

# 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

3DOF.  $\theta$

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  $R$   $y + 2 \leq 0$ . Infinite plane parallel to the x-axis at height  $y = -2$ .

### 2.1 Forward kinematics

Forward kinematics equations and experimentation. Transformation matrices.

### 2.2 Forward kinematics with joint constraint

Reworked forward kinematics equations and experimentation.

### 2.3 Inverse kinematics

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

## 3 Implementation of inverse kinematics solver

[Link to github.](#)

## 4 Experimentation

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