

This thesis was submitted to the Institute of Mechanism Theory, Machine Dynamics and Robotics

Cross-Compiling ROS2 Humble to WebAssembly

Master Thesis

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Aachen, 31 March 2023

Master Thesis

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Contents

Formula symbols and indices	viii
List of abbreviations	ix
1. Introduction	1
2. Literature Review	2
2.1. ROS on Web	2
2.2. Web Tools	2
2.3. Unreal WASM??	2
3. Concept Realization	3
4. Technical Levels	4
4.1. User Levels of Interaction	4
4.2. Technical Levels of Implementation	4
5. Scope of Tasks	5
6. Methodology	6
7. Middleware Implementation	7
8. Package Building Process	8
9. Design of Web Elements	9
10.Package Management and Distribution	10
11.Concept Assessment	11
12.Summary	12
13.Outlook	13
List of Tables	I
List of Figures	II
A. Illustrations	III

B. Tables

IV

Formula symbols and indices

Lower case latin letters as formula symbols

a $\frac{\text{m}}{\text{s}^2}$ acceleration

Upper case latin letters as formula symbols

A m^2 surface

Lower case greek letters as formula symbols

α — Weighting factor

Upper case greek letters as formula symbols

Ω $\frac{\text{rad}}{\text{m}}$ Angular frequency

Indices

a Amplitude

List of abbreviations

General abbreviations

FFT Fast-Fourier-Transformation

WASM Web Assembly

1. Introduction

Motivation for work

2. Literature Review

2.1. ROS on Web

2.2. Web Tools

2.3. Unreal WASM??

3. Concept Realization

Ideal scenario: - click on a link and run ROS - connect to a robot via bluetooth - share simulations and algorithms

4. Technical Levels

4.1. User Levels of Interaction

4.2. Technical Levels of Implementation

5. Scope of Tasks

- Middleware replacement (why sockets don't work)
- JavaScript “ROS master”

6. Methodology

- Development environment - Building tools - Testing tools (chrome, firefox)

7. Middleware Implementation

- What does the middleware do? - ROS supported middleware implementations - Why it needs to be replaced - Minimal implementation (minimal set of functions) - Design of middleware packages (tree diagram or something)

8. Package Building Process

- Emscripten - Colcon - Toolchains

9. Design of Web Elements

- Web workers, what are they? why are they needed?
- Communication channels - Registry of topics/subs/pubs - Message handling

10. Package Management and Distribution

- Automating package building - robostack?

11. Concept Assessment

- Survey - Performance measures - Limitations

12. Summary

13. Outlook

- Compiling on the browser - Packaging Gazebo - WASI

List of Tables

List of Figures

A. Illustrations

B. Tables