Inverse Kinematics for Human Fingers

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1 Introduction

Human finger ik solver. C++ OpenGL SDL2 SDL2TTF Finger assigned to me : little finger.

2 Mathematical model

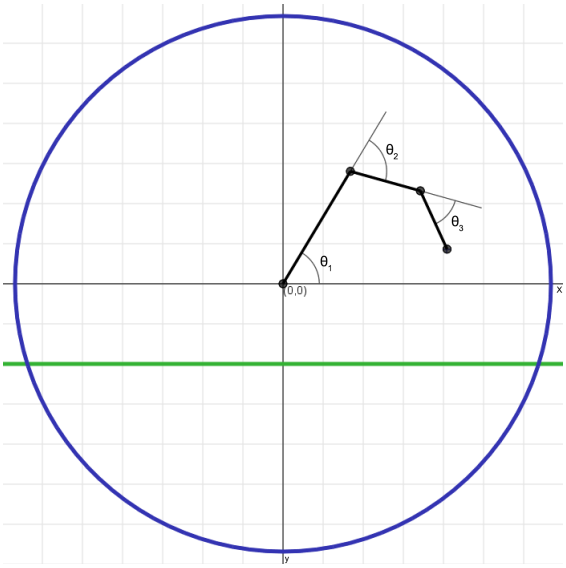

Figure 1: Situation sketch.

Table 1: Little finger link lengths

Link	**Length** (in mm)
Proximal phalanx	32.7
Intermediate phalanx	18.1
Distal phalanx	16.0

Initial model. Three bones represented by links. The proximal phalanx, intermediate phalanx and distal phalanx. TABLE OF LENGTHS HERE. Three 1-DOF joints which axes are parallel to and as such rotate in the z-axis. Angle limits. $\pi/3\theta M\pi/3, 2\pi/3\theta P0, and 2\pi/3\theta D0$ All motions of the finger take place in the (x,y) plane.

Three (n = 3) joints rotate in z-axis only, as such everything is in (x, y) space.

Unbounded object O x, y, z in R y + 2 <= 0. Infinite plane parallel to the x-axis at height y = -2.

2.1 Forward kinematics

Forward kinematics equations and experimentation. Transformation matrices.
0T1 1T2 2T3
0T3 = 0T1 * 1T2 * 2T3 = matrix
q = theta1 theta2 theta3

2.2 Forward kinematics with joint constraint

Reworked forward kinematics equations and experimentation.
2T3 = different

2.3 Inverse kinematics

Jacobi-matrix for reworked forward kinematics equations. Other IK related equations.

3 Implementation of inverse kinematics solver

Link to github. Description of ik solver

4 Experimentation

Initial guess is important. Alpha is important for accuracy. Edge cases for initial guess.