

# Interactive Graphics: Homework 2

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## 1 Models

For the bear structure I decide to make the "Upper Limbs" slightly thicker and longer than the "Lower Limbs" to enhance the difference between them and for the tail I build a little cube on the bottom of the body, it's rendered together with the body so, in the hierarchical model, it must be considered as a part of the torso of the bear and not as a sibling/child.

I made up the tree just by putting a green cube on top of a stretch brown one. At last I made another horizontal stretched green cube to make it look like there is a field of grass. The tree and the grass are not part of the hierarchical model of the bear so that I can move all the bear's components without worrying about distorting the rest of the scene.

For the texture I decide to use a single image of a black bear, to make clearly distinguishable the animal and the tree, for both body and head, dividing the image in : bear's ear, face and fur, while the last one is used for the most of the model, the ear are used only for two lateral faces of the bear's head cube and the face just once.



## 2 Animation

The scene is taken by a fixed camera, all the objects are in the frame except for the bear who is a little bit out on the left, ready to enter walking when the "start animation" button is pressed.

The animation is viewed from the side, in this way the objects don't need to be positioned properly on the z axis, the polygons of the bear are not touching the grass and are not scratching on the ones of the tree since they are too far from each other, but since the camera is positioned in parallel with the z axis the illusion is that they do overlap. My animation is splitted into 4 distinct phases with a function associate to each one of them:

- `walk()` : in which the bear walks until a fixed point.
- `stop()` : in which the bear stop walking and prepares for raising up.
- `raise()` : in which the bears raise up and "leans" on the tree.
- `scratch()` : in which the bear start a never ending cycle of up and down motion.

In this way I can focus on a specific part of the movement without interfering in the whole animation.

### 2.1 Walk

When the "start animation" button is pressed, the bear start a walking animation which consist in making the the upper limb follow a "pendulum-like" motion between 110' and 60' degree while his lower limb do the same but faster and in the opposite direction.



In this way i can precisely link the motion of the two part of a bear's leg and simply reuse the code for the other legs changing the starting point and the starting rotation direction.

When the bear reaches a fixed point near the tree the walking animation stops and the stop animation starts.

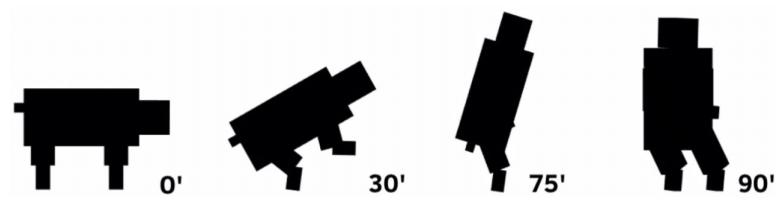
### 2.2 Stop

In the stop animation the legs move from the position where they were at the the end of the walking animation to a state where they're all aligned vertically. To verify if all of the limbs are in the correct position I used a array similar to the "theta" that is used for the rotation called "STOP\_flag".

When all the legs are in the proper position the raise animation starts.

## 2.3 Raise

During the raise animation the body of the bear start rotating from an horizontal position to a vertical one, I decided to divide the raise by key degree : 30', 75' and 90'; doing so I can give a dynamic appearance to the raise by changing the speed of the motion. For the first 30' degree the rotation of the torso is slow and the two hind legs start to bend as if the bear moves all of his weight on them. Between 30' and 75' degree the motion speed of both the legs and the body is faster to mimic the sprint of a get up. During the last 15' degree the rotation return slow and an additional rotation is added to make looks like the bear leans is back on the tree.



When the bear turns 90' degree the last phase of the animation starts: the scratch.

## 2.4 Scratch

At last the bear start a never ending scratch on the tree. The torso goes down until it reaches a certain point while the hind legs bend and when it change direction the legs stretch. I add an additional asynchronous head "nod" to make the scratch less clunky and more credible.