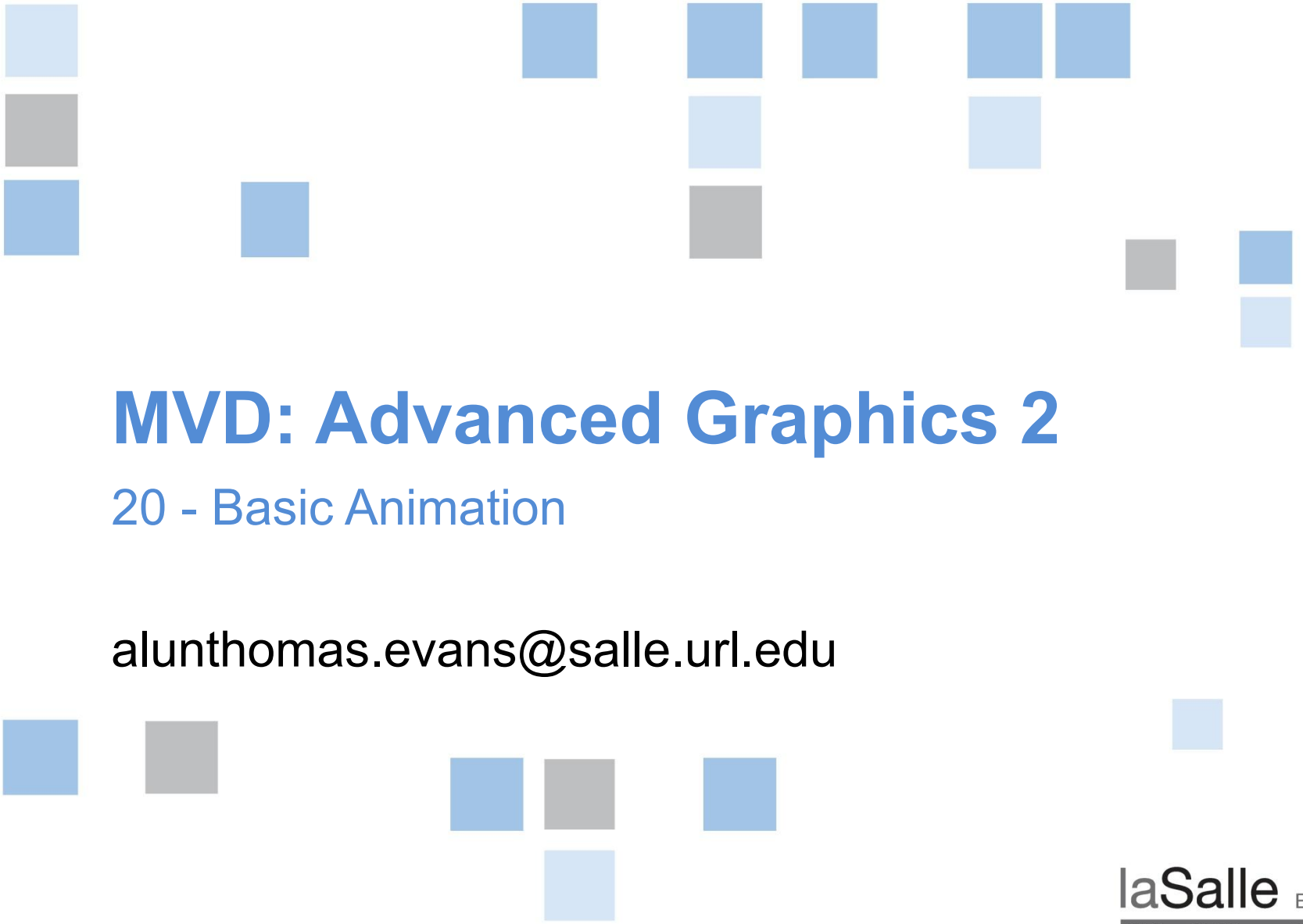

MVD: Advanced Graphics 2

20 - Basic Animation

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Bounce animation

What is an animation?

What parameters are changing?

What is an animation?

Change of entity attributes through *time*

Usually model matrix

Camera: target point or forward direction

Simple animation file

```
ball
24
0 0.0 6.75228563127 0.0 0.0 0.0 0.0 1.0 1.0 1.0
1 0.0 6.75228563127 0.0 0.0 0.0 0.0 1.0 1.0 1.0
2 0.0 6.7489703968 0.0 0.0 0.0 0.0 1.0 1.0 1.0
3 0.0 6.7397482757 0.0 0.0 0.0 0.0 1.0 1.0 1.0
4 0.0 6.72421696163 0.0 0.0 0.0 0.0 1.0 1.0 1.0
5 0.0 6.70192864454 0.0 0.0 0.0 0.0 1.0 1.0 1.0
6 0.0 6.67238273048 0.0 0.0 0.0 0.0 1.0 1.0 1.0
7 0.0 6.63501717702 0.0 0.0 0.0 0.0 1.0 1.0 1.0
8 0.0 6.58919780082 0.0 0.0 0.0 0.0 1.0 1.0 1.0
9 0.0 6.53420552274 0.0 0.0 0.0 0.0 1.0 1.0 1.0
10 0.0 6.46922026327 0.0 0.0 0.0 0.0 1.0 1.0 1.0
11 0.0 6.39330132687 0.0 0.0 0.0 0.0 1.0 1.0 1.0
12 0.0 6.30536307179 0.0 0.0 0.0 0.0 1.0 1.0 1.0
13 0.0 6.20414376024 0.0 0.0 0.0 0.0 1.0 1.0 1.0
14 0.0 6.08816741387 0.0 0.0 0.0 0.0 1.0 1.0 1.0
15 0.0 5.95569393932 0.0 0.0 0.0 0.0 1.0 1.0 1.0
16 0.0 5.80465840967 0.0 0.0 0.0 0.0 1.0 1.0 1.0
17 0.0 5.63259343446 0.0 0.0 0.0 0.0 1.0 1.0 1.0
18 0.0 5.43653401135 0.0 0.0 0.0 0.0 1.0 1.0 1.0
19 0.0 5.2129104958 0.0 0.0 0.0 0.0 1.0 1.0 1.0
20 0.0 4.95744115531 0.0 0.0 0.0 0.0 1.0 1.0 1.0
21 0.0 4.66507639999 0.0 0.0 0.0 0.0 1.0 1.0 1.0
22 0.0 4.33013850979 0.0 0.0 0.0 0.0 1.0 1.0 1.0
23 0.0 3.94700146449 0.0 0.0 0.0 0.0 1.0 1.0 1.0
24 0.0 3.51209746749 0.0 0.0 0.0 0.0 1.0 1.0 1.0
25 0.0 3.02858420309 0.0 0.0 0.0 0.0 1.0 1.0 1.0
26 0.0 2.51417596715 0.0 0.0 0.0 0.0 1.0 1.0 1.0
27 0.0 2.00666631674 0.0 0.0 0.0 0.0 1.0 1.0 1.0
```

Task:

- adapt our engine to be able to change attributes through time
- Read file to apply animation

Simple Animation component

What do we need?

Simple Animation component

What do we need?

```
struct Animation : public Component {
    std::string name = "";
    GLint target_transform = -1;
    GLuint num_frames = 0;
    GLuint curr_frame = 0;
    float ms_frame = 0;
    float ms_counter = 0;
    std::vector<lm::mat4> keyframes;
};
```

Task

Create two entities, each with an Animation Component, with a different **names** and different **ms_frame** values

Create an *Animation System* that updates each animation component and advances the frame at the correct time

Should also **loop** back to start of animation

Output to console when change frame:

name_framenumber

Exported animation files

```
ball
24
0 0.0 6.75228563127 0.0 0.0 0.0 0.0 1.0 1.0 1.0
1 0.0 6.75228563127 0.0 0.0 0.0 0.0 1.0 1.0 1.0
2 0.0 6.7489703968 0.0 0.0 0.0 0.0 1.0 1.0 1.0
3 0.0 6.7397482757 0.0 0.0 0.0 0.0 1.0 1.0 1.0
4 0.0 6.72421696163 0.0 0.0 0.0 0.0 1.0 1.0 1.0
5 0.0 6.70192864454 0.0 0.0 0.0 0.0 1.0 1.0 1.0
6 0.0 6.67238273048 0.0 0.0 0.0 0.0 1.0 1.0 1.0
7 0.0 6.63501717702 0.0 0.0 0.0 0.0 1.0 1.0 1.0
8 0.0 6.58919780082 0.0 0.0 0.0 0.0 1.0 1.0 1.0
9 0.0 6.53420552274 0.0 0.0 0.0 0.0 1.0 1.0 1.0
10 0.0 6.46922026327 0.0 0.0 0.0 0.0 1.0 1.0 1.0
11 0.0 6.39330132687 0.0 0.0 0.0 0.0 1.0 1.0 1.0
12 0.0 6.30536307179 0.0 0.0 0.0 0.0 1.0 1.0 1.0
13 0.0 6.20414376024 0.0 0.0 0.0 0.0 1.0 1.0 1.0
14 0.0 6.08816741387 0.0 0.0 0.0 0.0 1.0 1.0 1.0
15 0.0 5.95569393932 0.0 0.0 0.0 0.0 1.0 1.0 1.0
16 0.0 5.80465840967 0.0 0.0 0.0 0.0 1.0 1.0 1.0
17 0.0 5.63259343446 0.0 0.0 0.0 0.0 1.0 1.0 1.0
18 0.0 5.43653401135 0.0 0.0 0.0 0.0 1.0 1.0 1.0
19 0.0 5.2129104958 0.0 0.0 0.0 0.0 1.0 1.0 1.0
```

Reading the file

For each line.

read the translation and make a matrix

read the rotations into a quaternion, make a matrix

read the scale into a matrix

multiply the lot

save the keyframe

Reading text files (reminder!)

Open file with path ‘filename’, read line-by-line:

```
std::ifstream file(filename);
std::string line;

if (file.is_open())
{
    while (std::getline(file, line))
    {
        //do stuff with line...
    }
}
```

std::stoi() and std::stof() - convert string to int or float

Task: Parse animation file

Create an entity with a mesh component, using “ball.obj”

Optionally add a floor (“plane_20x20.obj”)

Call Parsers::parseAnimation to read bounce.anim file, and apply the animation to a ball entity in scene

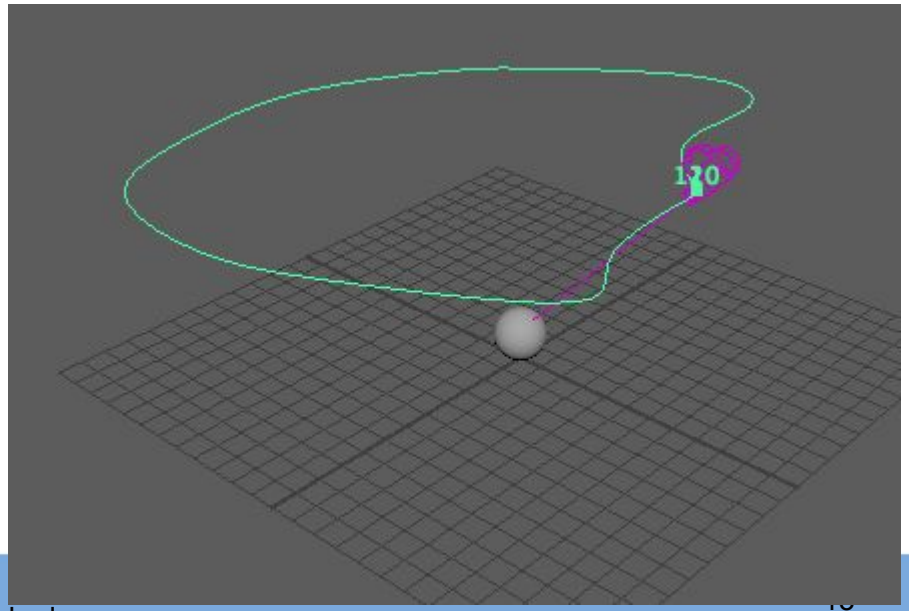
Advanced task

Create new function to parse camera_aim.anim

Camera moves along a custom track

Read comments

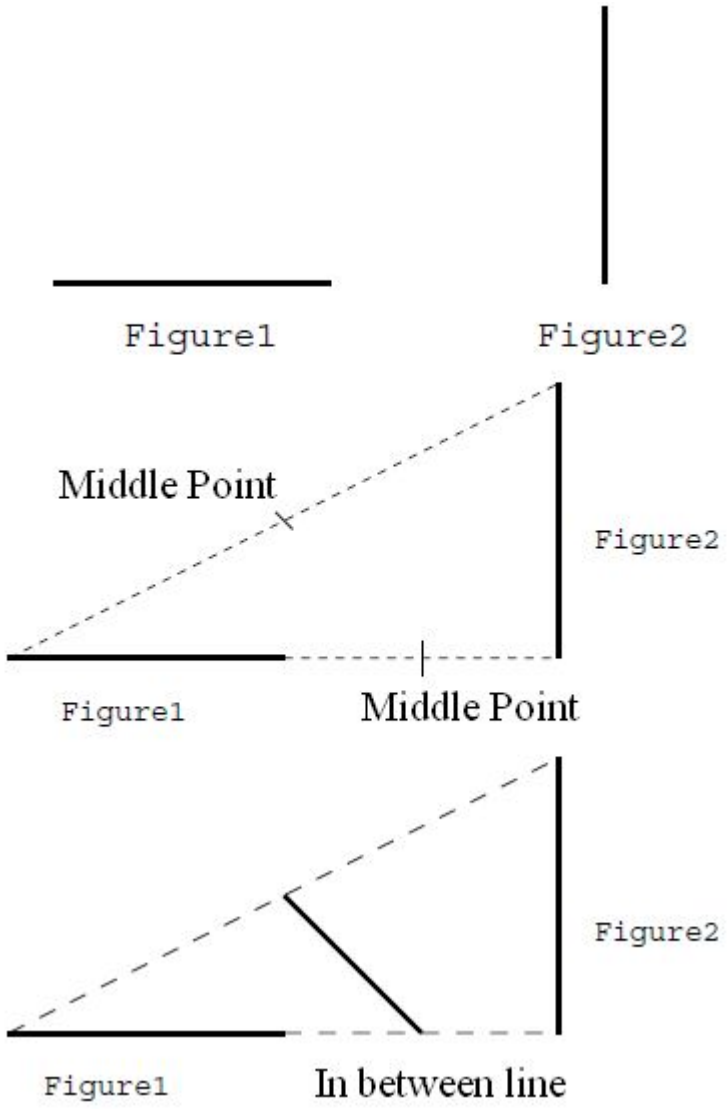
Input animation into engine



Course Deliverable: Tweening

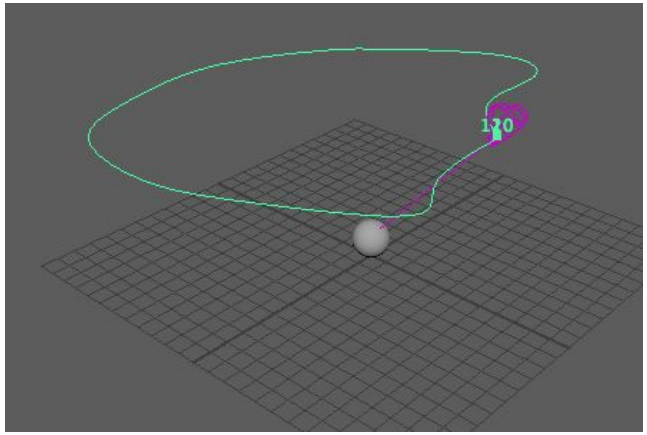
(Inbe)*Tweening* is the process of creating frames of movement in between 'key' frames.

Tweening is essentially **interpolation**



Tweening - software vs engine

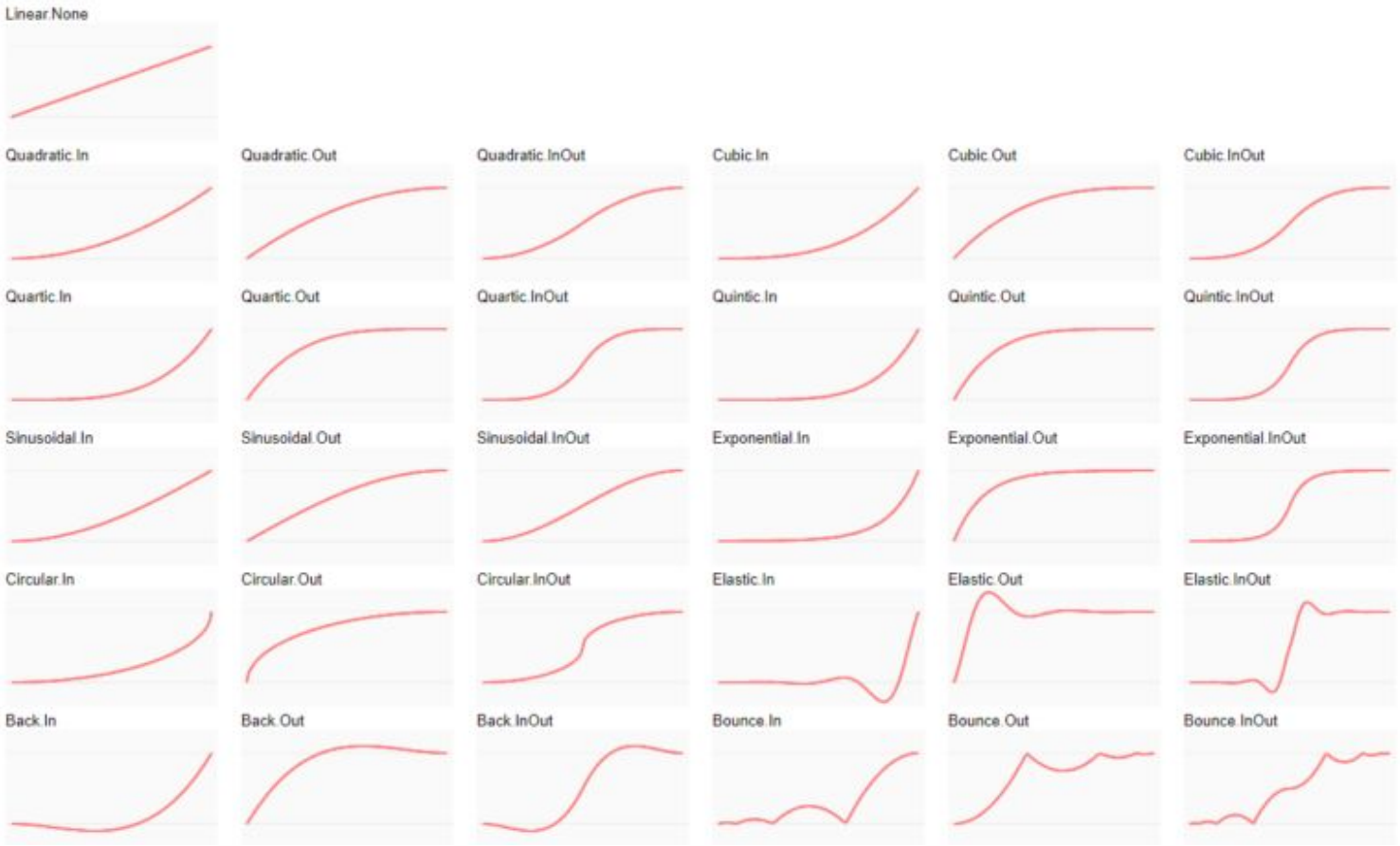
Almost all visual production packages (whether 3D such as Max or Maya, or 2D such as After FX) support tweening.



But it can be useful to implement it in a game engine for cases where animations are generated procedurally or through gameplay.

It is also particularly useful for creating UI effects

Tweening = Interpolation



http://www.researcharcade.com/blog/games-development/tweening-in-games/

Course Deliverable

Implement a tweening system in our engine:

To pass: basic linear interpolation of a single object featuring both **translation & rotation**

More points:

- implement different tweening functions
- GUI to choose between different functions
- Permit setting of keyframes in engine