

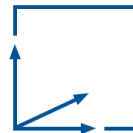
Kickoff Presentation:

Bachelor's Thesis in Informatics: Games Engineering

Smartphone-Assisted Virtual Reality Using Ubi-Interact

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May 5, 2019



Supervisor: Prof. Gudrun Johanna Klinker, Ph.D.

Advisor: Sandro Weber, M.Sc.

Motivation



Figure 1: Google Cardboard. Retrieved from <https://vr.google.com/cardboard/get-cardboard/>

Motivation

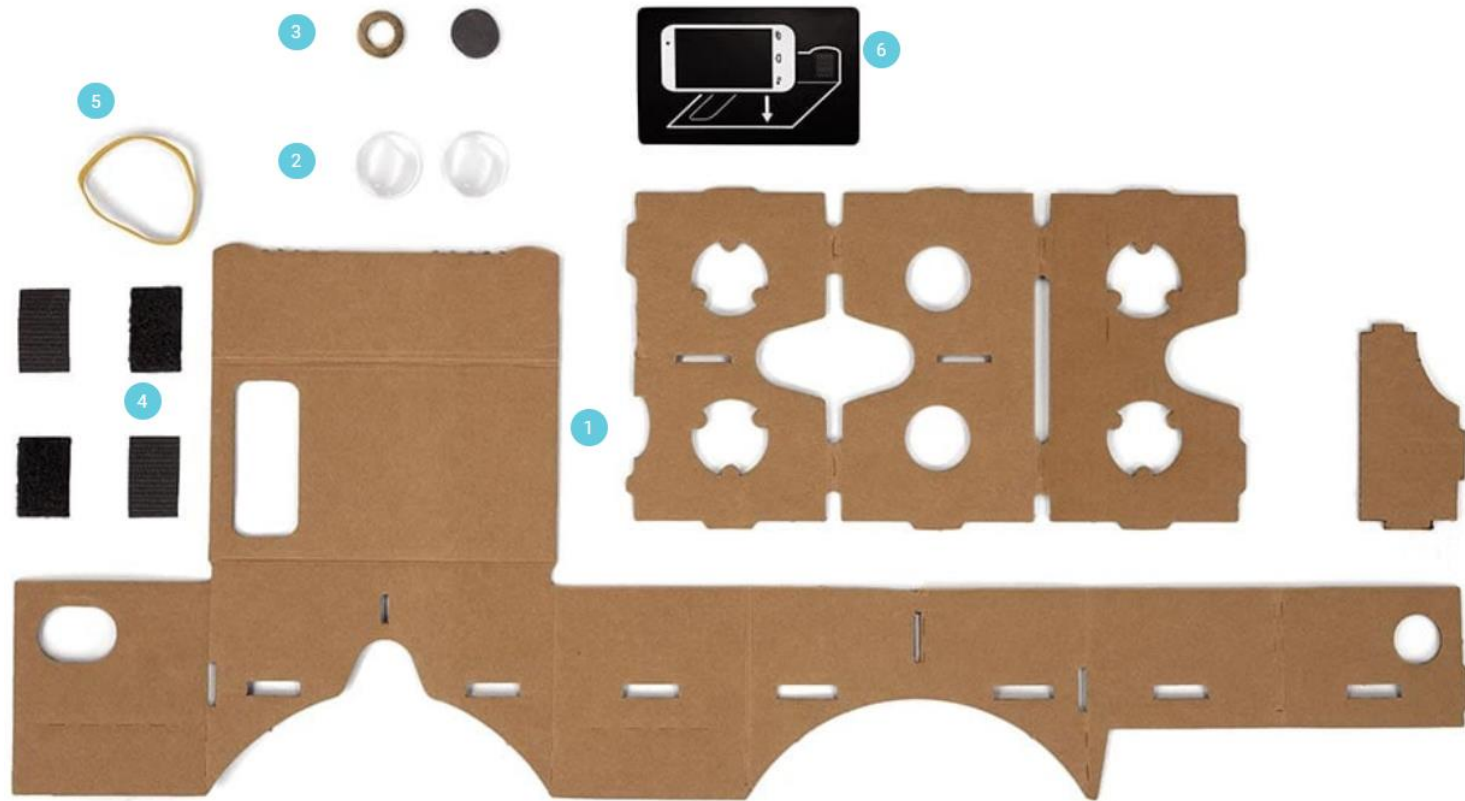


Figure 2: Google Cardboard. Retrieved from <https://vr.google.com/cardboard/get-cardboard/>

Motivation

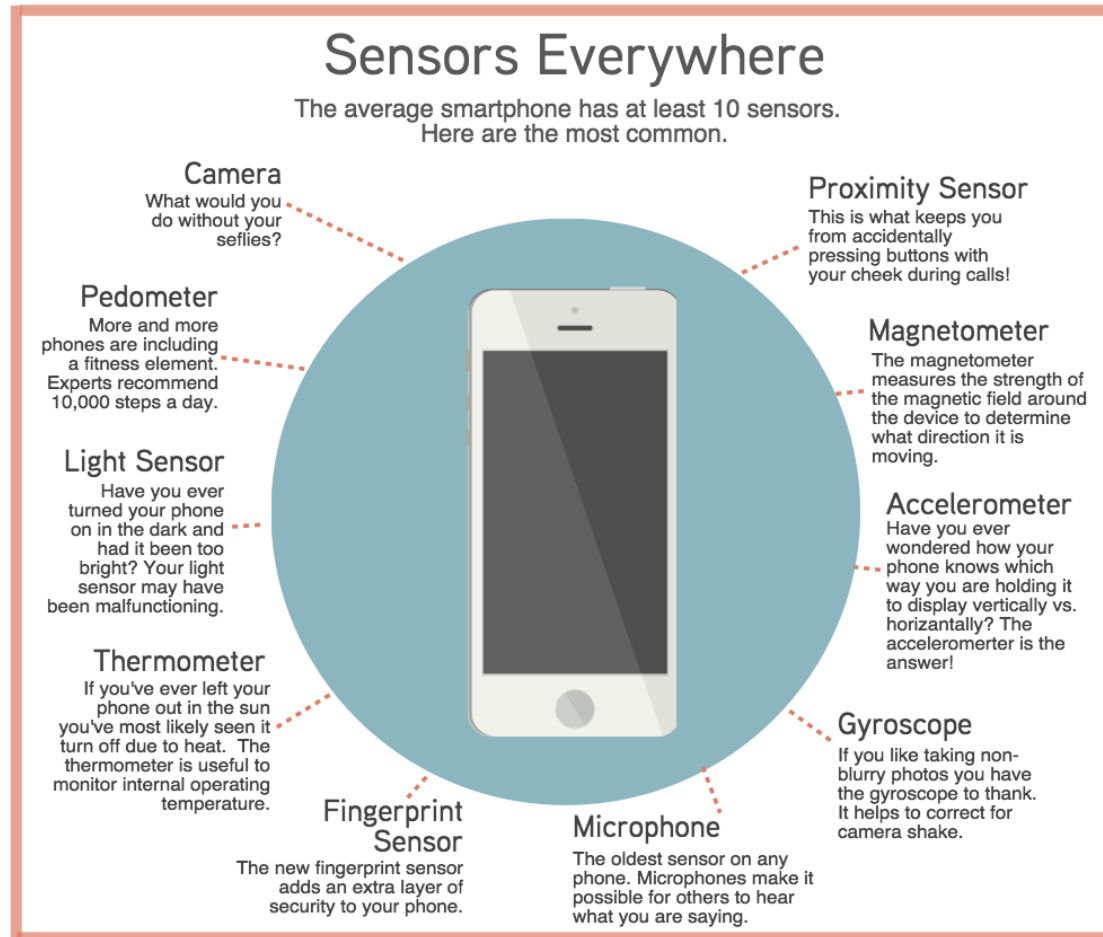


Figure 4: Sensors of a Smartphone. Retrieved from <https://www.corneralliance.com/blog/phone-internet-of-things>

Motivation



Figure 5: VR Controllers. Retrieved from <https://bit.ly/2WyZcrr>

Motivation

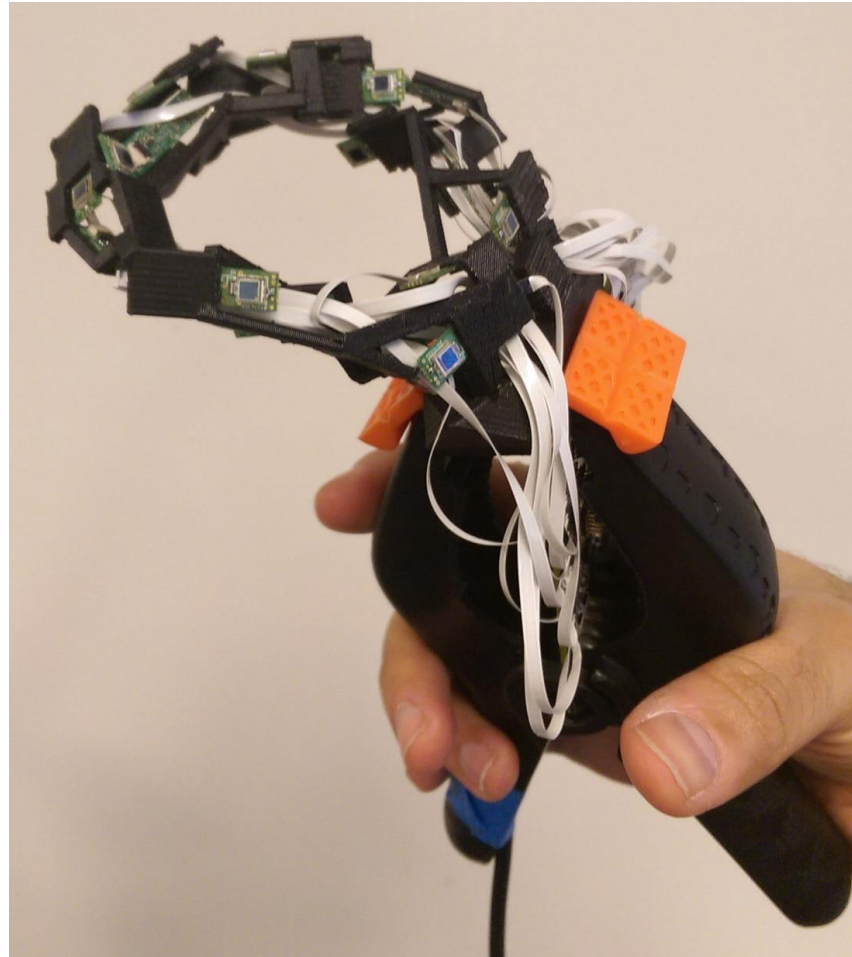


Figure 6: HTC Vive VR Controller Prototype. Retrieved from <https://engt.co/2997azg>

Motivation

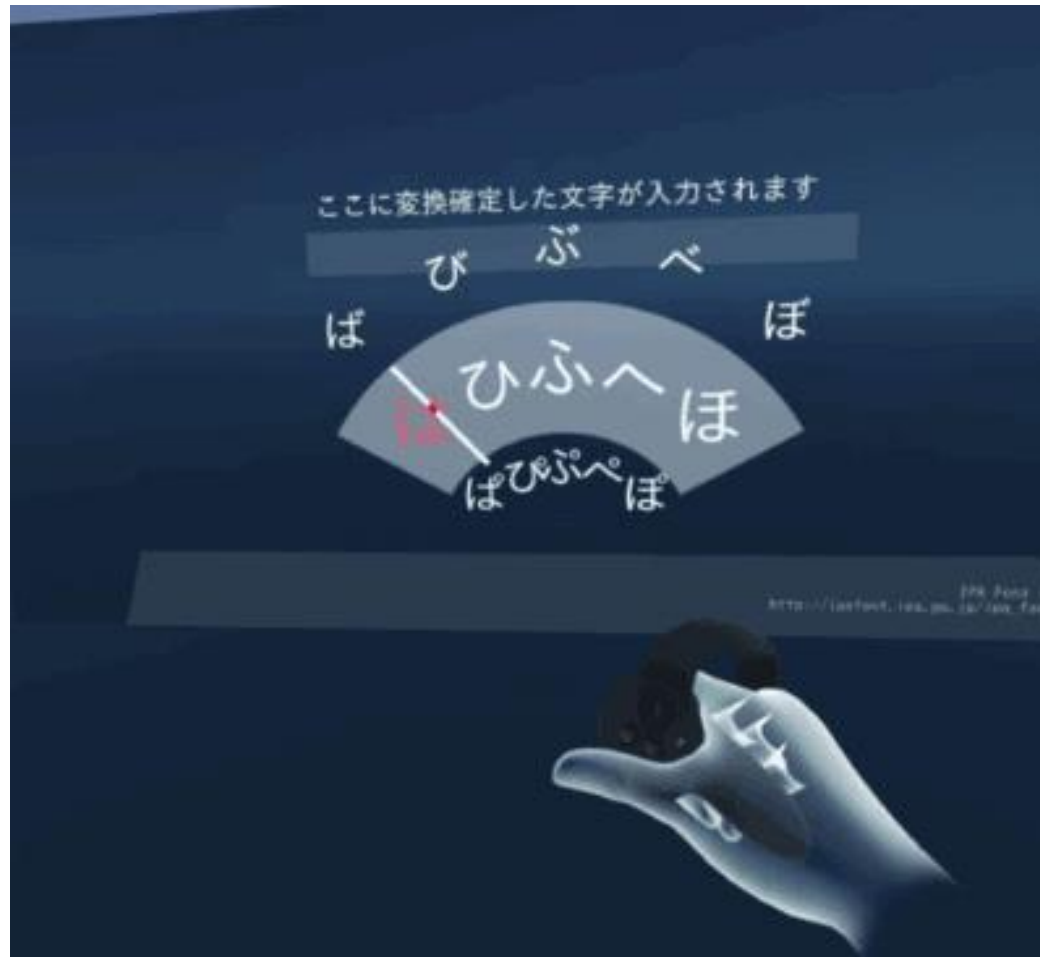


Figure 7: VR Text Input Method for Japanese and English. Retrieved from <https://github.com/yutokun/VR-Text-Input>

Problem Description: Issues

- Which VR-interactions can be implemented with a Smartphone?
- Which sensors/data a Smartphone provides, should be used?
- How to convey the real presence of the Smartphone to VR, without exact tracking?

Related Work: Smartphone Interaction

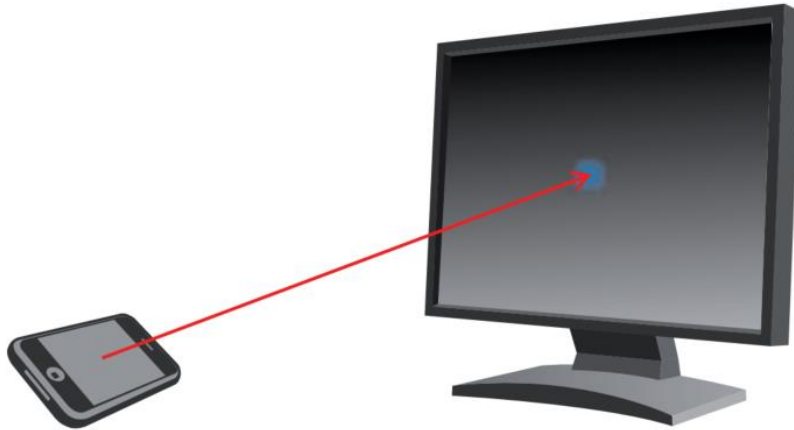


Figure 8: The Smartphone as a virtual laser pointer.

[1] Graf, H., & Jung, K. (2012).



Figure 9: Using a mobile device to rotate a 3D object.

[2] Katzakis, N., & Hori, M. (2010).

Related Work: Smartphone Representation

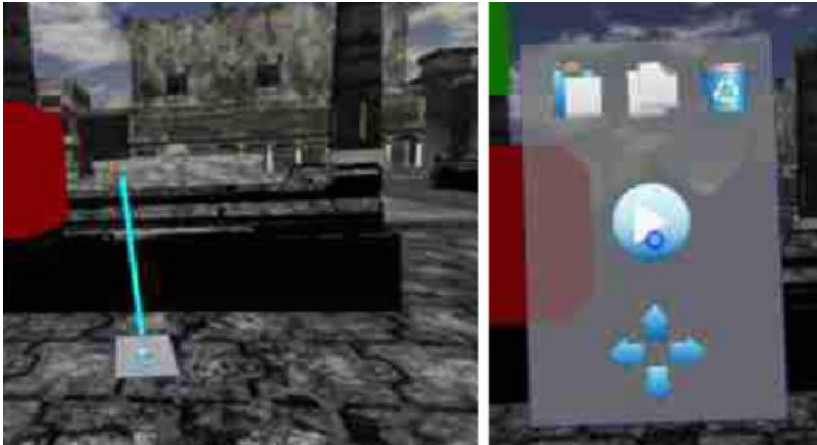


Figure 10: Virtual panel showing controls for interacting with objects.

[3] Steed, A., & Julier, S. (2013).

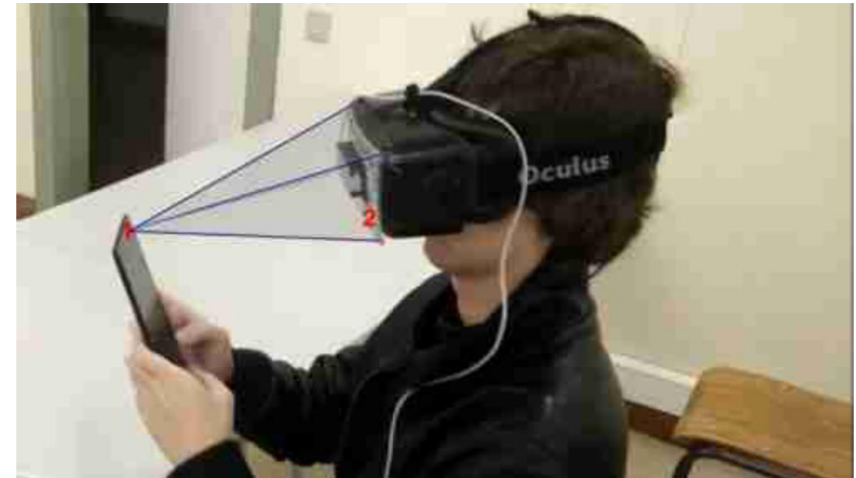


Figure 11: Exact tracking of the phone relative to the headset.

[4] Dias, P., Afonso, L., Eliseu, S., & Santos, B. S. (2018).

Goals of this Thesis

- Create multiple demos for Smartphone interactions:
 - Rotate 3D model
 - Laser pointer
 - Text input
 - ...
- Evaluate how well it works.
- Solve problems, like Smartphone representation.

Approach

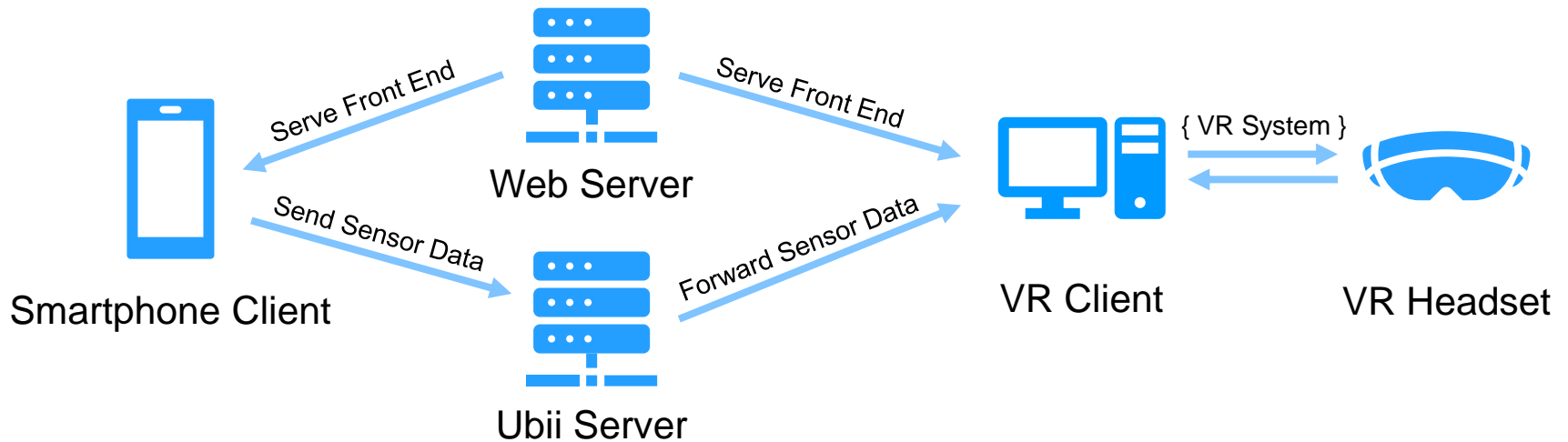


Figure 12: Project Architecture

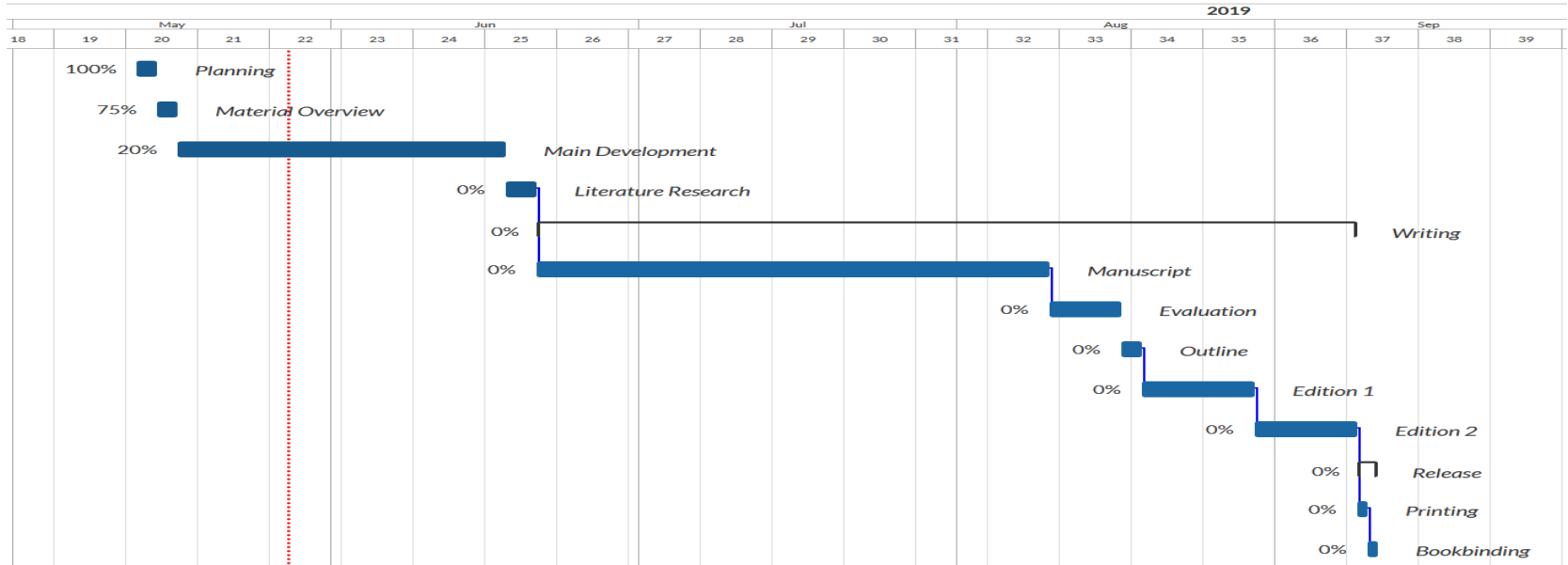
- VR-Renderer & Smartphone client, both embedded in the Ubii-web client
 - ⇒ No extra platform-specific app or software required
- Web-based technology stack:
 - Vue.js (ES6 JavaScript)
 - Three.js (WebGL)
 - Ubi-Interact

Discussion of Potential Issues

- No exact positional tracking
 - Possible with headset/smartphone camera and marker tracking
 - Only IMU (orientation + acceleration)
 - Also possible via integration (Orientation Fusion) → Drift
 - Is this really necessary?
- Touch input: Fingers are not tracked
 - Hard to use touch display
 - Cursor? 3D Touch?

Time Line

Figure 13: Project Time Line as Gantt Diagram



- Planning, Material Overview: 2 days ✓
- Implementation: 1 Month (\pm 2 Weeks)
- Writing (including correction): 2 Months (\pm 2 Weeks)
- Printing, Bookbinding, Backup: 2 Weeks

List of References

- [1] Graf, H., & Jung, K. (2012). The smartphone as a 3D input device. In 2012 IEEE Second International Conference on Consumer Electronics - Berlin (ICCE-Berlin). IEEE. <https://doi.org/10.1109/icce-berlin.2012.6336487>
- [2] Katzakis, N., & Hori, M. (2010). Mobile devices as multi-DOF controllers. In 2010 IEEE Symposium on 3D User Interfaces (3DUI). IEEE. <https://doi.org/10.1109/3dui.2010.5444700>
- [3] Steed, A., & Julier, S. (2013). Design and implementation of an immersive virtual reality system based on a smartphone platform. In 2013 IEEE Symposium on 3D User Interfaces (3DUI). IEEE. <https://doi.org/10.1109/3dui.2013.6550195>
- [4] Dias, P., Afonso, L., Eliseu, S., & Santos, B. S. (2018). Mobile devices for interaction in immersive virtual environments. In Proceedings of the 2018 International Conference on Advanced Visual Interfaces - AVI '18. ACM Press. <https://doi.org/10.1145/3206505.3206526>