Assignment 3: Arm IK

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2 classes have been added: class skeleton (calculate 2 sections IK using analytical solution, and control movement of torso/arm using spline-Bezier Curve in 3D space), class Hand (calculate 3 sections IK using CCD)

In demo, the screen has been split into 4 parts:

Top left, bottom left show the arm IK from two different camera angles:

The upper arm and lower arm's bone (including hand) attached to the top half of the torso. The skull of peter (red) is the goal arm tries to reach.

Analytical solution in 3D space has been implemented to calculate the rotation angle of the two sections of arms (function IKanalystic(), in maths_funcs.cpp).

Spline has been added to interpolate torso and arms' movement in 3D space. (function cubicBezier3D()in maths_funcs.cpp, which in turn, calls function cubicBezier() in maths_funcs.cpp), controlled by 4 points positioned according to goal's coordination and 1st.section's length.

Top right shows the keyframe where the goal(skull) is unreachable, using the same object of class skeleton and calling the same functions.

Bottom right shows the 3 sections hand (palm == torso, moves towards goal/skull with spline, 3 sections are 3 sections of fingers, attempts have been made to limit finger sections' rotation: only have one degree freedom to rotate around y axis in counter-clock wise. Also, can rotate max. 90.0 deg. The last limitation, however, doesn't work as well as expected, therefore in the demo this last limitation hasn't been used) IK (can be observed clearer from the simple model without using bone structure of Peter's right hand) using CCD solution in 2D space, max_try = 9; (inside class Hand, calling function handCCD() in maths_funcs.cpp).

For frame 1, 3, 4 (top left, bottom left and right), goal/skull moves whenever the certain key on the keyboard has been pressed, to demonstrate the spline, and to display how IK and CCD calculate rotating angles.
Frame 2's goal/skull, however, never moves, in order to demonstrate the keyframe when a goal cannot be moved.