

# Computer Graphics and Multimedia

## Tutorial 1 : Introduction to Computer Graphics and Multimedia

1. For a given regular parametrized curve  $C : (0,1) \rightarrow \mathbb{R}^3$ , write functions in Python that perform the following tasks: (a) find the length of the curve, (b) plot the graph of the curve, (c) reparametrise  $C(t), t \in (0,1)$  with unit speed parameter  $s \in (0,L)$ , where  $L$  is the length of the curve, (d) find and plot the tangents and the normals.
2. Try and store the cube object after scaling it by a factor of 2 in Blender. What are the various file formats in which the 3D model can be stored? Explore wavefront obj file format. State all the fields which are present in the obj file with the use of each field. Search for open source 3D models that are available. Import Utah Tea Pot model in Blender. How many vertices, edges and faces are there in it?
3. There are some open source animation movies created in Blender. Pick one that you like the most. Try and work on a (small) movie clip in Blender. What all information do you see when you load such movie in Blender?
4. Record 10 seconds (audio) narration of the following using Python with sampling rates of 1, 2, 4, 8KHz:

“Heat, like gravity, penetrates every substance of the universe, its rays occupy all parts of space. The object of our work is to set forth the mathematical laws which this element obeys. The theory of heat will hereafter form one of the most important branches of general physics.”

Plot the frequency spectra of the recorded audios. Observe the effect of playing the recorded audio with both, double the sampling rate and half the sampling rate. Store the recorded audios in wav format. What are the various fields of wav file format? Describe the purpose of each field in detail. Using Python (library of your choice), convert the recorded wav files to mp3 files. Check the size of the files. What is your observation?

5. Take your snapshot using mobile. Store it as JPEG. Using your favourite image editing tool (like darktable), convert your image into BMP and PNG. Do you see the effect on file size while storing with different file formats? What are the typical file formats that you have come across so far?
6. Have you worked with ffmpeg? If not explore. What is it for? What video players do you typically use for watching movies on your system? What about the browser based players? Any idea on what does Netflix use?