Assignment 3
CMSC 427, Fall 2003
Due: 11:00am Thursday, November 6, 2003

This assignment involves simulating martial kicking and punching with 3D graphics. The assignment web-page is at www.cs.umd.edu/class/fall2003/cmsc427/assg3/. The motion of the right player is implemented using the UP/DOWN/LEFT/RIGHT arrow keys. The corresponding motion for the left player is implemented by using the following keys:

- const GLint KEY_LEFT_ARROW_FOR_LEFT_PLAYER = 'c';
- const GLint KEY_RIGHT_ARROW_LEFT_PLAYER = 'b';
- const GLint KEY_UP_ARROW_FOR_LEFT_PLAYER = 'f';
- const GLint KEY_DOWN_ARROW_FOR_LEFT_PLAYER = 'v';

(a) Initialize the program to open up a window of size 640 x 640. Use glutWireCube (thickness = 7) to draw the arms, legs and trunk of the two players and glutWireSphere for the head. The lengths and angles of the players are as in Assignment 2. Assume that the world origin is at (0, 0, 0) and the ground is the X-Z plane. The right feet of the players (the origin of their local coordinate systems) are at (200, 0, 0) and (-200, 0, 0). Set up the room in which the players are placed. The six walls of the cube should have the following colors: (0.75, 1, 0.75), (0.85, 0.85, 1), (1, 0.85, 0.85), (1, 1, 0.75), (0.75, 1, 1), and (0, 0.5, 0.5). The dimensions of the room should be 10000 x 5000 x 10000 along X, Y, and Z, respectively. The viewing parameters are as follows:

- Set up the perspective viewing so that the near plane is at 1, far plane is at 20000, field of view is 90 degrees, and the aspect ratio is defined by the dimensions of the view window.
- Initialize the camera to be in the horizontal direction (0, 0, 1) on an imaginary sphere with radius 400 centered at the world origin. Next rotate it by -10 degrees about the X-axis (so that the camera is now above the horizon). Set up the camera so that it is looking at (0, 150, 0), with up vector (0, 1, 0).

(b) Implement changes to the camera position. If the user presses SHIFT + UP, then camera's latitude increases in steps of 10 degrees until 90 degrees. If the user presses SHIFT + DOWN, then camera's latitude decreases in steps of 10 degrees until 10 degrees.

(c) Implement the players moving forward and backward by the use of LEFT and RIGHT arrow keys. For a realistic gaming experience implement the following controls on the camera:

- The radius of the sphere on which camera is located is equal to the distance between the players. So when the players approach each other, the camera moves closer to the players and vice-versa. However, to avoid the players from appearing too large when they are close, the minimum distance of approach for the camera is defined by MINIMUM_CAMERA_DISTANCE (currently set at 300).
- The center of the sphere on which the camera is located is defined by the midpoint between the local origins of the two players.
- The camera always looks at 150 units above the midpoint between the two players.
- To make the moves more interesting, introduce a timed wait of 500 milliseconds after a motion key is pressed before you update the camera position. If the user does not press any additional LEFT/RIGHT/UP/DOWN keys in these 500 milliseconds, the camera position is updated. However, if the user presses one of these keys, the camera waits until there is no continuous pressing of motion keys.
(d) Implement the rotation of the players about each other by using the UP/DOWN keys. UP key means rotate to the players right and DOWN key means rotate to the players left. In either case, the axis of rotation should be vertical (parallel to the Y-axis) and passing through the other player. The players should also rotate about their respective Y-axes to always face each other. Maintain the camera controls as specified in part (e) with timer control.

(e) Implement the kicking and punching actions of Assignment 2 with following minor changes:

- Collision detection: Collision between the players occurs if the distance between their left feet is less than 4 units.
- Make sure the other player backs up along the direction in the first player moved.
- In Assignment 2 you had to draw a star near the head of the player that was kicked or punched. In this assignment, draw a small yellow solid sphere near the head for punching and a large yellow solid sphere for kicking.

Implement the cheating keys, restart, and quitting the game as in Assignment 2. Also draw the energy bars above the players (Hint: you will have to change the projection matrix temporarily for this).