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Developing Apps for Android and Other Platforms with Kivy and Python

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droidcon 2013
7 - 10 April Berlin



Knowledge for Tomorrow

Outline

- Introduction
- Python
- Kivy
- Demos
- Limitations
- Credits



Me

Scientist,
Head of department



Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center

Founder,
CEO

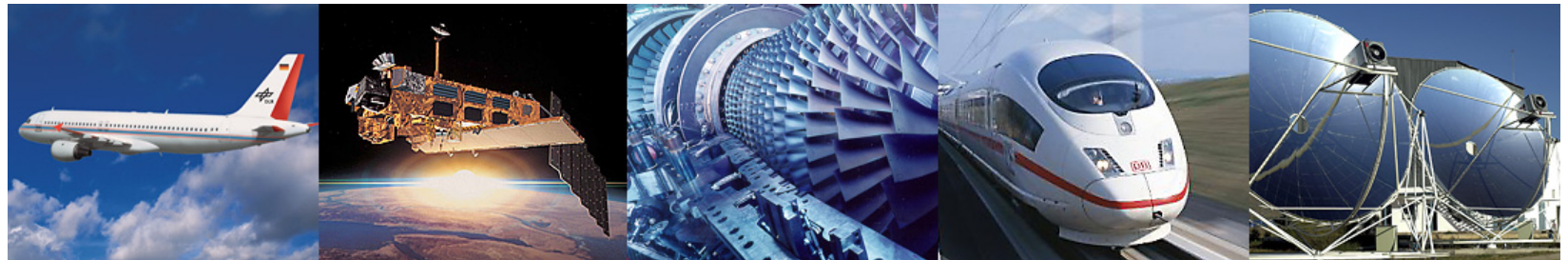


Enthusiastic about
Python



DLR

German Aerospace Center



- Research Institution
- Space Agency
- Project Management Agency

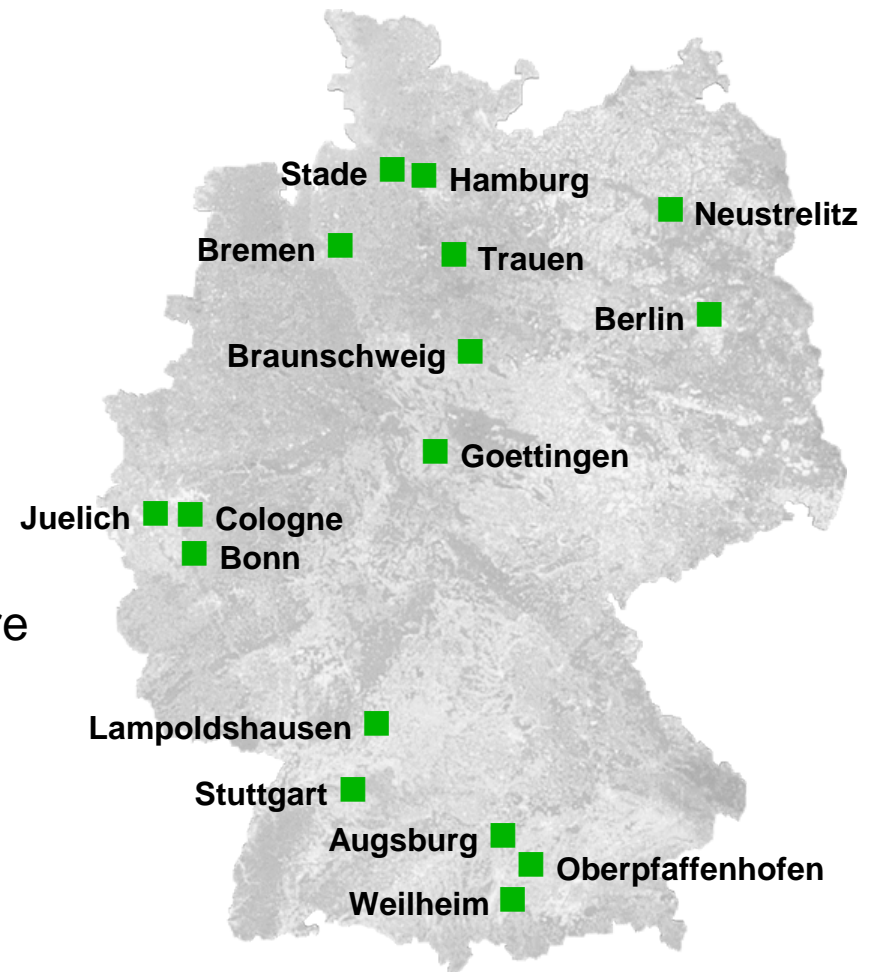


Locations and employees

7400 employees across
32 institutes and facilities at
■ 16 sites.

Offices in Brussels, Paris,
Tokyo and Washington.

~1400 employees develop software



Python

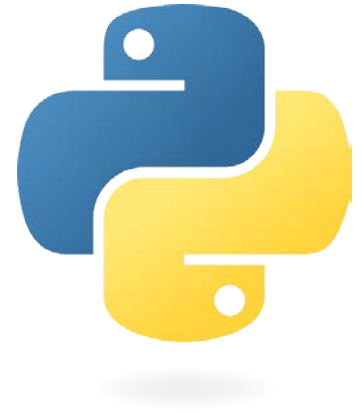


Knowledge for Tomorrow



Python

- General-purpose, high-level programming language
- Object-oriented, aspect-oriented, functional
- Dynamic type system
- Easy-to-learn with clear and expressive syntax



```
def faculty(x):  
    if x > 1:  
        return x * faculty(x - 1)  
    else:  
        return 1
```



Python on Mobile Devices

Early Mobile Development with Python

- PyS60 for Symbian
- Python CE for Windows Mobile

Current Mobile Development with Python

- Scripting Layer for Android (SL4A)
- Python for Android (Py4A)
- PySide / Qt for Android
- WinRT / IronPython for Windows 8
- Kivy...



Kivy



Knowledge for Tomorrow



Kivy

- Platform-independent Python-Framework
- Available for
 - Android
 - iOS
 - Meego
 - Windows
 - Linux
 - OSX
 - (Raspberry Pi)
- Development in Python on all platforms
 - Not emulated!



kivy.org



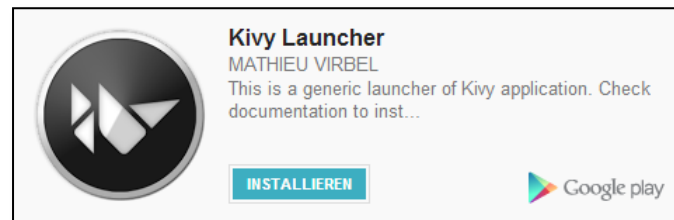
Kivy Basics

- Framework for Natural User Interfaces (NUI)
 - Touchscreens / Multi-Touch
- GPU accelerated graphics
 - Based on OpenGL ES 2.0
- Suitable for prototypes as well as products
 - Porting to new platforms is easy



Kivy Software

- Open Source (LGPL), 7 Core developer
- Source code: **<https://github.com/kivy>**
- Documentation: **<http://kivy.org/docs>**
- Kivy on Google Play:
<https://play.google.com/store/apps/details?id=org.kivy.pygame>

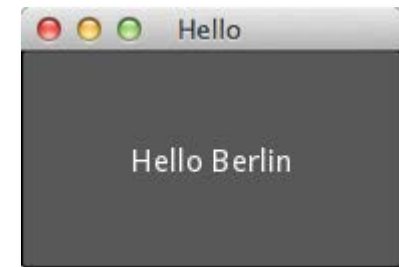


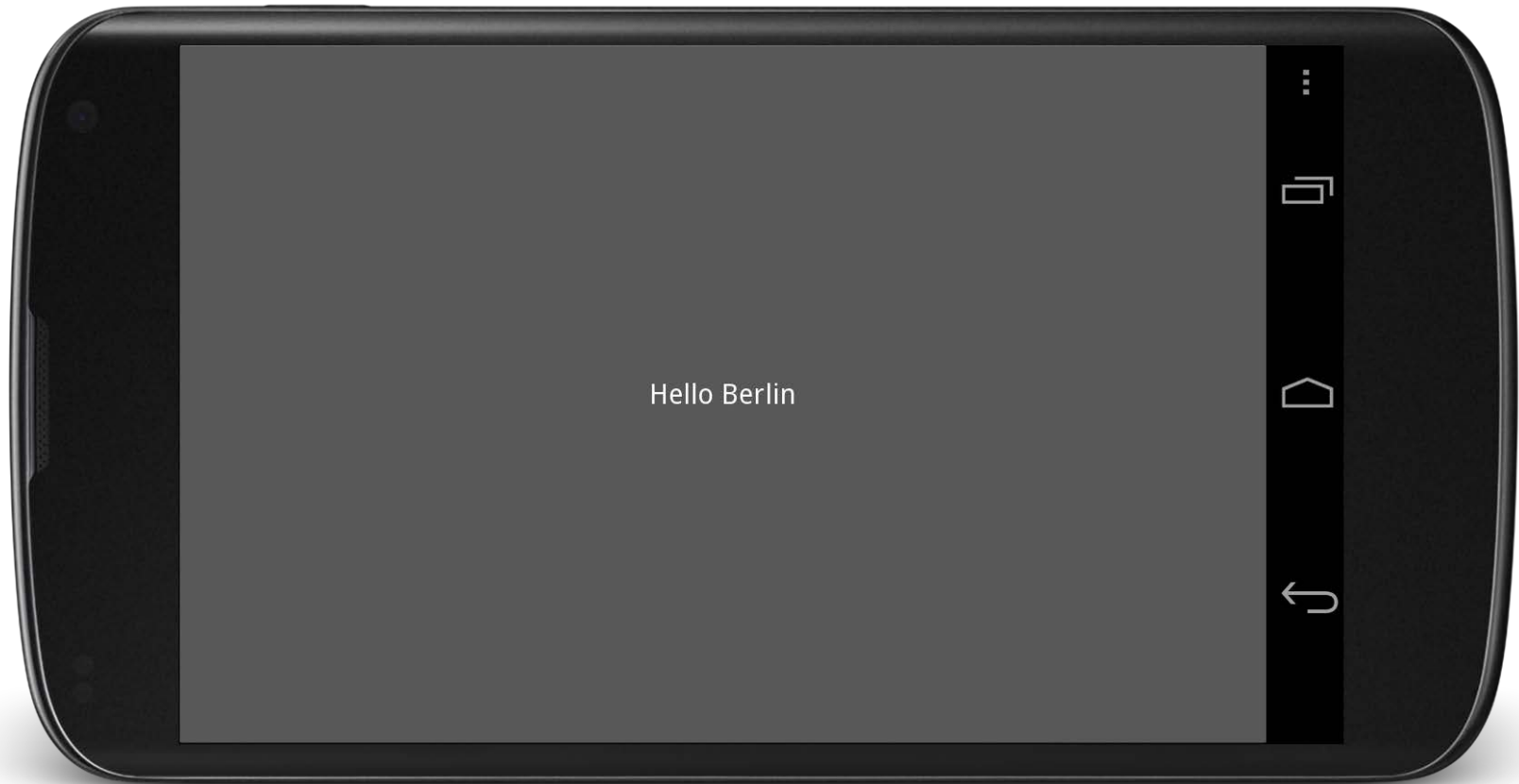
Kivy says Hello!

```
from kivy.app import App
from kivy.uix.button import Button

class HelloApp(App):
    def build(self):
        return Button(text='Hello Berlin')

HelloApp().run()
```





Development with Kivy

- Python for widgets, input, program logic
- Language **KV** for layout und graphics
- Cython for low-level access to graphic routines

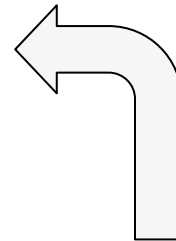


“Hello Berlin” with KV

```
from kivy.app import App

class HelloApp(App):
    pass

HelloApp().run()
```



File **hello.kv**
defines root widget

```
#:kivy 1.0
```

```
Button:
```

```
    text: 'Hello Berlin'
```



Example: Pong

```
import kivy
from kivy.app import App
from kivy.uix.widget import Widget

class PongGame(Widget):
    pass

class PongApp(App):
    def build(self):
        return PongGame()

if __name__ == '__main__':
    PongApp().run()
```



Pong Graphics

```
#:kivy 1.6.0

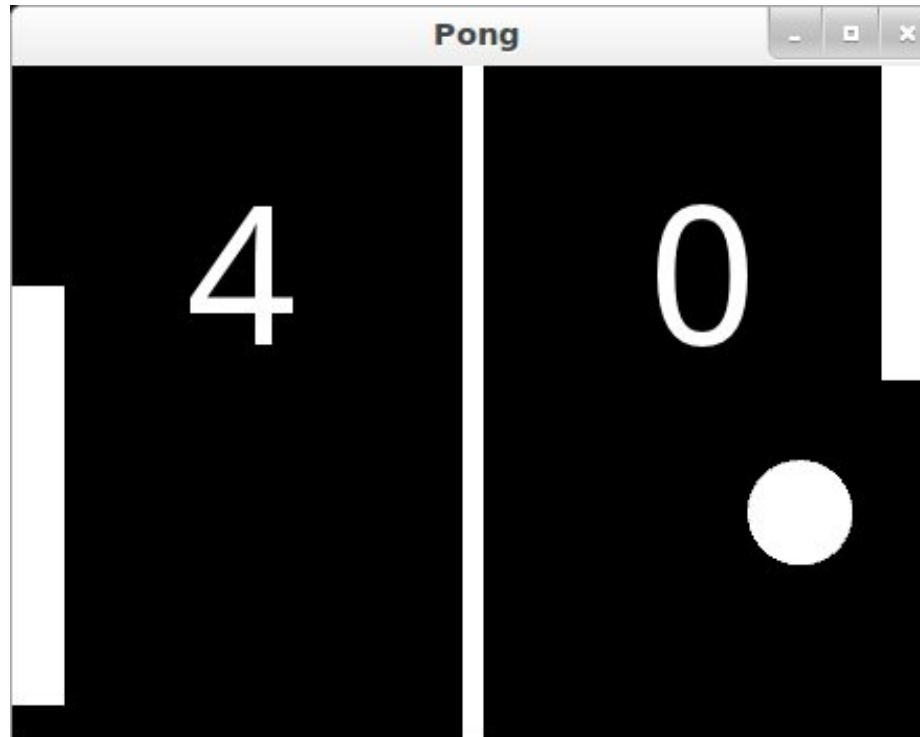
<PongGame>:
    canvas:
        Rectangle:
            pos: self.center_x - 5, 0
            size: 10, self.height

        Label:
            font_size: 70
            center_x: root.width / 4
            top: root.top - 50
            text: "0"

        Label:
            font_size: 70
            center_x: root.width * 3 / 4
            top: root.top - 50
            text: "0"
```



Pong



Full example: <http://kivy.org/docs/tutorials/pong.html>



Accessing Java Classes from Python

- Smartphones have many APIs
 - Camera, Compass, Contacts, Location, ...
- Access from Python via **PyJNIus**
 - **<https://github.com/kivy/pyjnius>**
 - Implemented with JNI and Java reflection

Example

```
from jnius import autoclass

Hardware = autoclass('org.renpy.android.Hardware')
print 'DPI is', Hardware.getDPI()
```



Packaging

- Creating packages for Windows, OSX, Android und iOS:
<http://kivy.org/docs/guide/packaging.html>



Build Tools

Tool chain

- Python-for-android
- Cross compiler for ARM
- Android SDK & NDK
- Python and some Python packages

Buildozer

- Hides the complexity: Downloads, compiles, packages Kivy source code
- **<https://github.com/kivy/buildozer>**

```
% buildozer android debug deploy run
```



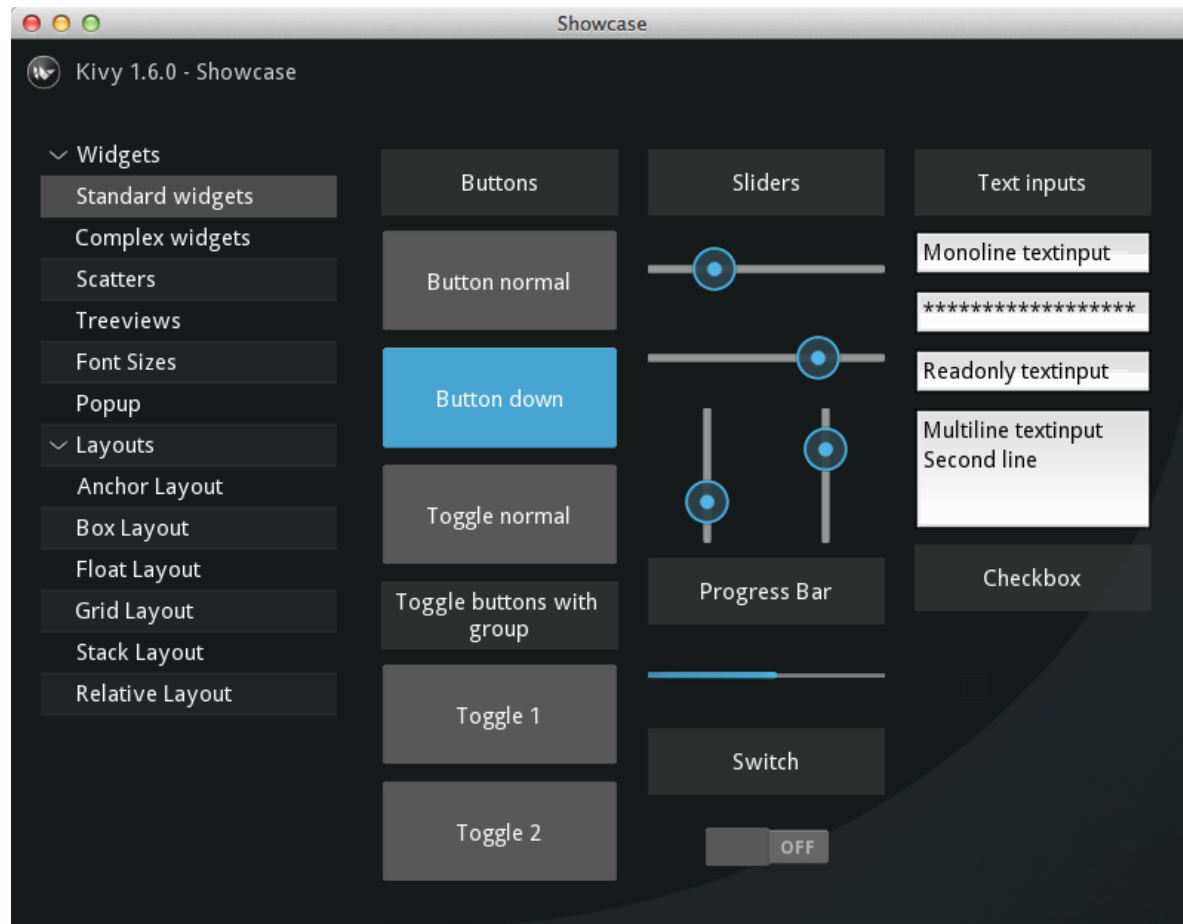
Demos



Knowledge for Tomorrow



Kivy Showcase



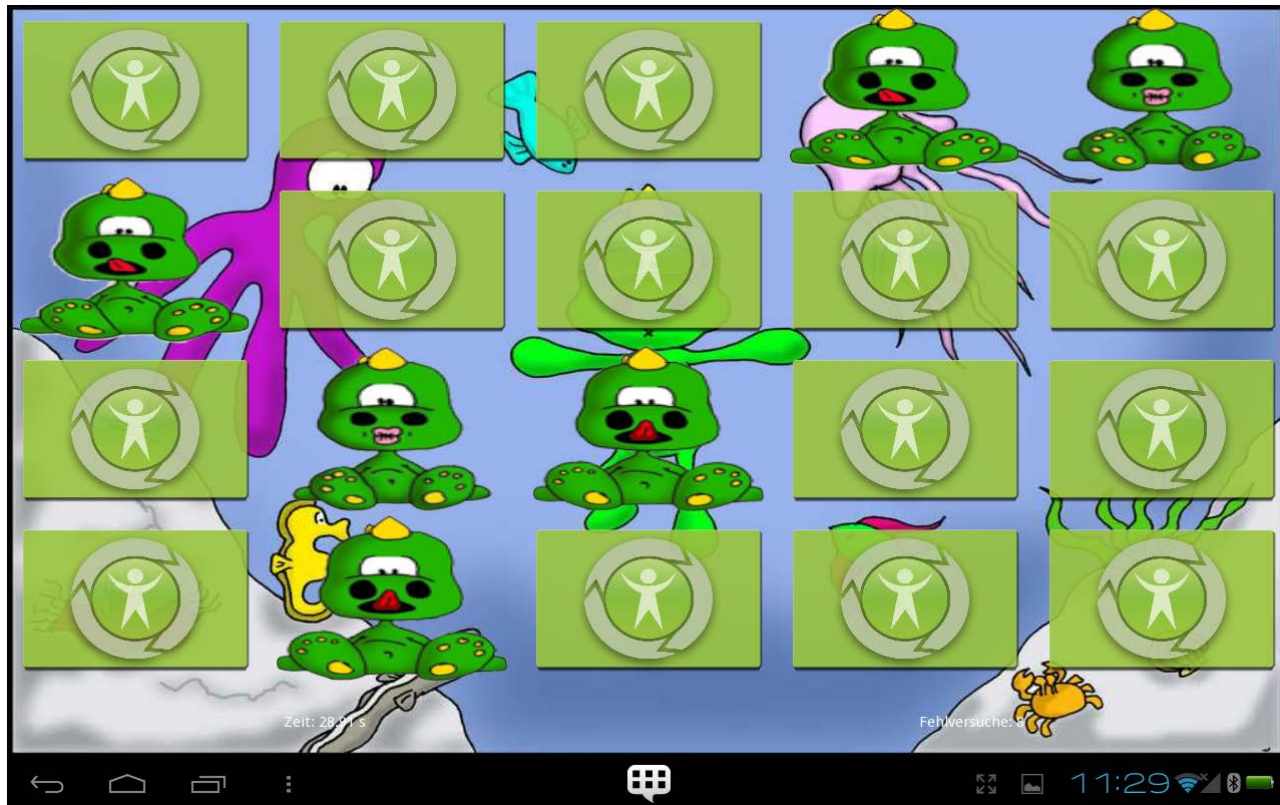
Kivy Pictures



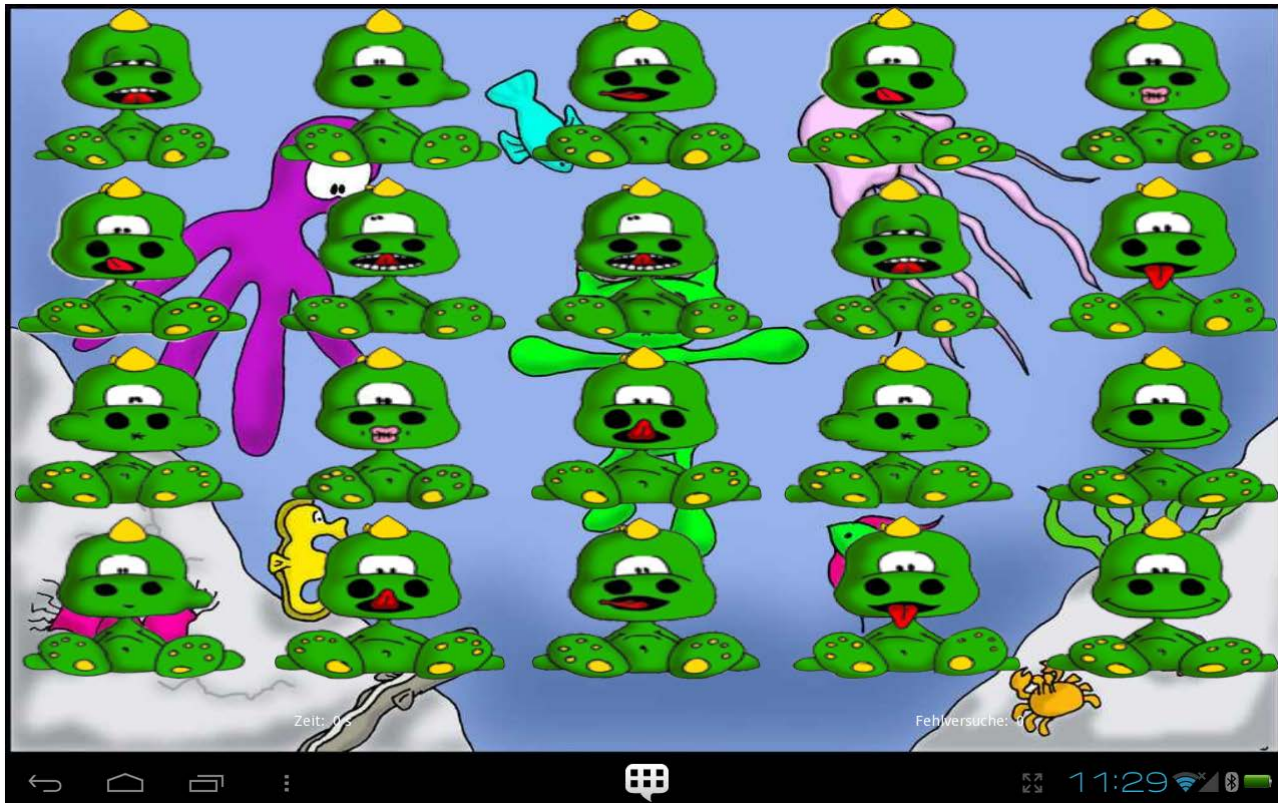


Small Dragon Luki

Speech therapy game for kids



Small Dragon Luki

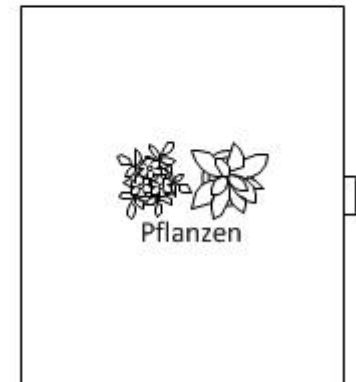
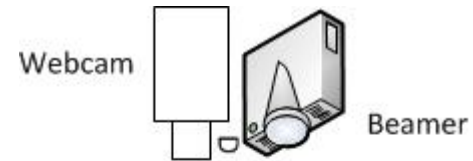


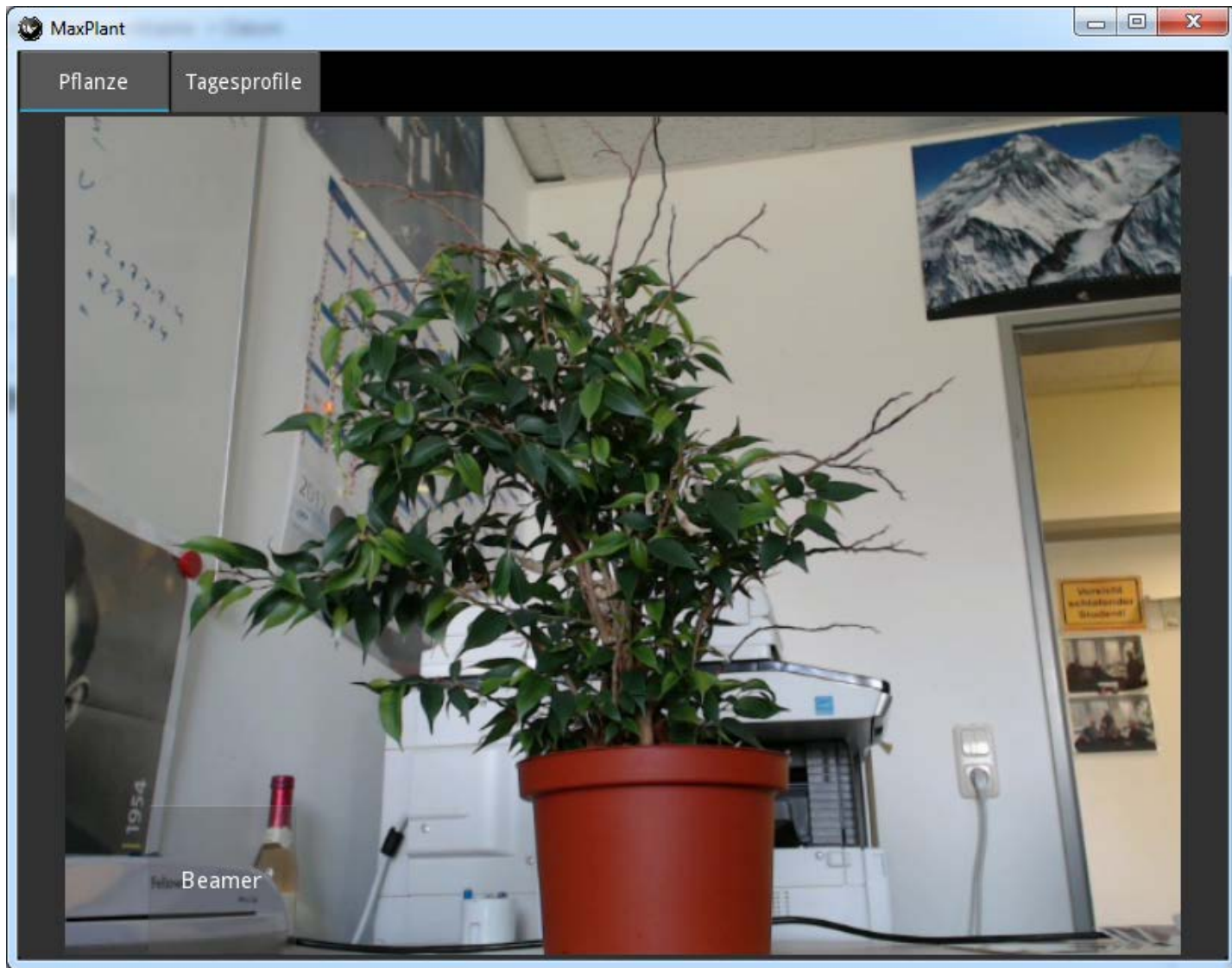
MQTT Client

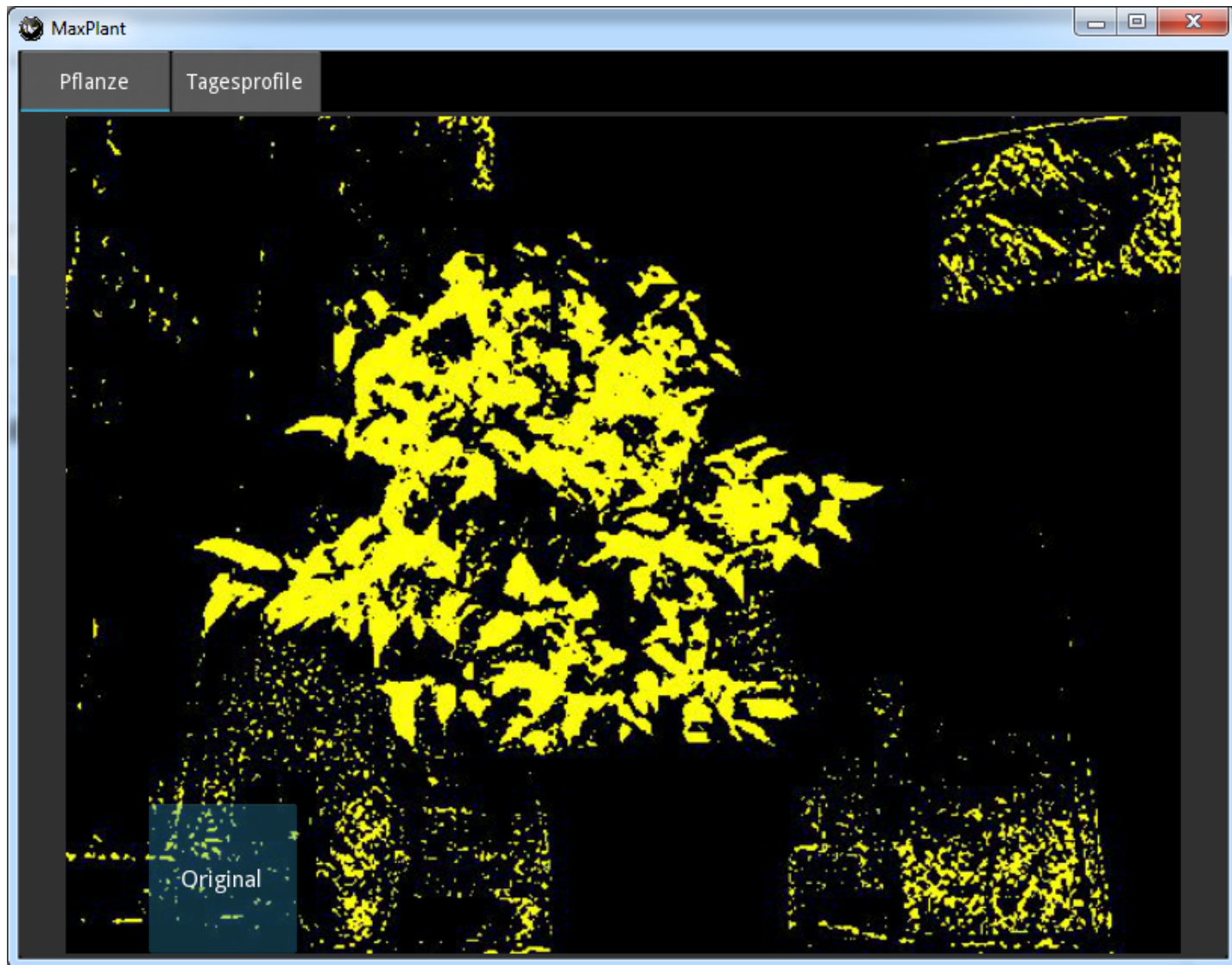


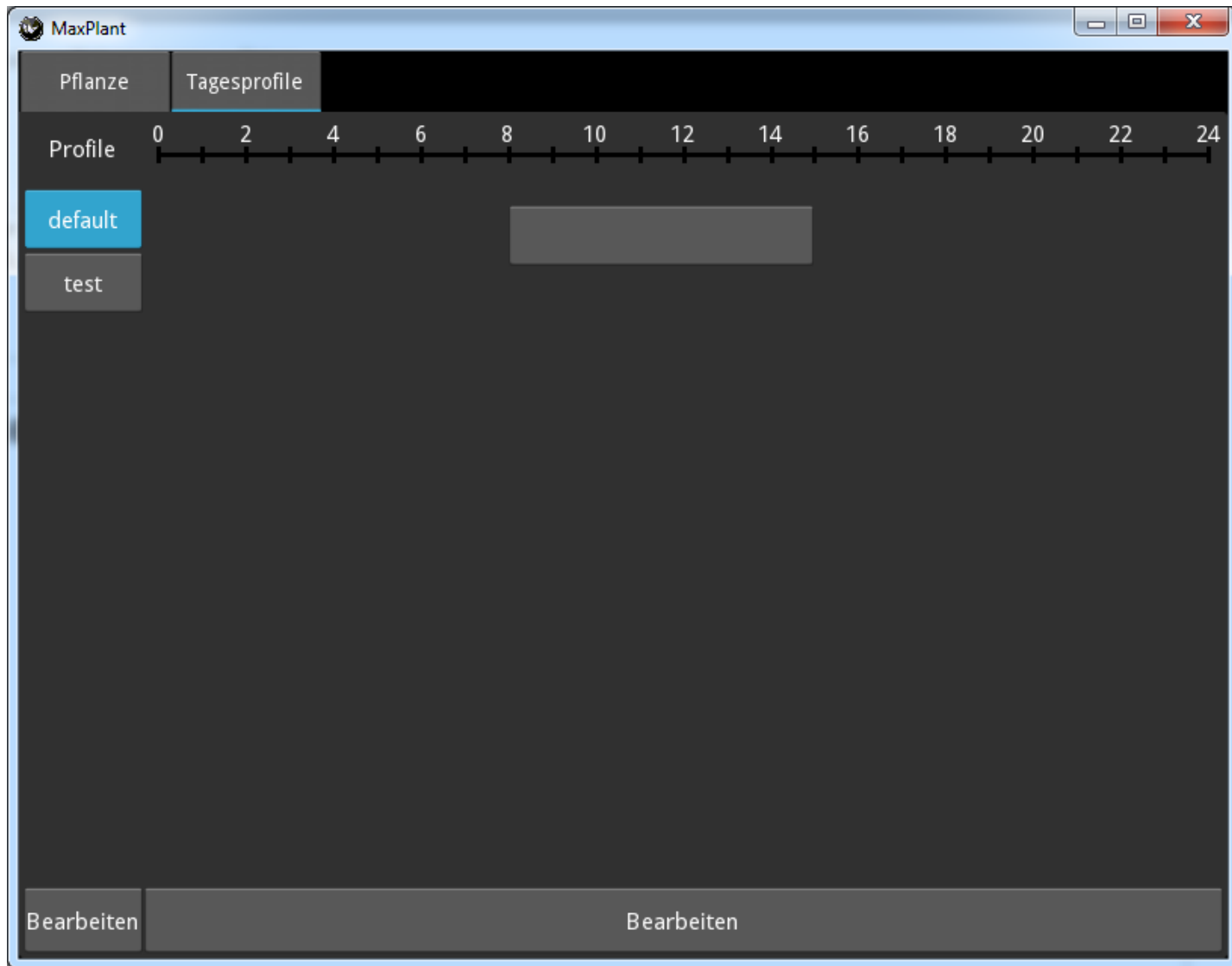
Steering Plant Growth

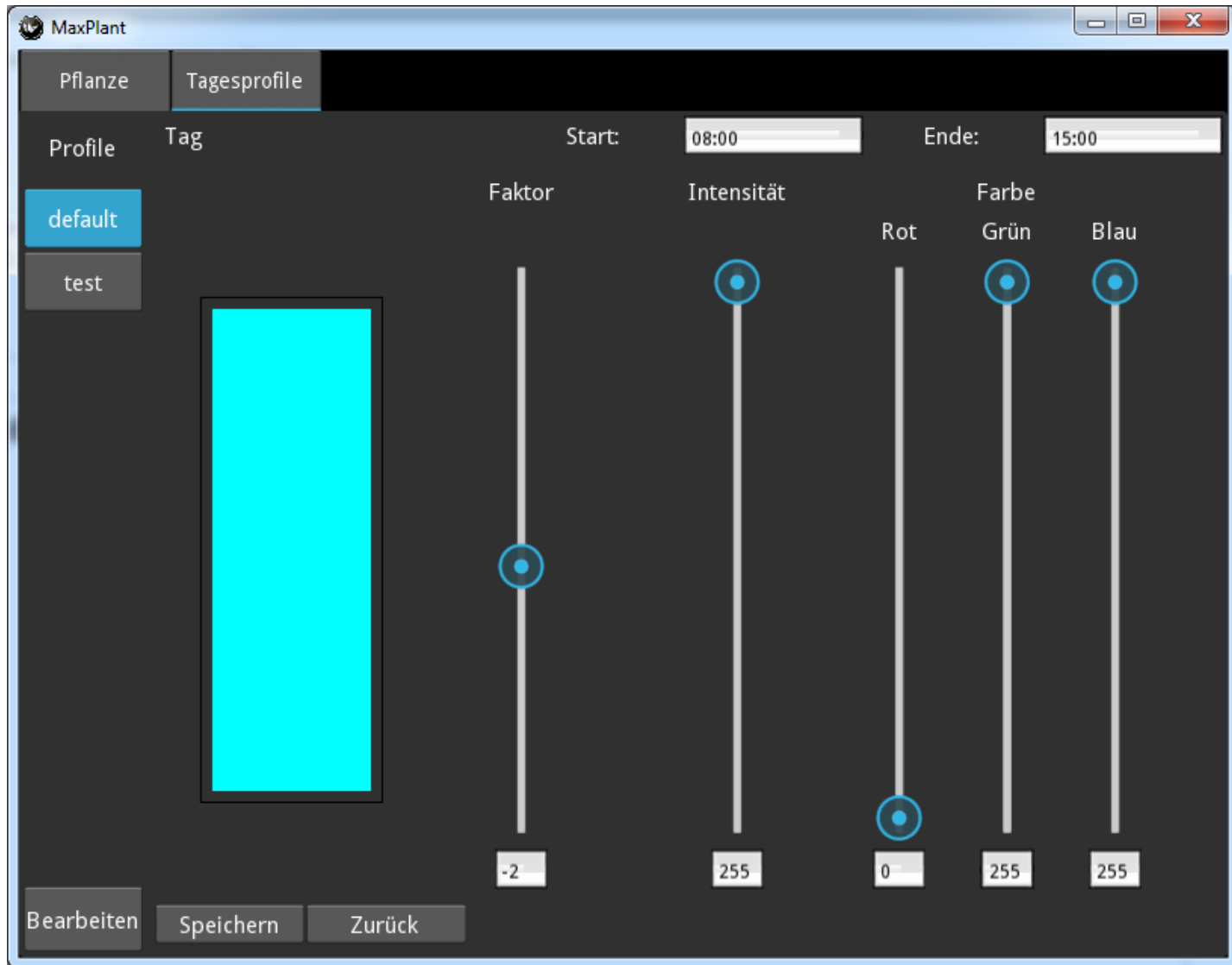
- Webcam takes picture of plants
- Computer detects plant
- Computer generates an image for lighting
- Light source (e.g., a projector) illuminates the plant using the generated image











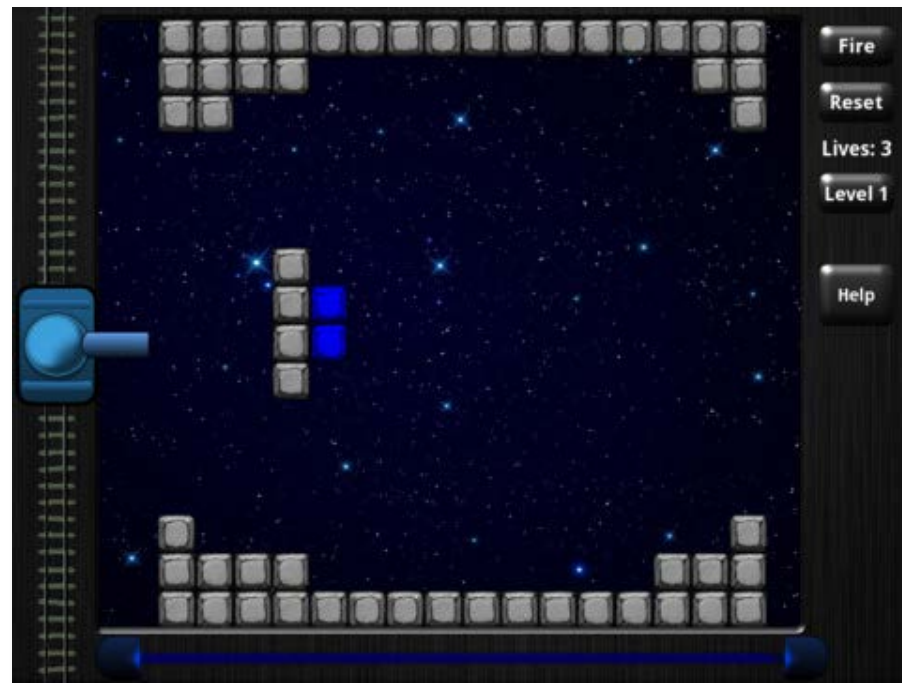
Other Examples...



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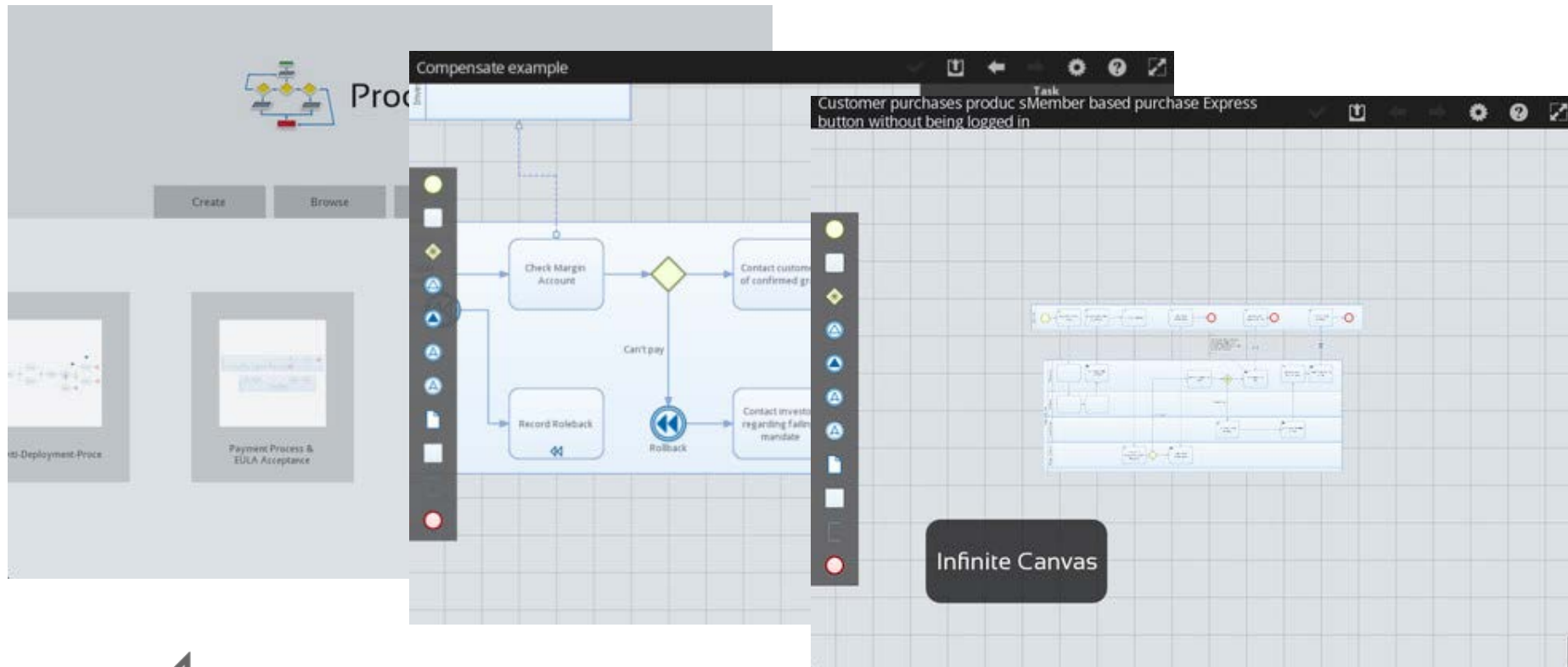
iOS-App Deflectouch

<https://itunes.apple.com/de/app/deflectouch/id505729681>



iOS/Android-App ProcessCraft

<https://itunes.apple.com/gb/app/processcraft/id526377075>
<http://showgen.com>



Limitations



Knowledge for Tomorrow

Missing, but Planned (or In Progress)

User Interface Designer

- Design tool for Kivy Language KV
- Planned for GSoC

Abstraction of mobile APIs

- Platform-independent Python wrapper for platform APIs (Android, iOS, Linux/Mac/Windows)
- Project **Plyer** will start as GSoC project maybe

Porting to Raspberry Pi

- Useful for small/cheap standalone systems
- Founded via Crowdsourcing (**bountysource.com**)



Credits

Thanks to the Kivy developers

- Mathieu Virbel (@**mathieuvirbel**)
- Thomas Hansen (@**hansent**)
- Gabriel Pettier (@**tshirtman**)
- and many others



Questions?

Summary

- Kivy allows platform-independent development of apps for Android, iOS, Meego, Windows, OSX and Linux
- Suitable for multi-touch and graphics applications, such as kiosk systems, exhibits, games, ...

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