Developing Apps for Android and Other Platforms with Kivy and Python

Presentation · April 2013

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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

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Outline

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

Me

Scientist,
Head of department

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Founder,
CEO

medando

Enthusiastic about
Python

Py cologne

PyHPC2013

PyCon. DE 2013

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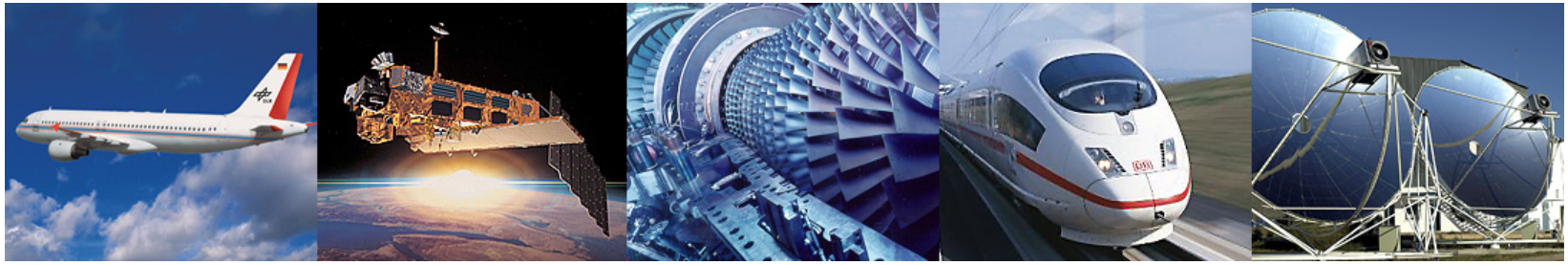
German Aerospace Center



- 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

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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
```

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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

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Kivy

- Platform-independent Python-Framework

- Available for
  - Android
  - iOS
  - Meego
  - Windows
  - Linux
  - OSX
  - (Raspberry Pi)

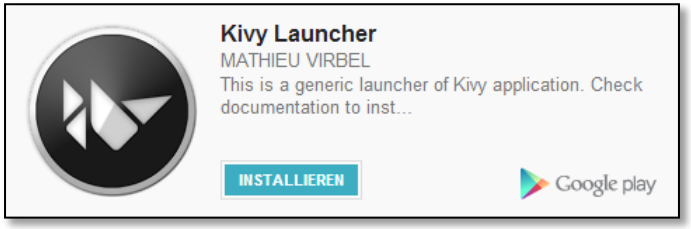
- Development in Python on all platforms
  - Not emulated!

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()
```

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Development with Kivy

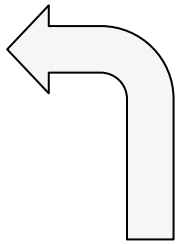
- Python for widgets, input, program logic
- Language **KV** for layout und graphics
- Cython for low-level access to graphic routines

“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

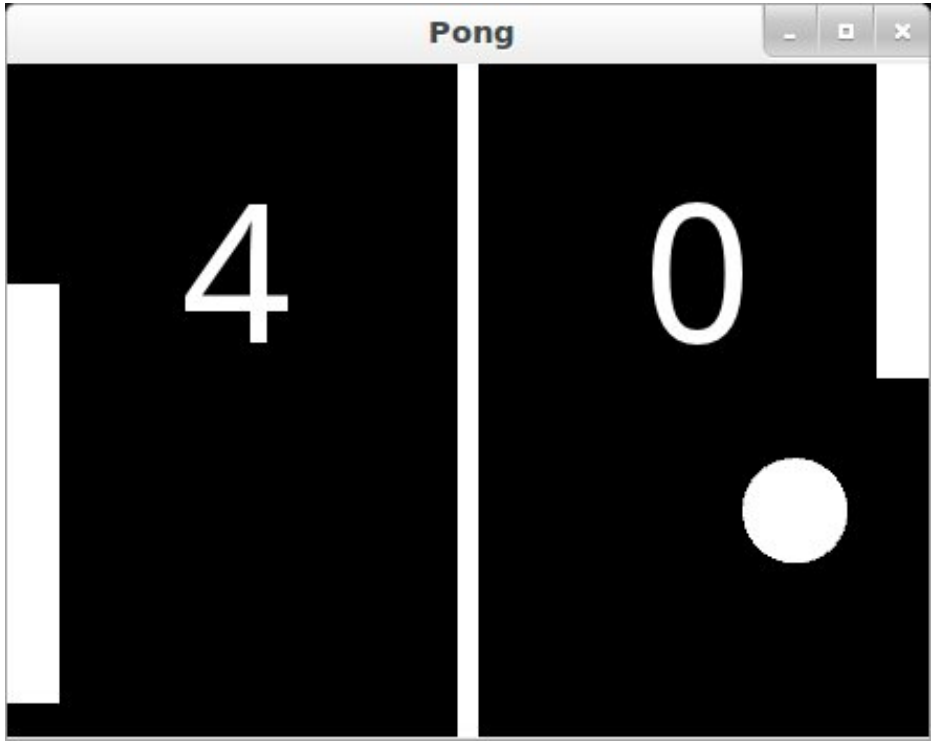
```
#:kivy 1.6.0

<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

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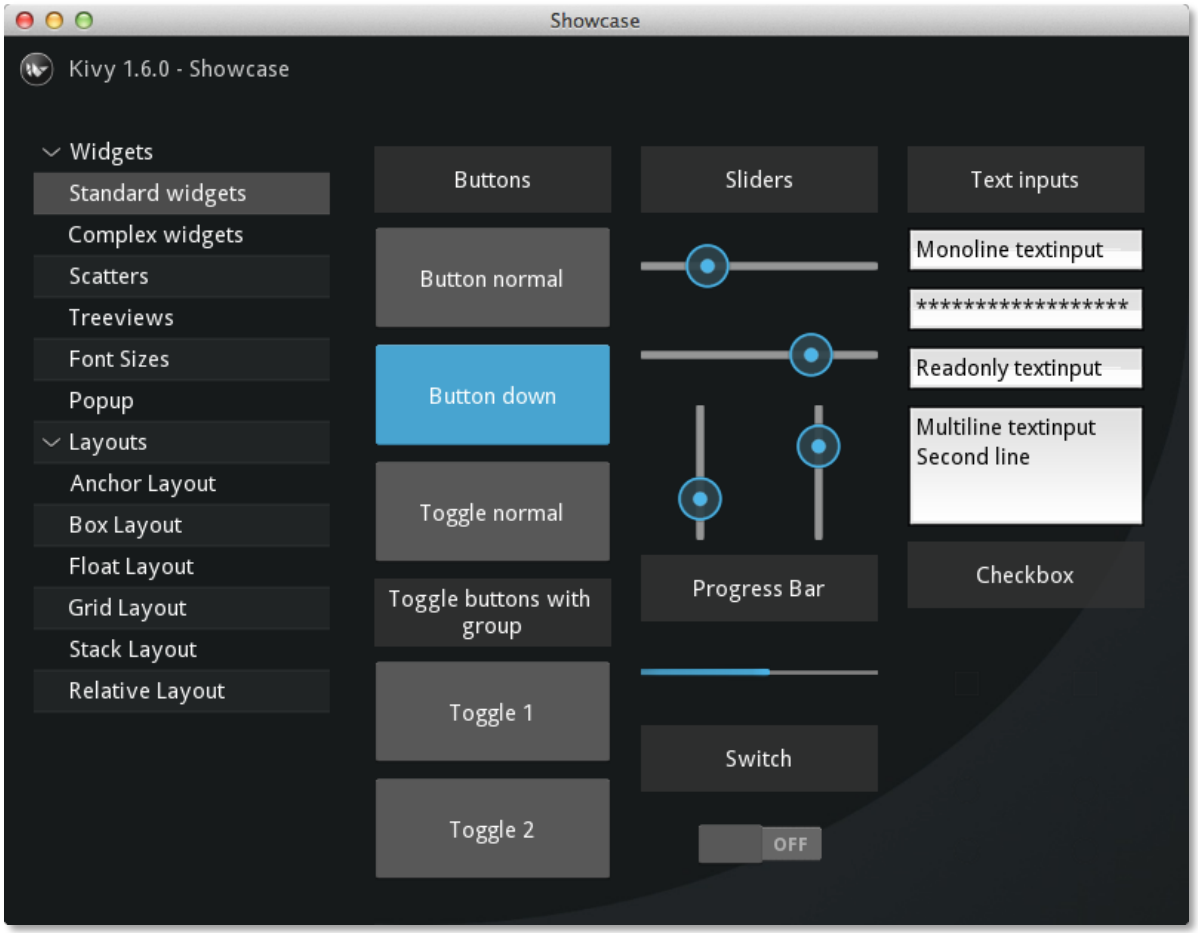
Kivy Showcase



Kivy Pictures

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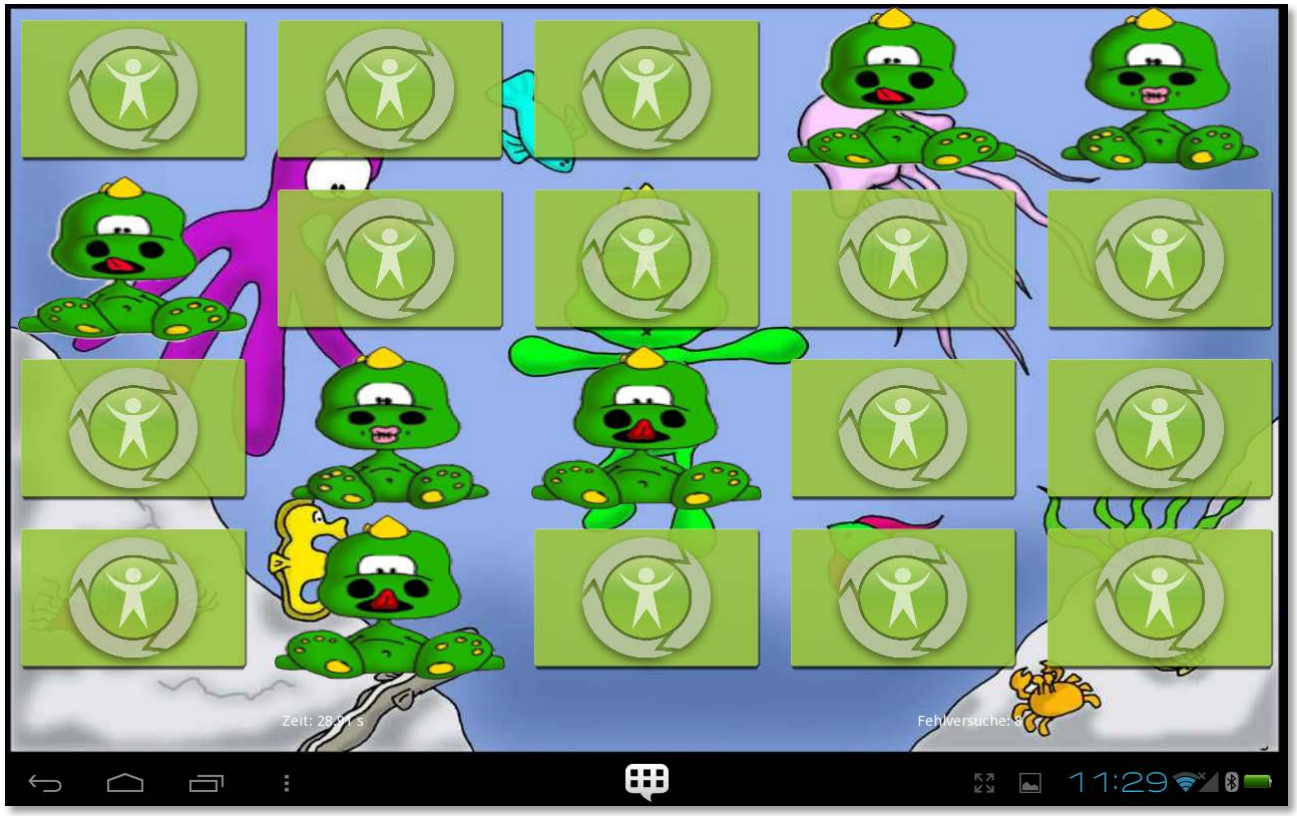
Small Dragon Luki

Speech therapy game for kids



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Small Dragon Luki

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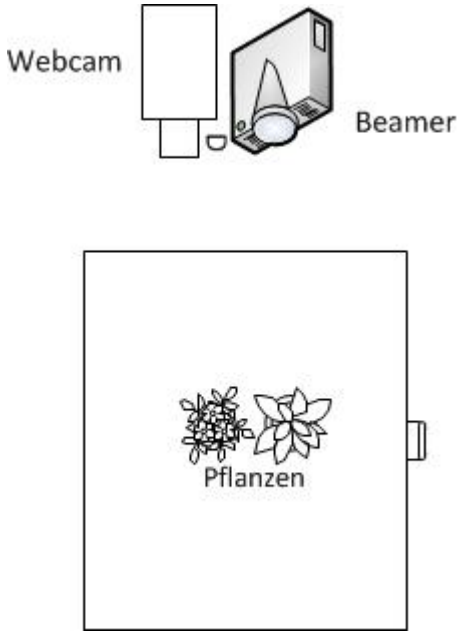
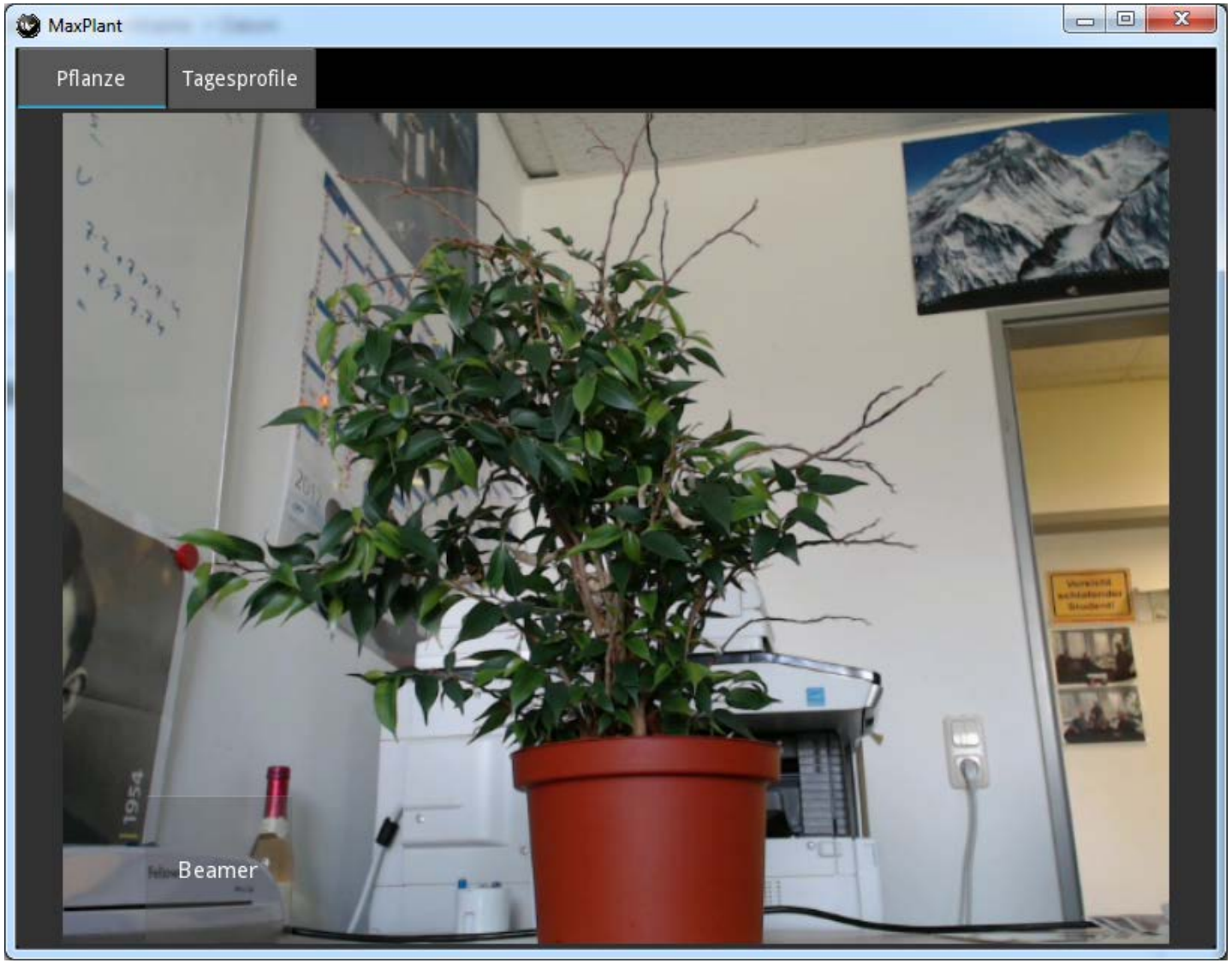
MQTT Client

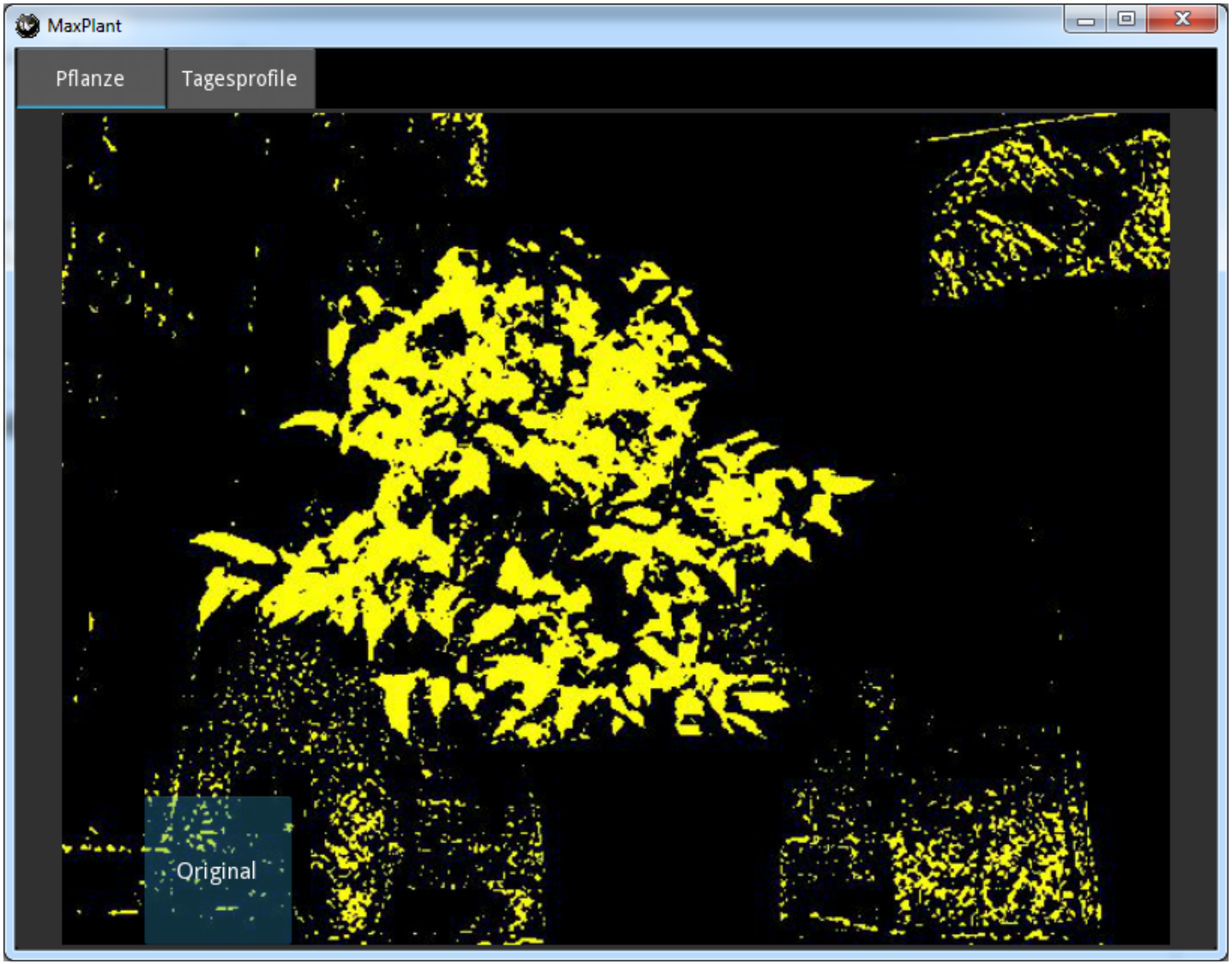

medando messaging
0.1
MQTT Topics
$SYS/broker/version 0
$SYS/broker/timestamp 0
$SYS/broker/changeset 0
$SYS/broker/uptime 0
$SYS/broker/messages/stored 0
$SYS/broker/messages/received 0
$SYS/broker/messages/sent 0
$SYS/broker/messages/dropped 0
$SYS/broker/subscriptions/count 0
$SYS/broker/retained messages/count 0
$SYS/broker/clients/total 0
$SYS/broker/clients/inactive 0
$SYS/broker/clients/active 0
$SYS/broker/clients/maximum 0
$SYS/broker/clients/expired 0
$SYS/broker/heap/current size 0
$SYS/broker/heap/maximum size 0
$SYS/broker/publish/messages/received 0
$SYS/broker/publish/messages/sent 0
$SYS/broker/publish/bytes/received 0
Test Messages
Send test callback!

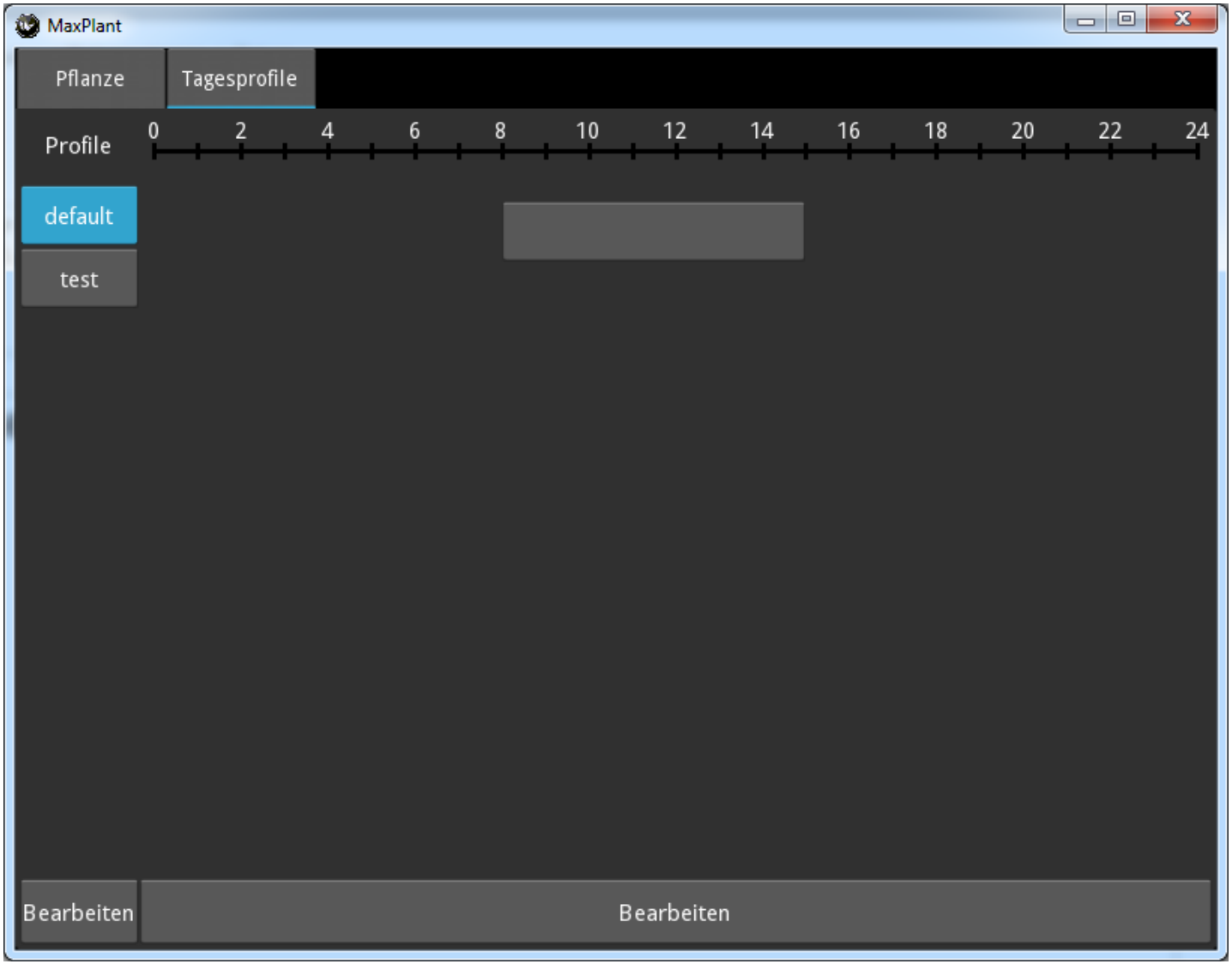
Steering Plant Growth

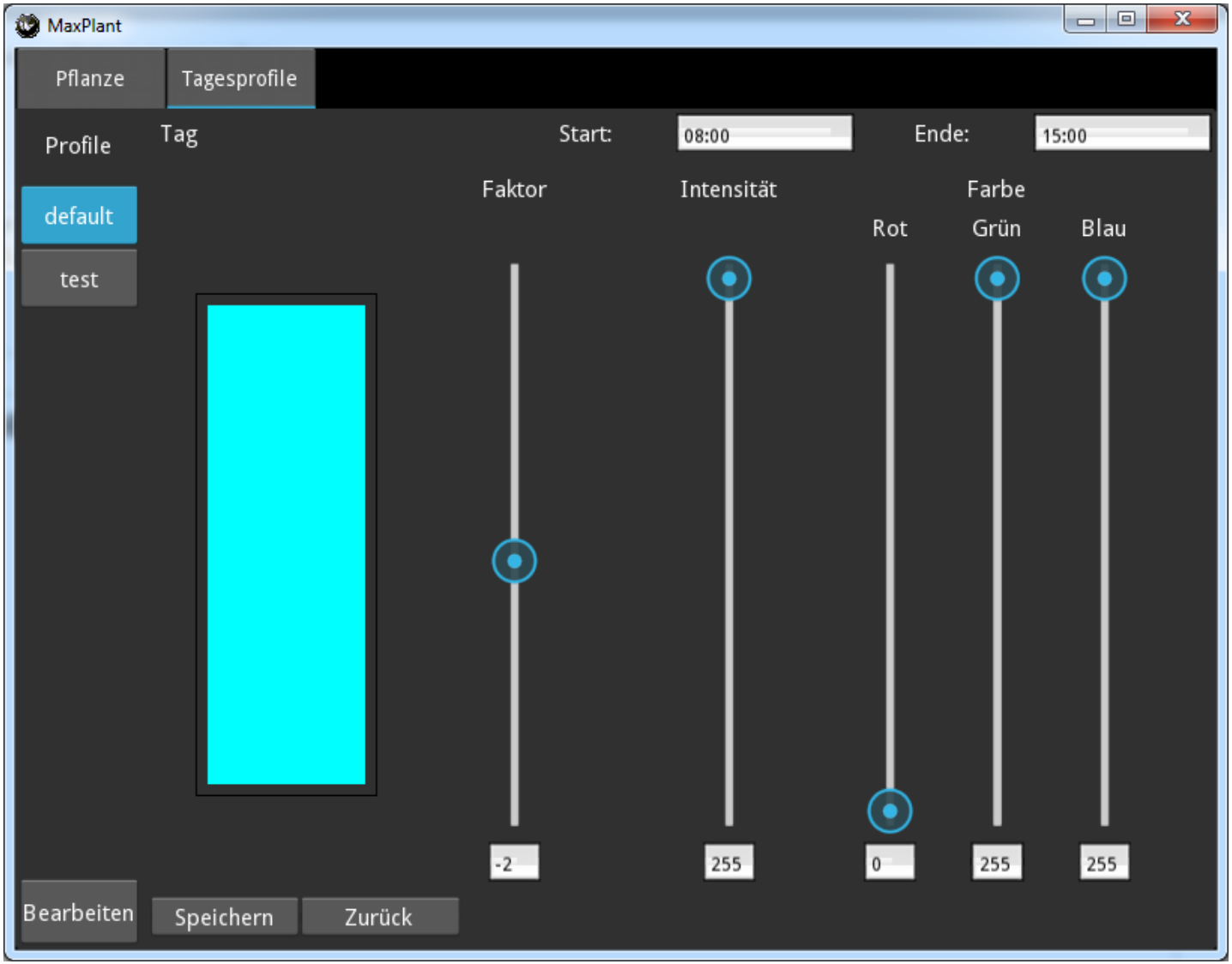
- Webcam takes picture of plants
- Computer detects plant
- Computer generates an image for lighting
- Light source (e.g., a projector) illuminates the plant using the generated image




MaxPlant
Pflanze
Tagesprofile
Beamer


MaxPlant
Pflanze
Tagesprofile
Original


MaxPlant
Pflanze
Tagesprofile
Profile
0
2
4
6
8
10
12
14
16
18
20
22
24
default
test
Bearbeiten
Bearbeiten


MaxPlant
Pflanze
Tagesprofile
Profile
Tag
Start:
08:00
Ende:
15:00
default
test
Faktor
Intensität
Farbe
Rot
Grün
Blau
-2
255
0
255
255
Bearbeiten
Speichern
Zurück

Other Examples…

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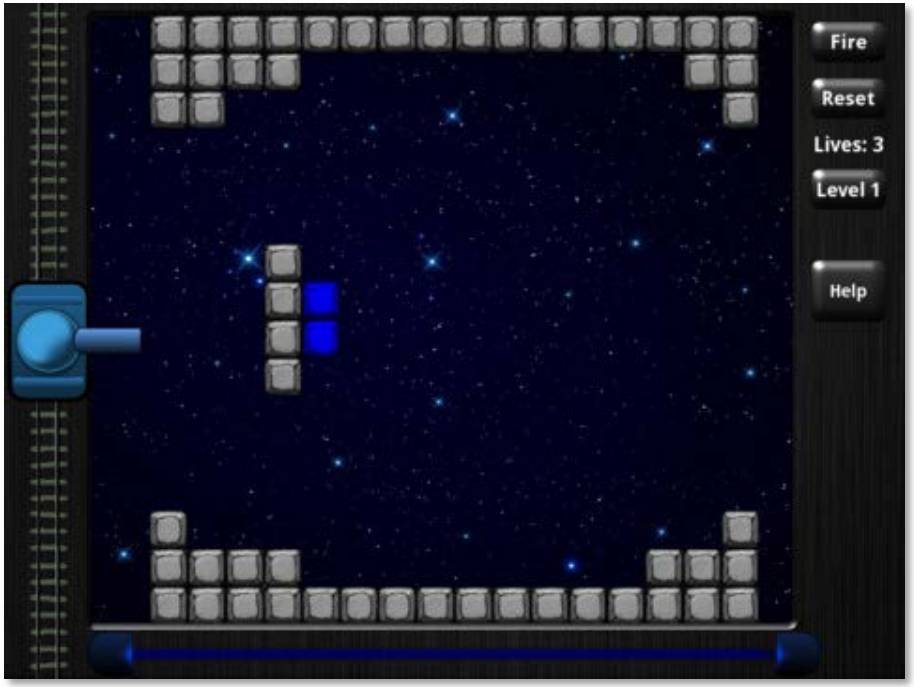
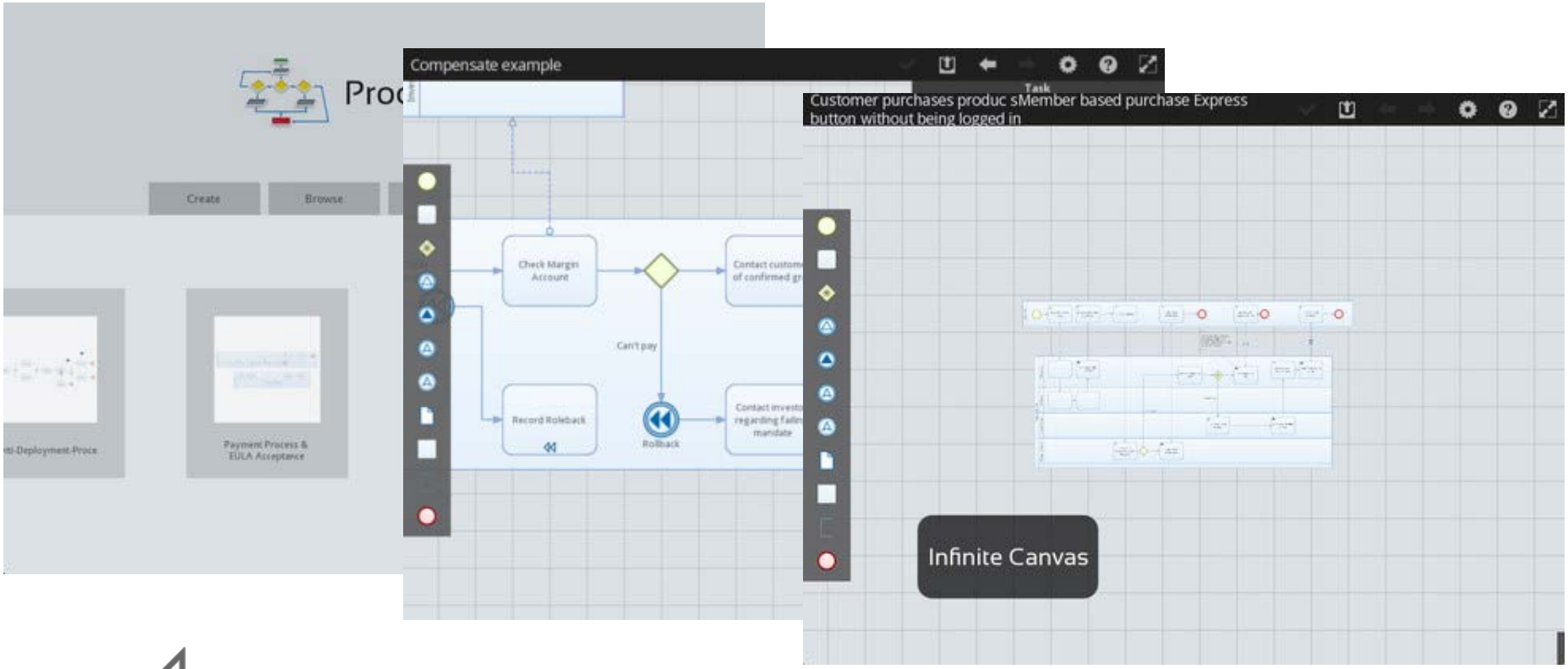
iOS-App Deflectouch

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



iOS/Android-App ProcessCraft

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



Limitations

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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

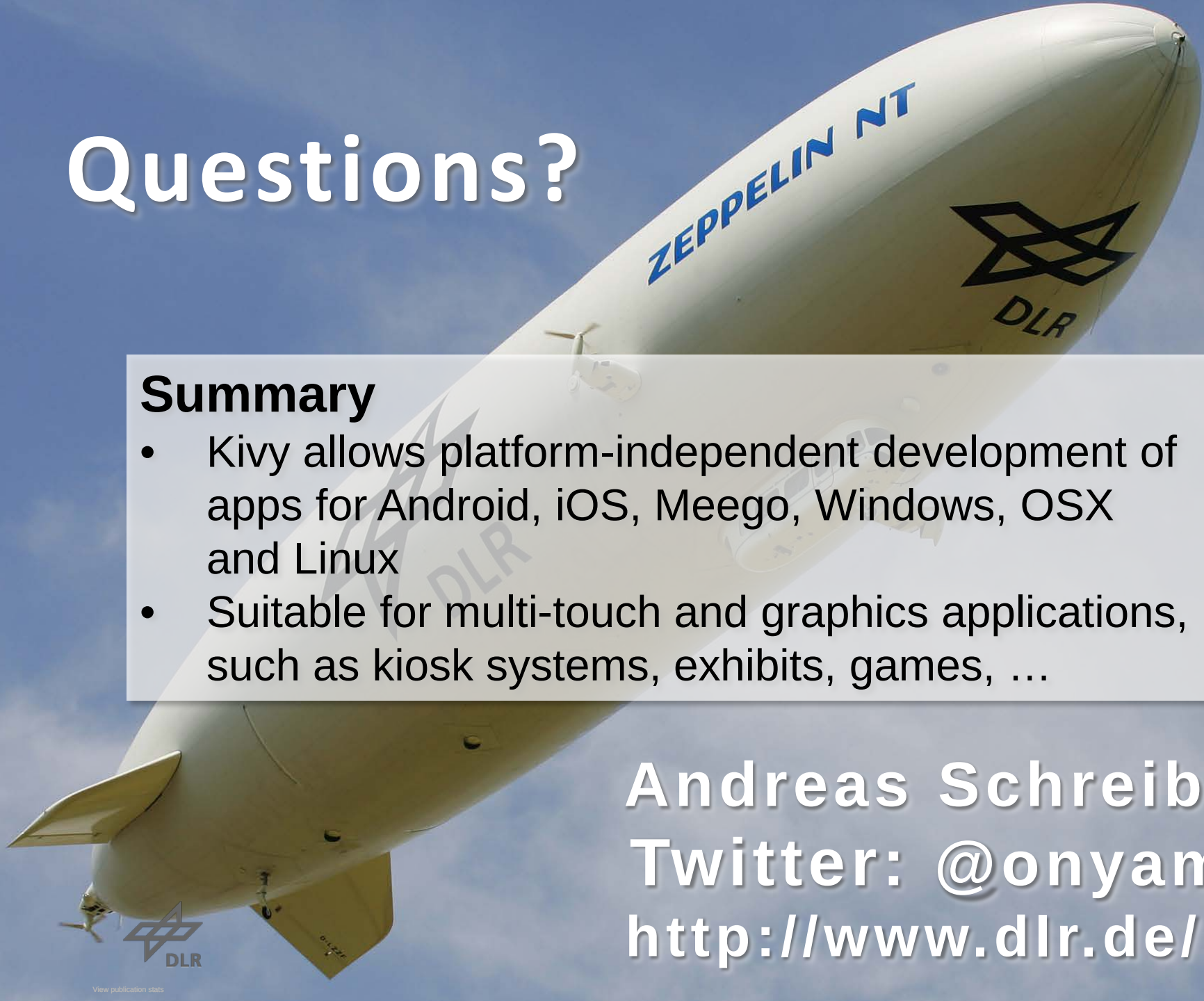
- Useful for small/cheap standalone systems
- Founded via Crowdsourcing (**`bountysource.com`**)

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, …

Andreas Schreiber
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http://www.dlr.de/sc