

Contents

Declaration of Authorship	iii
Abstract	v
Acknowledgements	vii
1 Introduction (0. Aufgabenstellung)	1
2 3D Animation Basics (0.5 Basics)	3
2.1 Joints	3
2.2 Skeletal Format	3
2.3 Pose Space vs. Work Space	3
2.4 Forward Kinematics	3
3 Inverse Kinematics (1. Inverse Kinematics)	5
3.1 Analytical Methods	5
3.2 Jacobian Methods	5
3.3 Heuristic Methods	5
3.3.1 CCD	5
3.3.2 FABRIK	5
3.4 Other Methods	5
4 Constraints (2. Constraints)	7
4.1 Constraint Types	7
4.1.1 Swing Twist	7
4.1.2 Canonical Limits	7
4.1.3 Cone Limits	7
4.1.4 Hinge Limits	7
4.2 Jacobian Constraints	7
4.3 CCD Constraints	7
4.4 FABRIK Constraints	7
4.5 iTASC	7
5 Motion Retargeting (4. Motion Retargeting)	9
5.1 Available Tools	9
5.2 Skeleton Matching	9
5.3 Naive Retargeting	9
5.4 Limb based Retargeting	9
5.4.1 Online Motion Retargeting	9
5.4.2 Motion Retargeting for crowd Simulation	9
5.5 Machine Learning Approaches	9

6	Automated Rigging (5. Autorigging)	11
6.1	Machine Learning Approaches	11
6.1.1	Pinocchio	11
6.1.2	Rignet	11
6.2	Thinning Approaches (TODO genauer anschauen für mögliche impl?)	11
6.3	Skin Matching Approaches	11
6.4	SMPL fitting	11
6.5	Re-Meshing	11
7	CrossForge Editor (6. Editor)	13
7.1	Chosen Tools	13
7.2	Scene Management	13
7.3	User Interface	13
7.3.1	Picking System	13
7.3.2	Imgui Integration	13
7.4	Animation System	13
7.4.1	Sequencer	13
7.4.2	Motion Retargeting and Rigging Integration	13
7.4.3	Editing Tools (Restore Restpose, apply Transform etc.)	13
7.5	Inverse Kinematics Implementation	13
7.5.1	Jacobian Method	13
7.5.2	CCD	13
7.5.3	FABRIK	13
7.6	Constraints Implementation	13
7.7	Motion Retargeting	13
7.8	Model Import and Export	13
8	Conclusion and Future Work (7. Future)	15
8.1	Editor Improvements	15
8.2	Utilizing Skinning Alternatives	15
8.3	Other Useful Tools	15
8.4	Clothing	15
8.5	Motion Blending	15
8.6	Blender Addon	15
	Bibliography	17