Welcome page - Step III - Add the templates

my_survey/templates/my_survey/Results.html

```
{% extends "global/Page.html" %}
{% load otree static %}

{% block title %}
   Thank you
{% endblock %}

{% block content %}
Thank you very much for your participation  {{player.name }}.

   {% next_button %}
{% endblock %}
```

Adding a Page - Step III - Templates: using variables

- In a template you can access variables defined in vars_for_template of the specific page:

```
{{ var }}
```

You can also use lists and dictionaries

- You can also access any variable in Constants, Player, Group…

```
{{ player.variablename }}
{{ group.variablename }}
{{ Constants.variablename }}
```

Enhancing Our Fields

- **Adding labels**
  - models.StringField(label = “What is your name”)
- **Minimum, maximum age**
  - models.IntegerField(min = 18, max = 117)
- **Empty allowed**
  - models.Integerfield(blank = True)
- **Default**
  - models.IntegerField(initial = 20)
- **Multiple choices**

department = models.StringField(choices = [“Economics”, “Law”])

- **Radio widget**
  - widget=widget.RadioSelect()

Dynamic formfield validation

```
class Player(BasePlayer):

    fruit = models.StringField()

    def fruit_choices(self):
        import random
        choices = ['apple', 'kiwi', 'mango']
        random.shuffle(choices)
        return choices
```

Similar things with other functions:

- {field_name}_max()
- {field_name}_min()
- {field_name}_error_message()
- Validating multiple fields together

Validating multiple fields

```
class Ask(Page):
   form_model = 'player'
   form_fields = ['name', 'age', 'is_student','department']


   def error_message(self, values):
       print("The values I get are", values)
       if values['is_student'] and not values['department']:
           return "But you said that you are student. Do you mind sharing your department with us?"
```

Lets run the App