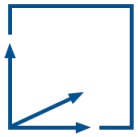
Physical Embodiment in VR: Interchangeable Web-Based Modules using Ubi-Interact

Leonard Goldstein

24.02.2022



Kickoff: Bachelor Informatics

Supervisor: Prof. Gudrun Klinker, Ph.D.
Advisor: Sandro Weber, M.Sc.

Introduction / Motivation

Myriad of devices & technical approaches for VR/AR

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Ubi-Interact: framework for network interaction across platforms

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Interact with virtual world in a way that feels natural

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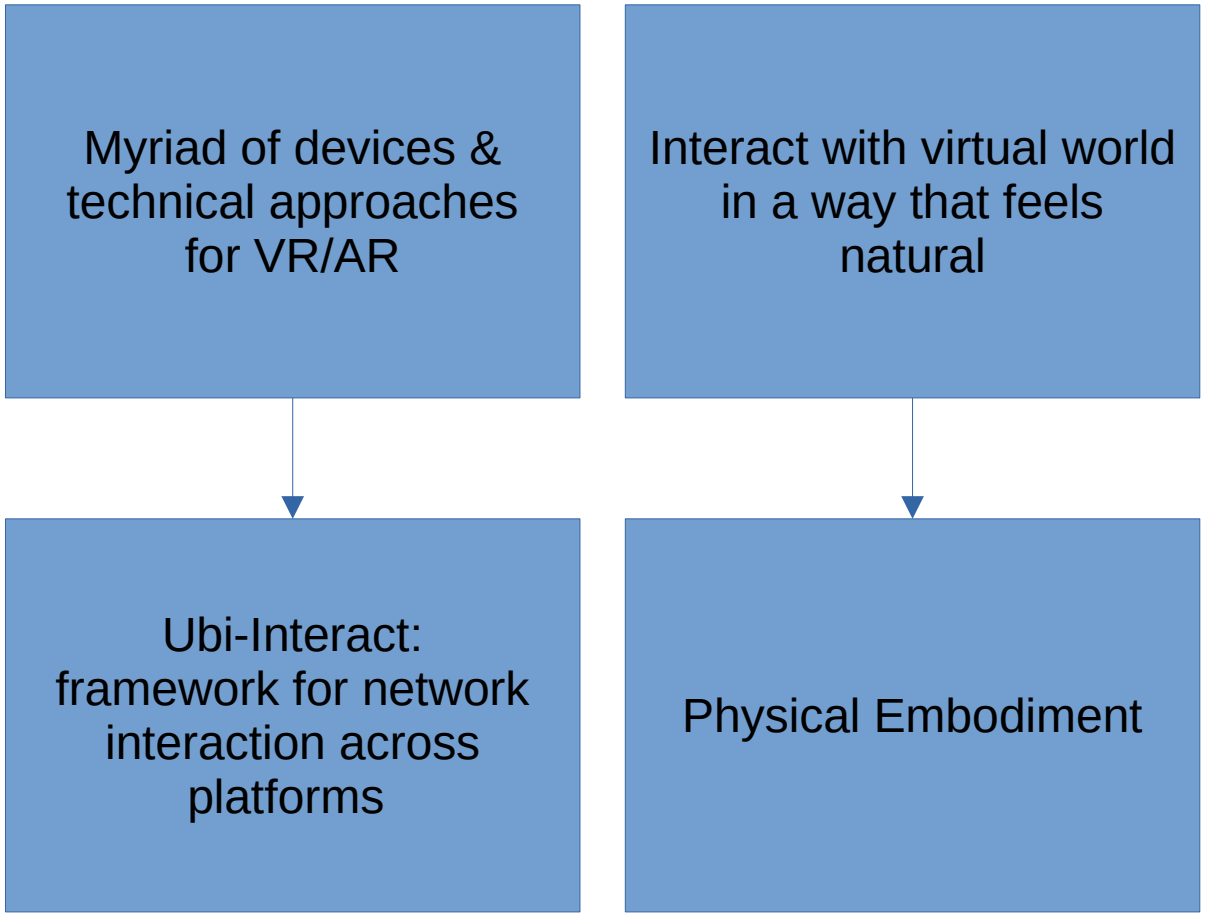


Introduction / Motivation

Myriad of devices & technical approaches for VR/AR

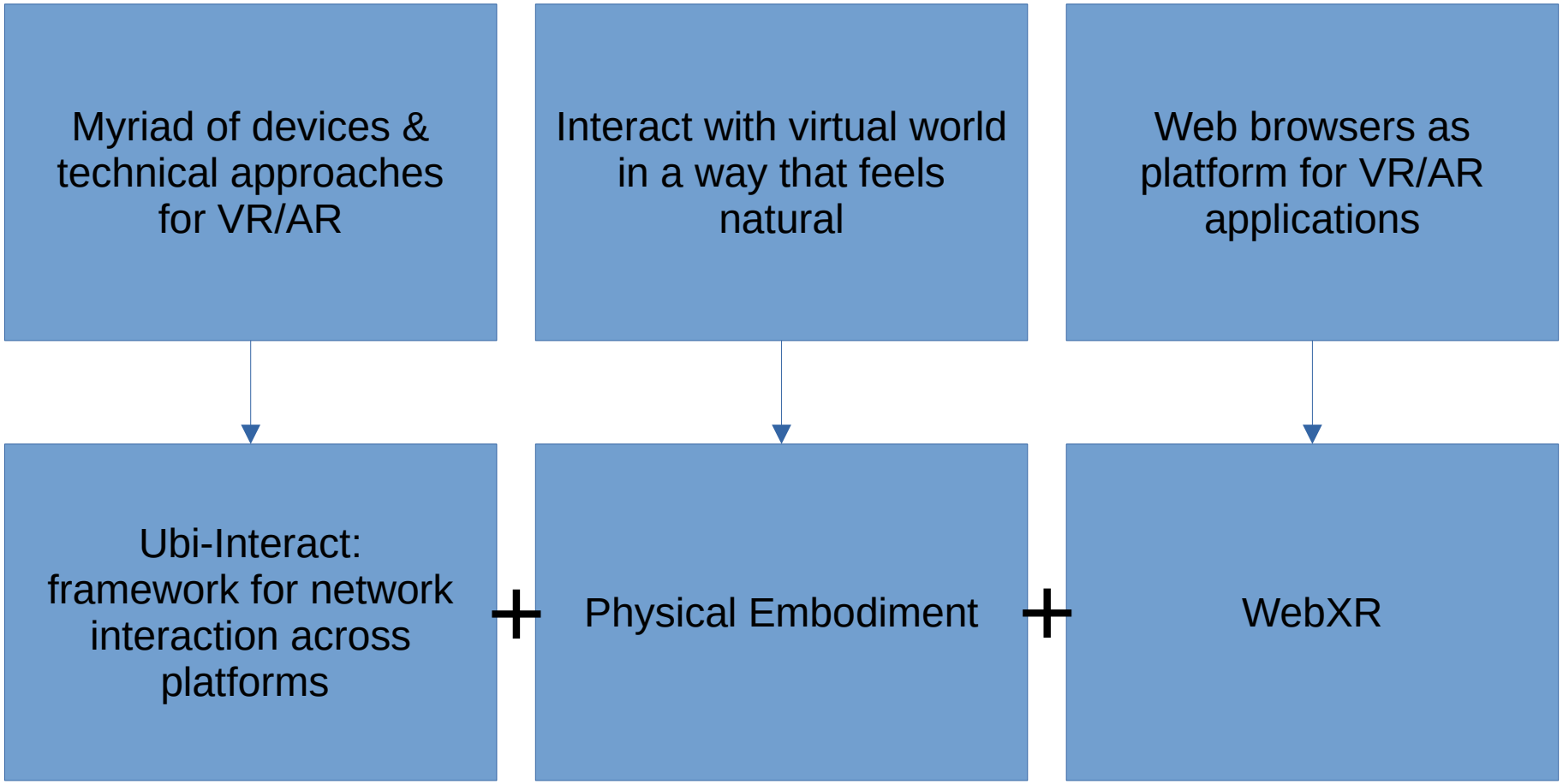
Interact with virtual world in a way that feels natural

Web browsers as platform for VR/AR applications

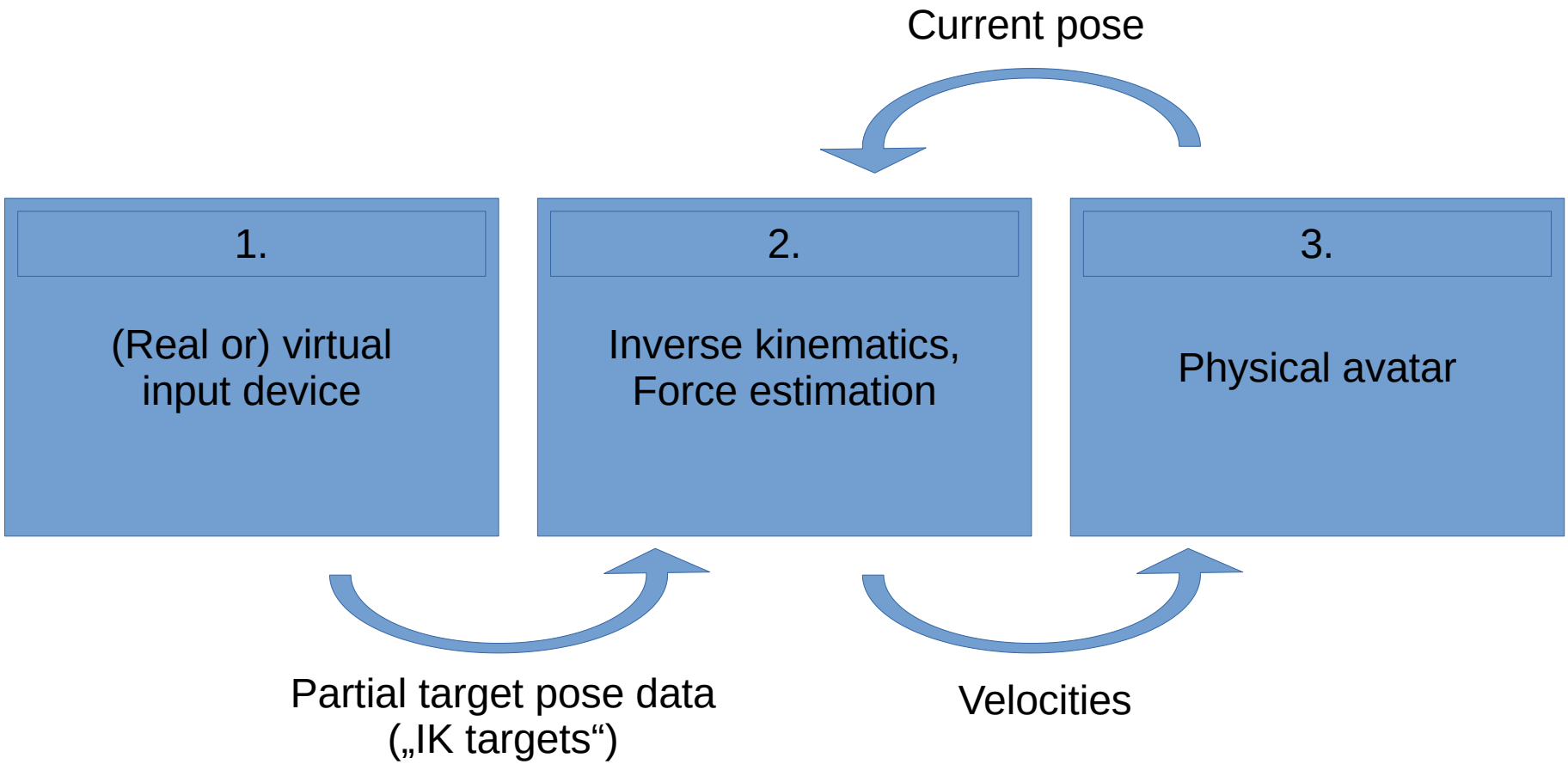
Ubi-Interact: framework for network interaction across platforms

Physical Embodiment

Introduction / Motivation



Problem Description: Issues



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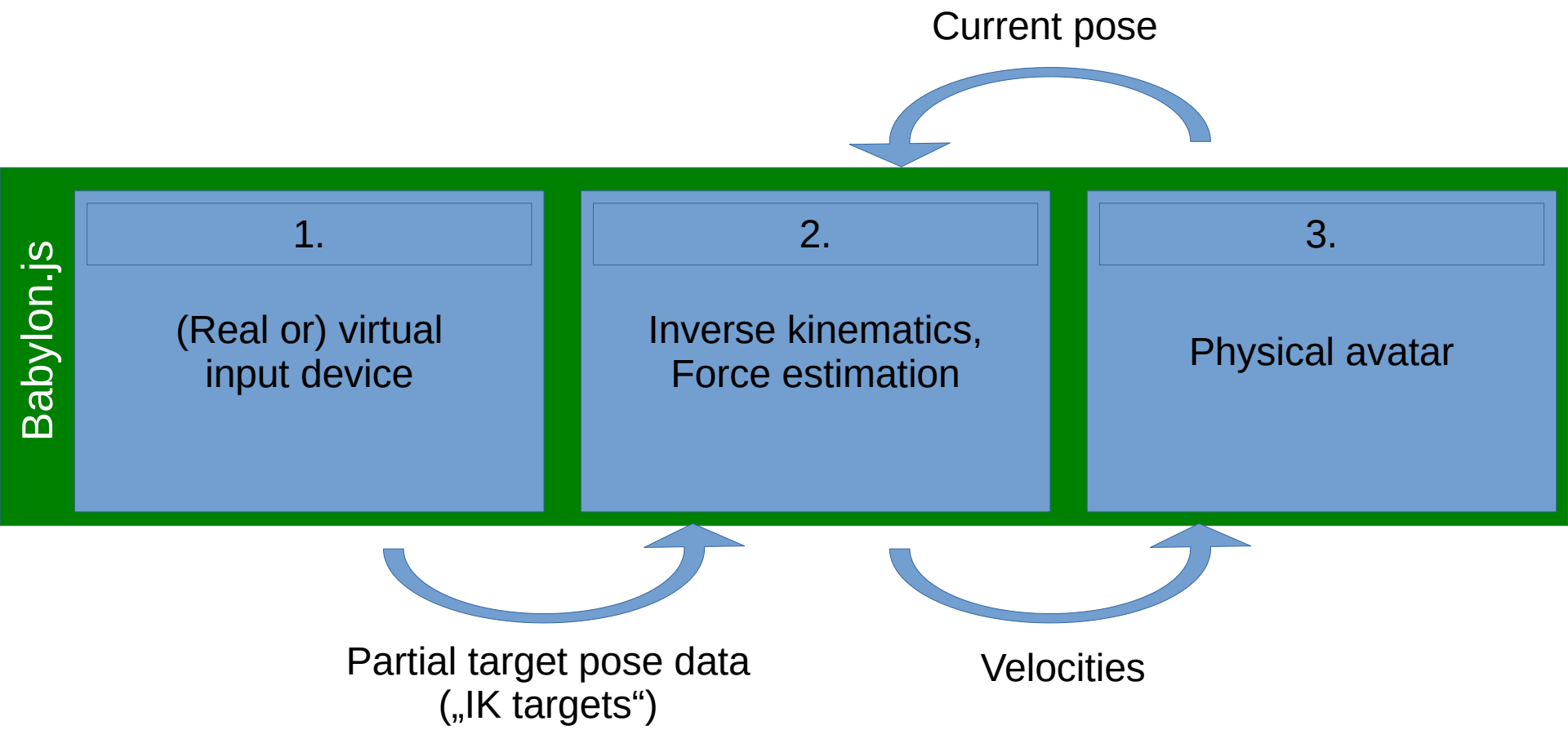

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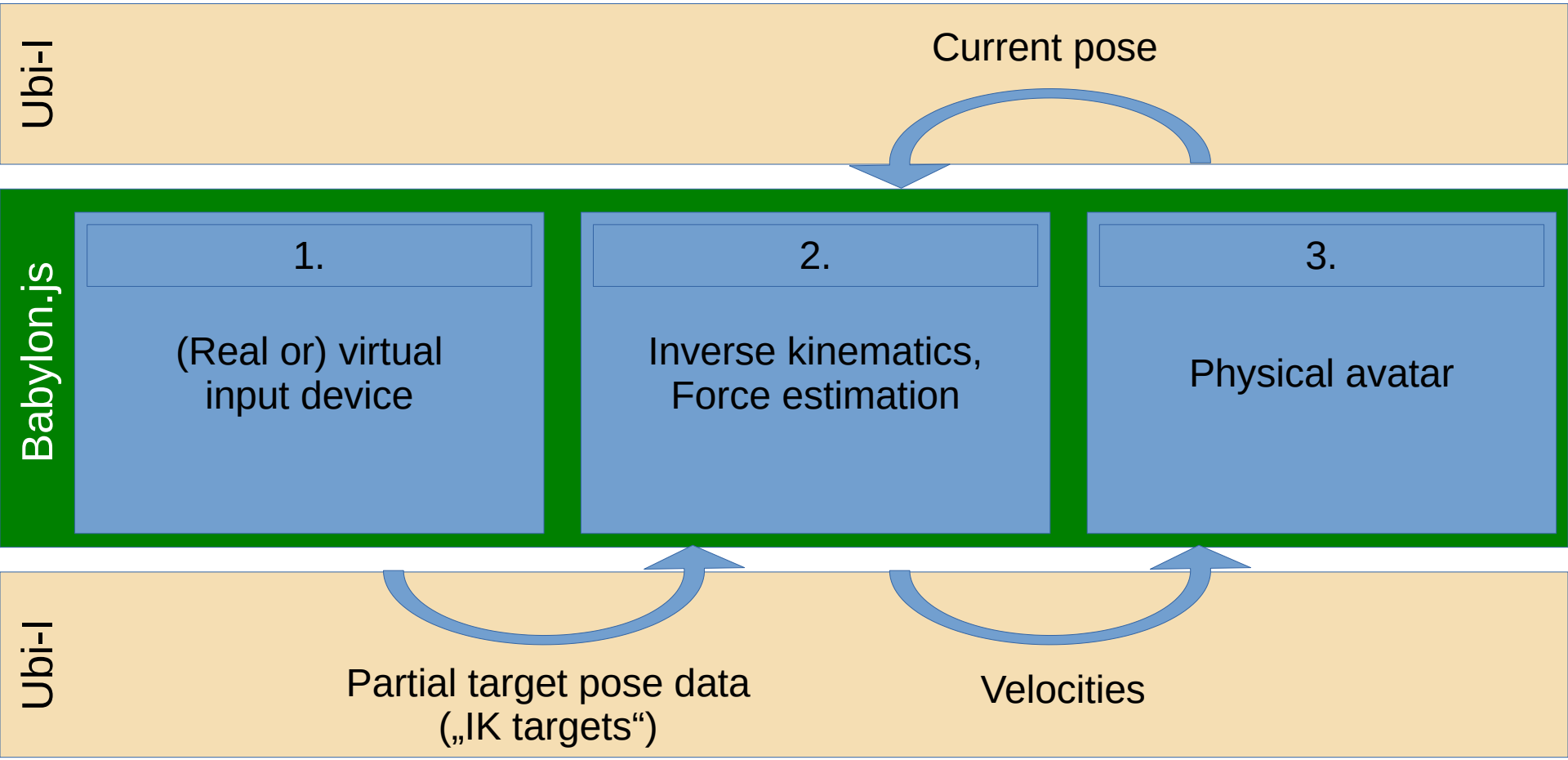
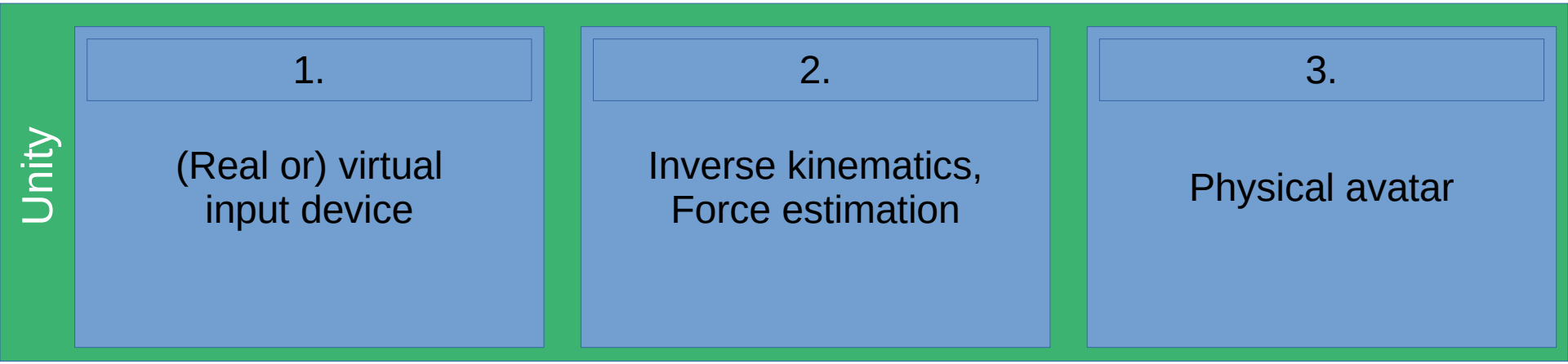


Existing Solutions / Related Work



Goals of this Thesis

Babylon.js

1.	2.	3.
(Real or) virtual input device	Inverse kinematics, Force estimation	Physical avatar

Unity

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(Real or) virtual input device	Inverse kinematics, Force estimation	Physical avatar

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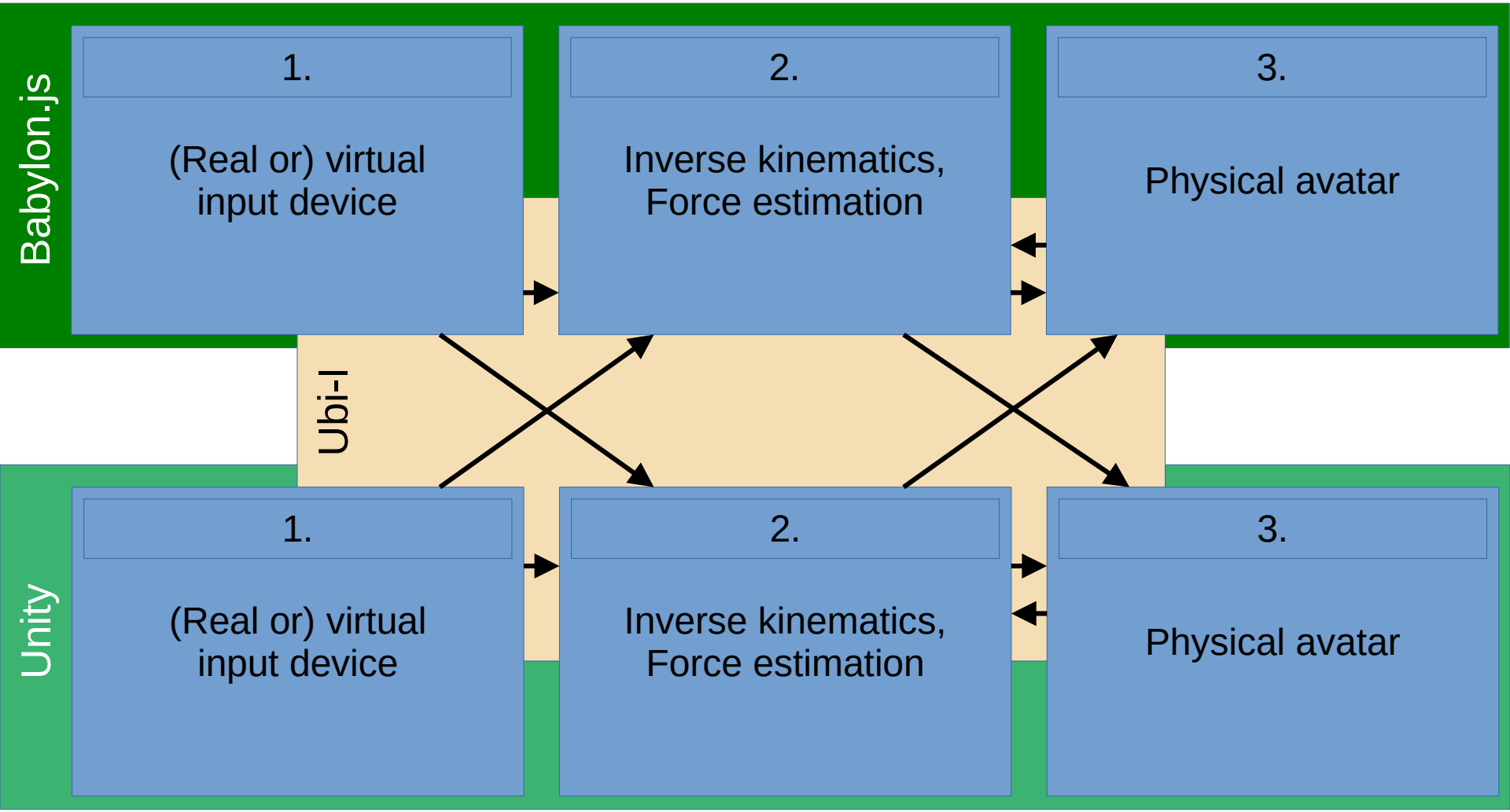
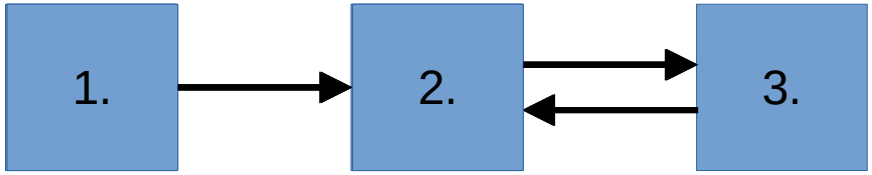


Proposed Work / Approach

- Implement module communication first:



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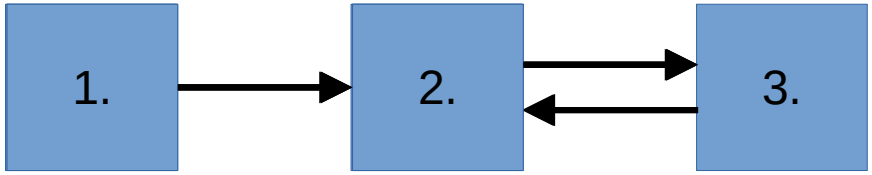
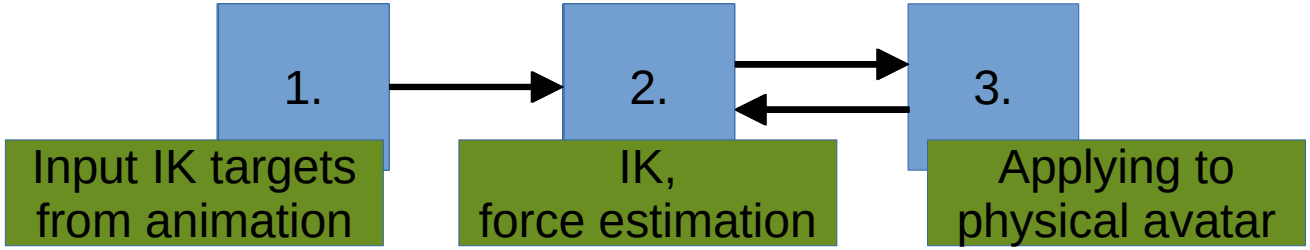


- Implement data processing thereafter:



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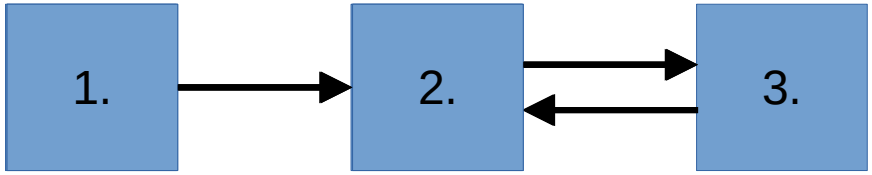

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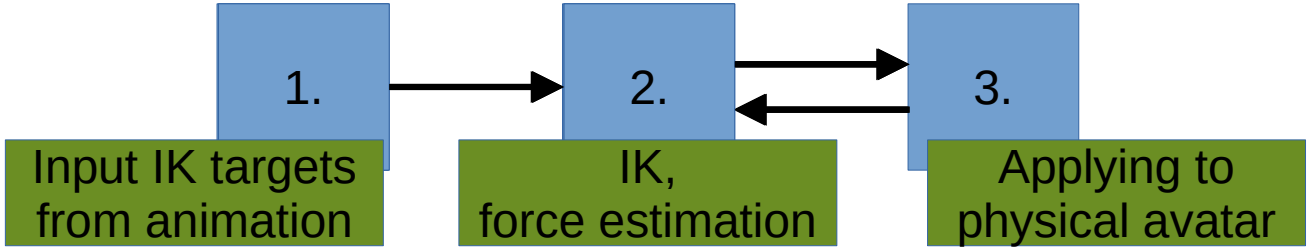
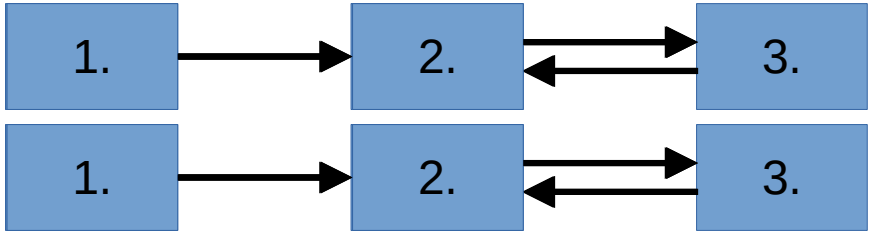


- Observe performance, similarities, differences



Discussion of Potential Issues

Implementation related:

- Not planning correctly
  → stucture of code development to find problems early
- Some parts might be impossible in browsers?
  → omit / implement somewhere different

Thesis related:

- Being new to science
  → reading
  → getting feedback on own writing
- Academic english writing style
  → TUM English Language Center

Outlook

Input from real hardware

Different bone rigs

Lower-level implementations

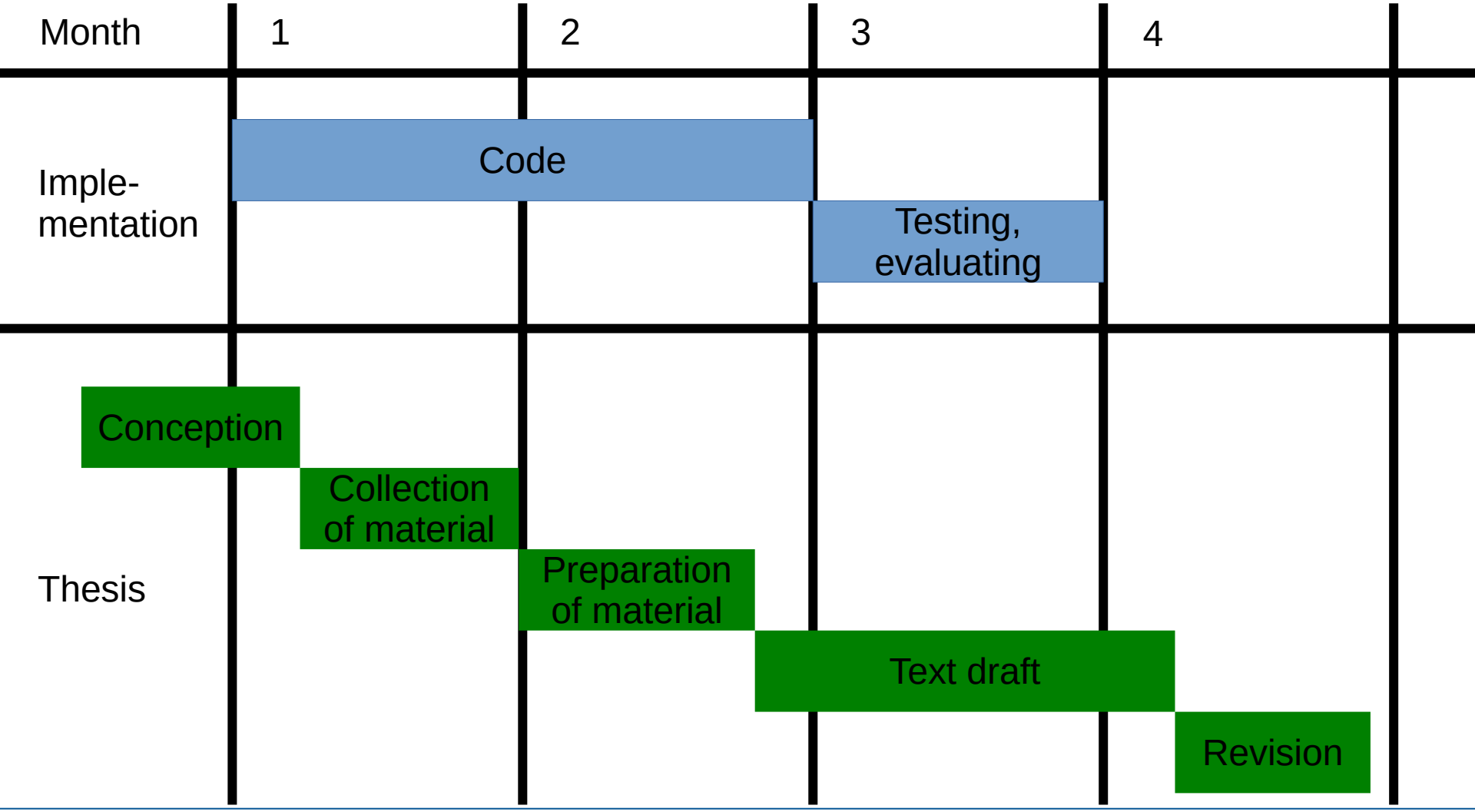
Multi-user scenarios

Applying physics to real robots

Different IK algorithms

HCI in physical embodiment

Time Line


Month
1
2
3
4
Imple-
mentation
Code
Testing,
evaluating
Thesis
Conception
Collection
of material
Preparation
of material
Text draft
Revision

List of References

1. Weber, Sandro, et al. "Ubi-Interact." MobiQuitous 2020-17th EAI International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services. 2020.
2. Weber, S. & Klinker, G., (2019). VR Re-Embodiment in the Neurorobotics Platform. Mensch und Computer 2019 - Workshopband. Bonn: Gesellschaft für Informatik e.V.. DOI: 10.18420/muc2019-ws-585
3. D. Roth, J. -L. Lugrin, J. Büser, G. Bente, A. Fuhrmann and M. E. Latoschik, "A simplified inverse kinematic approach for embodied VR applications," 2016 IEEE Virtual Reality (VR), 2016, pp. 275-276, doi: 10.1109/VR.2016.7504760.
4. Kirk M Besmer. 2015. What Robotic Re-embodiment Reveals about Virtual Re-embodiment. Postphenomenological Investigations (2015), 55.
5. Michael Hellwig, „Abschlussarbeiten meistern,“ 2-part course, 2021.