DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Bachelor's Thesis in Informatics: Games Engineering

Smartphone-assisted Virtual Reality using Ubi-Interact

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Smartphone-gestützte Virtuelle Realität mit Ubi-Interact

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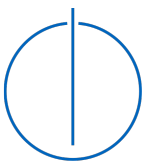

I confirm that this bachelor's thesis is my own work and I have documented all sources and material used.

Munich, October 15, 2019 Michael Alexander Lohr

Acknowledgments

Abstract

Contents

Abbreviations

VR Virtual Reality

UBII UBI-Interact

IMU Inertial measurement unit

1 Introduction

Hi, this is my thesis, and I'm going to be the introduction.

2 Implementation

2.1 Ubi-Interact

UBI-Interact (UBII) is a framework for distributed applications, which enables to connect all kinds of different devices together. A centralized server is used to manage the system in a local network. The abstraction into devices, topics and interactions allows to decouple the implementation of a software from device specific environments.

2.1.1 Architecture

The core components of the UBII framework are:

Client describes a network participant, which is defined by an unique identifier and a network socket adress.

Devices can be registered by clients. A device is an abstraction for a virtual device, which groups different components like input and output devices together. A source for such an input device component, could be any sensor e.g. a hardware button or an Inertial measurement unit (IMU). Output devices like a lamp or display can be represented by output device components. Devices are defined by unique identifier, a client and a list of components. Components are defined by a topic, a message format and wether it publishes input or output data.

Topics are data channels which are addressed by a name. Clients can publish messages to topics, which are registered by a device. Clients are also able to receive messages, after subscribing to a topic. Such messages (topic data) are formatted as JSON[1] -string, whose structure is defined by the device.

Interactions are reactive components which are defined by devices. They operate on topics and are defined by a source code snippet[2]. Interactions are executed in a fixed interval on the UBII server. They can subscribe to topics and use the the received topic data as input. The output of the interaction is published into

[1] JSON is a standardized data exchange format, that uses human-readable text. It is often used for web-based data communication.

[2] Currently only JavaScript is supported as a script language.

another topic. It is also possible to keep data to use in future executions (persistent state).

3 Introduction

3.1 Section

Citation test [Afo+17] vs [Afo+17].
More [pre Afo+17, post]
Also possible:[1]

Acronym test Virtual Reality (VR) cool.
And a second time VR awesome.

3.1.1 Subsection

See Table 3.1, Figure 3.1, Figure 3.2, Figure 3.3.

Table 3.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

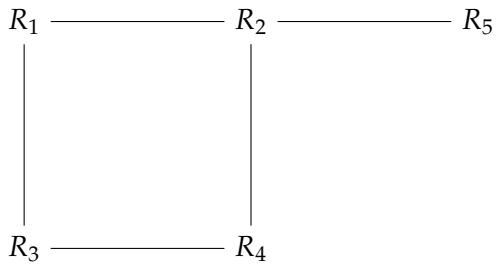

Figure 3.1: An example for a simple drawing.

[1] Afo+17.

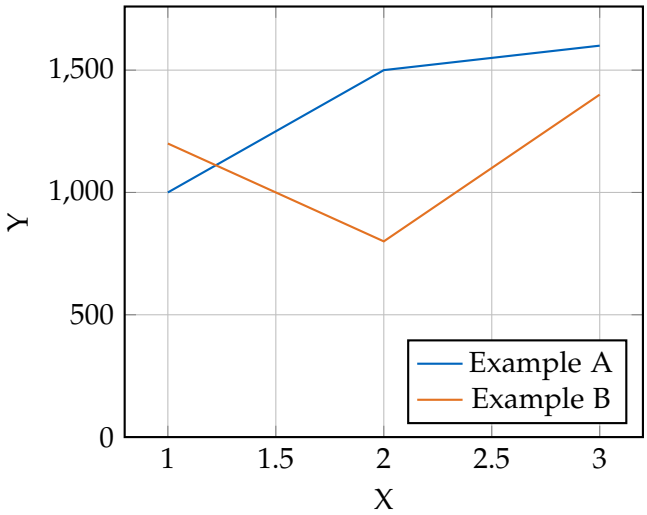

Figure 3.2: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 3.3: An example for a source code listing.

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Bibliography

[Afo+17] L. Afonso, P. Dias, C. Ferreira, and B. S. Santos. "Effect of hand-avatar in a selection task using a tablet as input device in an immersive virtual environment." In: *2017 IEEE Symposium on 3D User Interfaces (3DUI)*. Piscataway, NJ: IEEE, 2017, pp. 247–248. ISBN: 978-1-5090-6716-9. DOI: 10.1109/3DUI.2017.7893364.