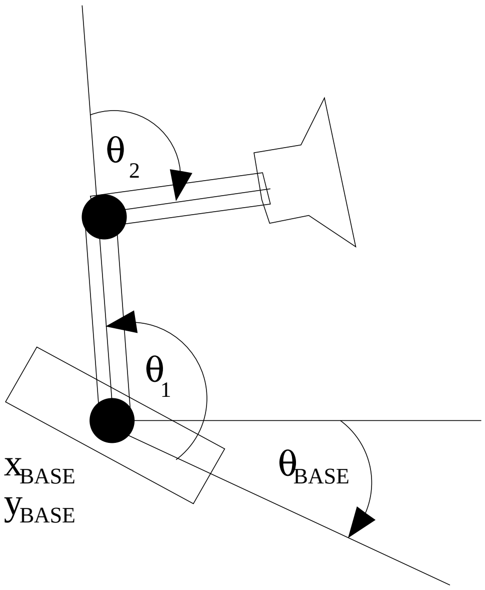

Figure 1: Position parameters for luxo.

Homework 4: More Spatial Vectors

Suppose you want to use Featherstone's formulation to implement an inverse kinematics routine for luxo. This assignment repeats HW3 for the more complex lamp character.

1. What parameters make up the generalized position ($\mathbf{q}$) and generalized force ($\mathbf{Q}$) vectors for luxo?

2. What are the local frame joint axis vectors $\hat{s}_i'$? Sketch the local coordinate frames you are using.

3. Please give values for all of the transformation matrices ${}_i\hat{X}_{i+1}$.

4. What are the local coordinate frame inertia matrices $\hat{I}_i'$?

5. How will you deal with gravity? (Be specific, using parameters that are part of the inverse dynamics formulation.)

6. How would you add torques at each of the two rotary joints in response to user mouse input? Use a combination spring and damper. The user should be able to specify desired orientation for both joints with a mouse click. (Be specific about your implementation, using parameters that are part of the inverse dynamics formulation.)

7. (BONUS) What would you need to change to make luxo a truly 3D character? Again, be as specific as you can.