8/27/20

NI vs. CGI

Natural Image NI – the way the human eye perceives an image (retina)
Approximation – Camera

CGI – Computer Generated

Digital camera is a discrete device, pixels, digital, defined only for a discrete set of coordinates of spatial (Xi, Yi)
Screen is discrete.

Film camera?

Eye is it analog/continuous? Discrete?

Signal 1-d Say audio, speech, seismographic x(t) t time
Analog if it is defined for every time T0<= t <= T1
Digital if it is defined for a discrete set of times

2-D signal (say image) I(x, y)
Analog, Defined for every x, y in a given range
Digital for discrete

Video is time and space

Film camera – practically it is discrete BC we have
AgCl molecules that are sensitive to light

However, Per DT this is the best approximation for the eye film cameras.

Our goal is to be able to generate NI images using computer CGI.

Challenge to be able to generate CGI that is judged to be NI by Human
Challenge find a way to automatically analyze an image and decide whether it is NI or CGI

Image processing
Image analysis image recognition
Image synthesis – computer graphics where we generate images

The CGI pipeline

Phase 1 – Model
Model-view volume

Define Objects – using primitives ➔ library of objects (sphere)
Manipulate objects – duplicate; transform → translation, scaling, rotation
Transformations (M)


Modelview

1) e.g., how to get an ellipse from a circle?
2) Egg from a sphere?

Uniform (in (x, y, z)) scale on circle/sphere ➔ sphere / circle
Non uniform ➔ 1, 2


Projection transformation (p)

Phase 2

Camera volume, eye volume camera view volume
Define the camera

1) Parallel projection camera
2) Perspective projection - aperture

Phase 3
NDC - Normalized Device Coordinates - standard form (OGL concern)

Phase 4
Port, in a window, on the screen = defined by the user the transformation is OGl concern

Participation Requirement
If you participate (Verbally or on chat), then after class please send an email with the
Title:
<Name> <Class> <date> participated

e.g.,
Dan Tamir CS3358 20200825 Participated

Qt QT; Set of Classes that includes OpenGL as a class; Was used Nokia
DirectX OpenGL Graphics libraries available in many software platforms.
There is hardware that support DirectX and OpenGl
ATI/AMD, Nvidia, Silicon-Graphics Include (SGI) the OGL library.
Cards, GPUs, Graphics Pipeline
OpenGL is Open Source
A Cellphone might (should) include a GPU for accelerating graphics
A GPU can also accelerate many other parallel programming.

Why study OpenGL
OGL is a low-level library

Unity, Unreal video editing, are built on top of OGL.

You get added value by understanding the principles of Graphis OpenGL
If you use the above.
OpenGl is a good environment to understand the underlying theory of CG.

Why OGL 2.x when the world is at OGL 4.x
I recommend that you download 2.x if you do not use the VM.
1.x 2.x are geared to the CG pipeline and therefore are closer to the actual GG underlying theory.
4.x might shout if you use 2.x function (depreciated)
Version 3.x 4.x are geared to GPUs they hide details.

3.x / 4.x is available under HTML (for embedded systems)

Please write the sentence:

I (your name) understand that I am not supposed to submit assignments / tests etc. by email.

If I miss the deadline (generally 11:55pm), fFor a justified reason – I will submit to my TRACS drop-box and send an email notifying Dr. Tamir about it.