CT404/CT336: Graphics & Image Processing

Assignment 1: Graphics in 2D and 3D

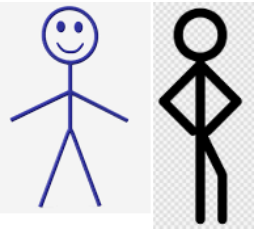
Due Date: **Friday, Oct 18, 23:59 pm**

This assignment consists of two programming tasks one each in Canvas 2D and Three.js where you will apply concepts of 2D and 3D graphics. Each programming task has several incremental steps where each completed step will earn you more credit.

Be creative and have fun!

Task 1: Dancing stick figures in Canvas2D (10 points)

If you search for 'stick figure' images online, you will come across several versions of stick figures. In this task you will draw (and possible animate) stick figure(s) of your choice.



1.1 : Create a stick figure of your choice. You can use different colours for lines and face. You can make two part limbs instead of one (as in the right figure above) for better animation in Task 1.4. Place it randomly on the HTML canvas. (2 points)

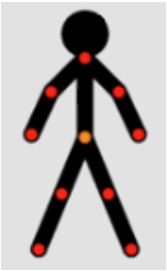
1.2: Give it a facial expression of your choice.
Tip: The example 'canvasExample2.html' included in first lecture slides might be a good starting point. (1 points)

1.3: Keyboard Interactivity: Ask the user to press a keyboard key to input a number in the range (e.g. 1-5) by displaying a message. Draw that many number of figures in the Canvas and place them randomly on the Canvas. For fun, you can give them different colours/expressions.
Tip: You can look at the example 'CanvasWithKeyboardExample.html' from Week 3 for keyboard integer inputs.
Tip: The commands of *contex.save()*, *context.translate()*, *context.restore()*, provided in 'canvasTranslateExample.html' included in first lecture slides will be handy to draw multiple figures on the canvas. (2 points)

1.4: Animation: Make the figure(s) move.
Now you will animative your stick figure(s). Give your figures different speeds and directions randomly and make them bounce off the canvas boundaries. For a smoother animation, choose wisely between *window.setTimeOut* and *window.requestAnimationFrame* discussed in Week 3. (2 points)

Tip: You can look at the code example 'canvasAnimationExample1_withSmootherAnimation.html' provided in Week 3 as a good starting point.
Tip: You can find good tips/tutorials on Canvas animations (and else) on https://developer.mozilla.org/en-US/docs/Web/API/Canvas_API/Tutorial/Basic_animations .

1.5: Animation: Make the figure(s) dance!
Now that you have moving figures, you can make them dance by moving their limb extremities as shown by the red dots. (3 points)



I am looking forward to seeing your dancing parties of stick figures! 😊

Task 2: A *functional* Desk Lamp in Three.js (15 points)

This task will let you apply several 3D concepts in one task using Canvas and Three.js e.g. nested coordinates, lighting & shading, different materials and animation in 3D. For this task, you should start with the example 'Threejs-20-controllable-desk-lamp.html' provided in Week 3 and build upon it.

2.1: Interactivity: In the original example, all parts of the lamp can move. As a first step, make the lamp base and arms unmovable/rigid so that only the lamp shade can rotate. Make it colourful (e.g. a student made a purple lamp for me during the lab 😊) (1.5 points)

2.2: Make a flat surface representing a table top and place the lamp on it. Use the '*OribitControls*' discussed in Week 3 so that the scene can be viewed from different angles. (2 points)

2.3: Lighting: Add ambient lighting to this scene which is 'on' by default. (1.5 points)
Tip: You can look into the example 'Threejs-22-lights-examples.html' to make a flat surface, *OrbitControls* and ambient lighting.

2.4: Lighting: Attach a light source in the middle of the lamp shade (choose the light source type wisely) to fit the lamp shade. Make use of the 'pivots' and nested coordinates discussed in Week 2, 3. (2 points)
Tip: You can look into the example 'Threejs-22-lights-examples.html' to make a flat surface, *OrbitControls* and ambient lighting.

2.5: Interactivity: Attach an event to the lamp shade so that clicking on the lamp shade turns the light on and off. This means that you will have two events attached to the lamp shade. Pressing the mouse down and moving will rotate the lamp shade, as in the original example, whereas pressing the mouse up event will 'toggle' the lamp light. (3 points)

2.6: Materials: Place different objects of different shading and reflective properties on the table top to shine the light on (you can get creative with the objects). The objects should have different colours, materials and reflective properties. How about adding a book? (2 points)
Tip: You can look into the examples 'Threejs-22-lights-examples.html' and 'Threejs-23-materials-examples.html' for examples of different object properties.

2.7: Animation: Make an object move on the table top. For example it can be a cube or ball moving from one side to another. (3 points)
Tip: You can look into the examples 'Threejs-21-shading-algs.html' provided in Week 3 for a Three.js animation example.

Good, I am looking forward to seeing your personal desk space with a functional lamp!