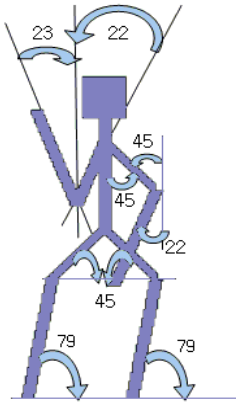
Assignment 2

CMSC 427, Fall 2003
Due: 11:00am Tuesday, October 21, 2003

This assignment involves simulating martial kicking and punching with 2D graphics. The assignment web-page is at www.cs.umd.edu/class/fall2003/cmsc427/assg2/. Compile and run the startup code from the above page after linking with OpenGL and GLUT. The startup code that we are giving you does the following:

- It opens up a GLUT window of size 640 x 480.
- It displays the red player on the right.
- It displays the foreground and the background.

(a) Initialize the program to place the blue-colored player on the left half of the window. To do this, reflect the red player about the center vertical line of the window. The angles and lengths of the blue player on the left should correspond to those of the red player on the right. The angles of the various joints for the red player are given in the figure to the left.

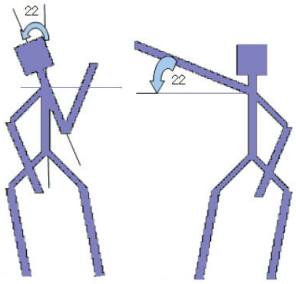


Implement player movements (sliding) as in Assignment 1. The right red player moves to the left or the right using the left and the right arrow keys, respectively. The left player in blue should move to the left by the key c and to the right by the key b. The amount of movement is STEP_SIZE (which is 4 pixels).

Identify the sliding collisions: the left foot of the right player crosses the right foot of the left player. Move each of the players away from each other by twice the STEP_SIZE when they collide.

Finally, draw the energy bars at the top. Initially show them in yellow to indicate full energy. Show the energy depletion in brown. For every sliding collision deplete the energy of the player that was stationary at that time by 1% of the length of that player's energy bar. You can decide on some reasonable length of the energy bars. **(4)**

(b) Punching: Use key a to make the left player punch and the key o to make the right player punch. We discuss below the steps for the right player to punch the left player. Implement the punching of the right player by the left player appropriately.



- Move the elbow and the hand as shown in figure to the left and go back to the normal position. The entire motion (extending the arm and moving it back) should happen over 16 frames.

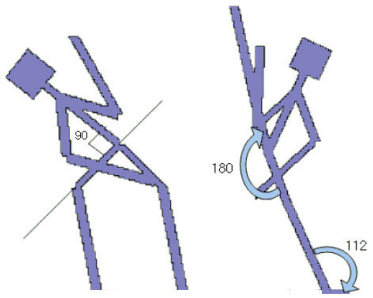
- Check if the left hand of the right player hits the head of the left player. If it does, the left player's head and neck rotate about the base of the neck by 22 degrees as shown in the left figure and then go back to the normal position.

The entire motion (rotation of the head/neck and moving it back) should happen over 4 frames. To simplify implementation you may check for collision only when the left arm of the right player is fully extended.

- In case of collision due to punching implement the left player backing up by BACK_UP_SIZE (which is 2) pixels per frame over 4 frames. Reduce the left player's energy by 7% and have a small red star appear and disappear near the head of the left player.

(9)

(c) Kicking: Use key s to make the left player kick and the key p to make the right player kick. We discuss below the steps for the right player to kick the left player. You should also implement the kicking of the right player by the left player appropriately.



- Move the knees and feet of the right player as shown in the left figure and then go back to the default upright position. The entire motion (kicking and returning to normal position) should occur over 30 frames.

- Check if the left foot of the right player hits the head of the left player. If it does, the left player's upper body (from waist up) should rotate away by 45 degrees (as shown in the left figure) and come back to the normal position over 10 frames. You should perform collision detection at every frame (not just for the frame with the fully extended leg position). As soon as you detect the collision, you should start retracting the leg back to the normal position.

- In case of collision due to kicking implement the left player backing up by BACK_UP_SIZE (which is 2) pixels per frame over 10 frames. Reduce the left player's energy by 15% and have a *large* red star appear and disappear near the head of the left player.

(6)

(d) Finishing touches: Here are some finishing touches to the game for you to add:

- The player whose energy is fully depleted dies and falls on his back. Implement this as a rotation about the tip of the right foot over 20 frames. As the player rotates and falls down, his transparency should gradually increase, finally reaching the alpha value of 0.2.

- Every game has cheating keys. By pressing <Alt> <Shift> <z>, fill up the energy of the left player up to 25% and by pressing <Alt> <Shift> <m>, fill up the energy of the right player up to 25%.

- Restart the game by pressing <Alt> <Shift> <r>. Once the game is over only the <ESC> and restart keys should function; all other keys should be ignored by your program.

(6)