A Quick Introduction to Videogame Graphics

McGill Game Workshop 2005
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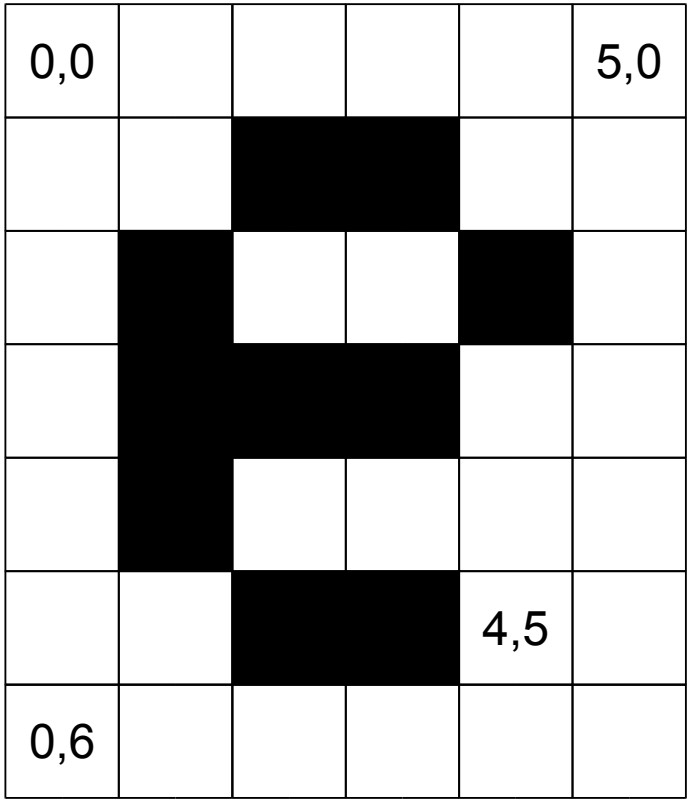
Outline

- 2D Graphics
- 3D Graphics
- Content Pipeline

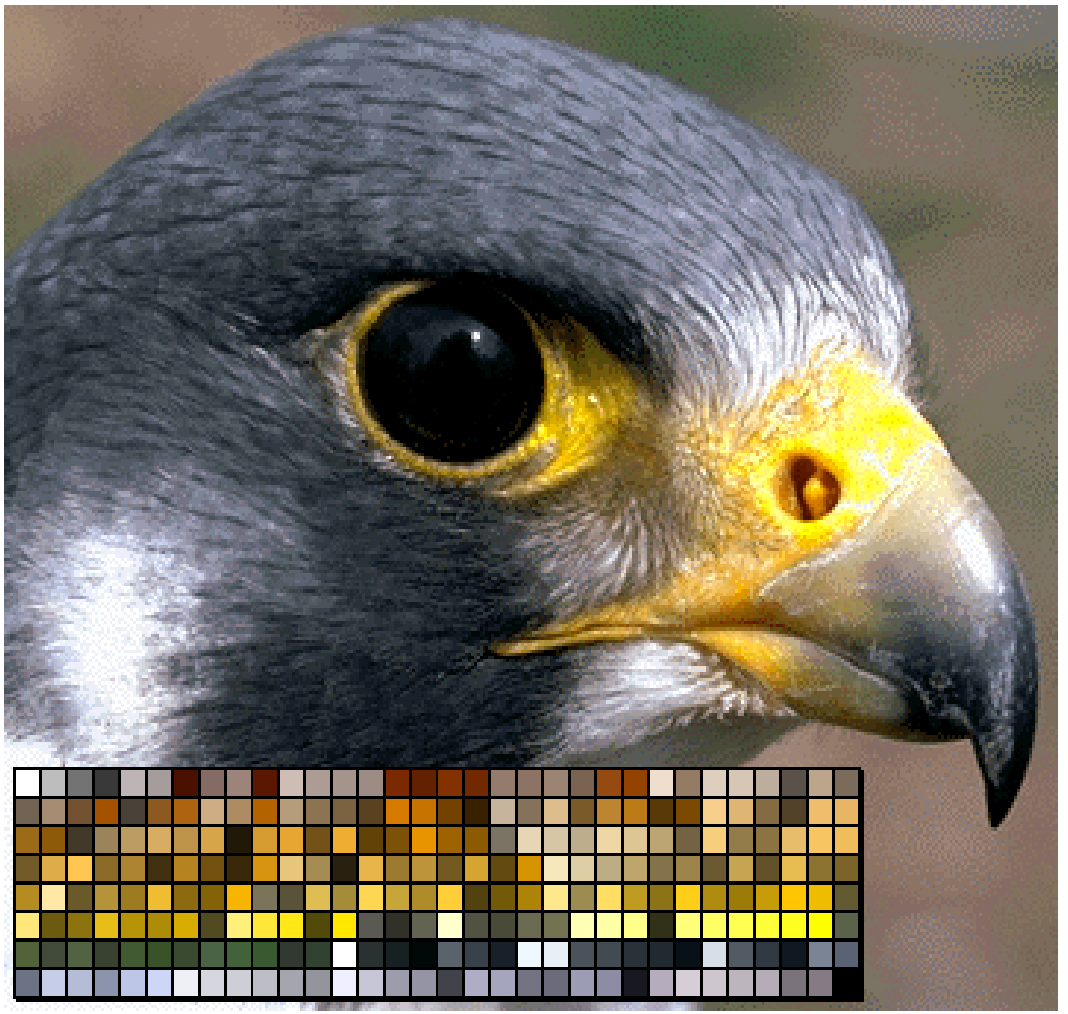
2D Graphics

- The content of the screen is stored as a 2D array.
- The size of the array is determined by
  - The resolution of the screen
  - The color model
- We can draw to the screen by changing the values of the 2D array.
- This is called raster
- graphics.



Color Modes

- Various color models are used in videogames
  - Palletized 16/256 colors
  - RGB (red/green/blue)
  - RGBA (RGB/alpha)



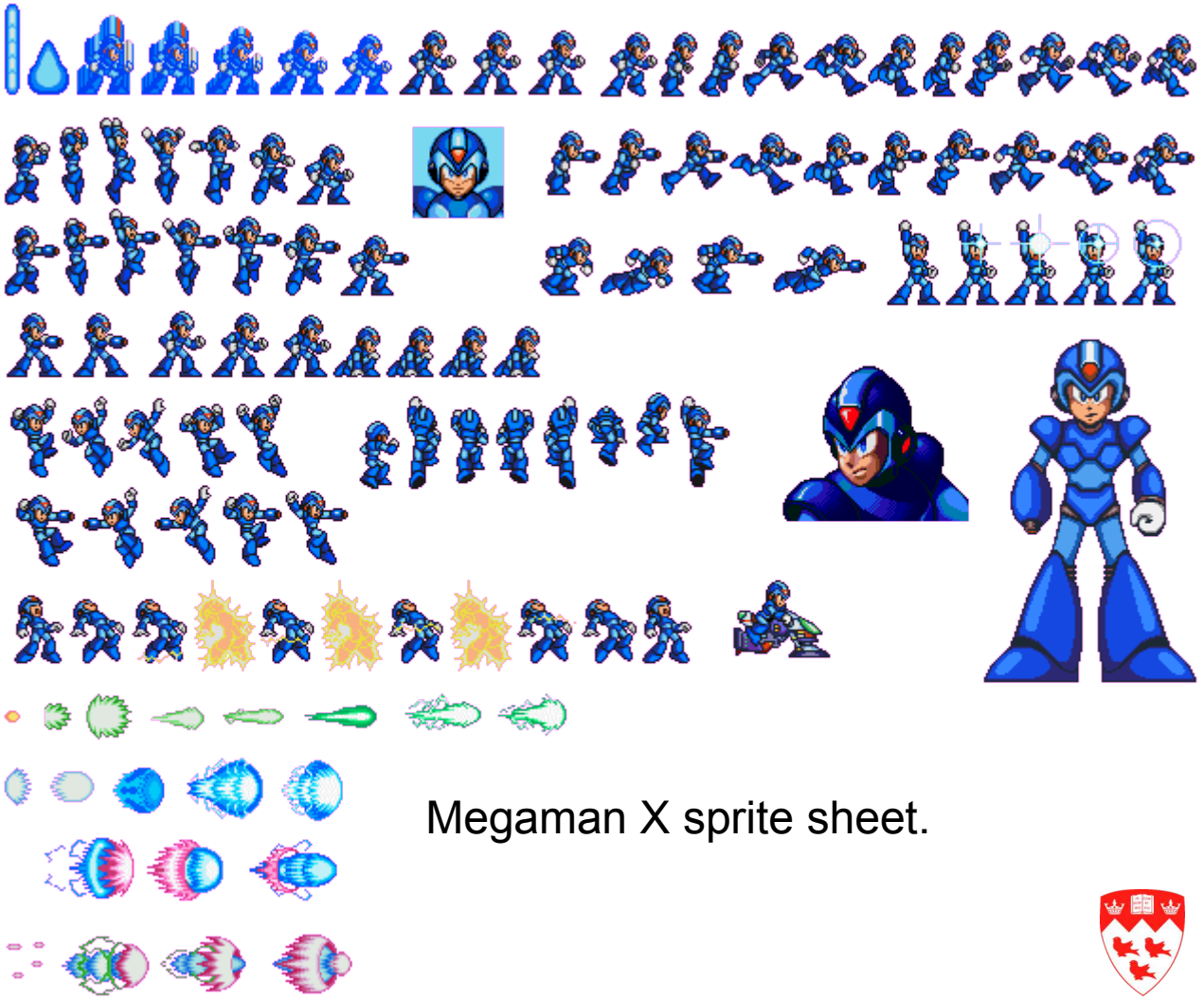
Example of a 256 colors image.

Sprites and Backgrounds

- 2D videogames are composed of sprites and backgrounds.

Solution

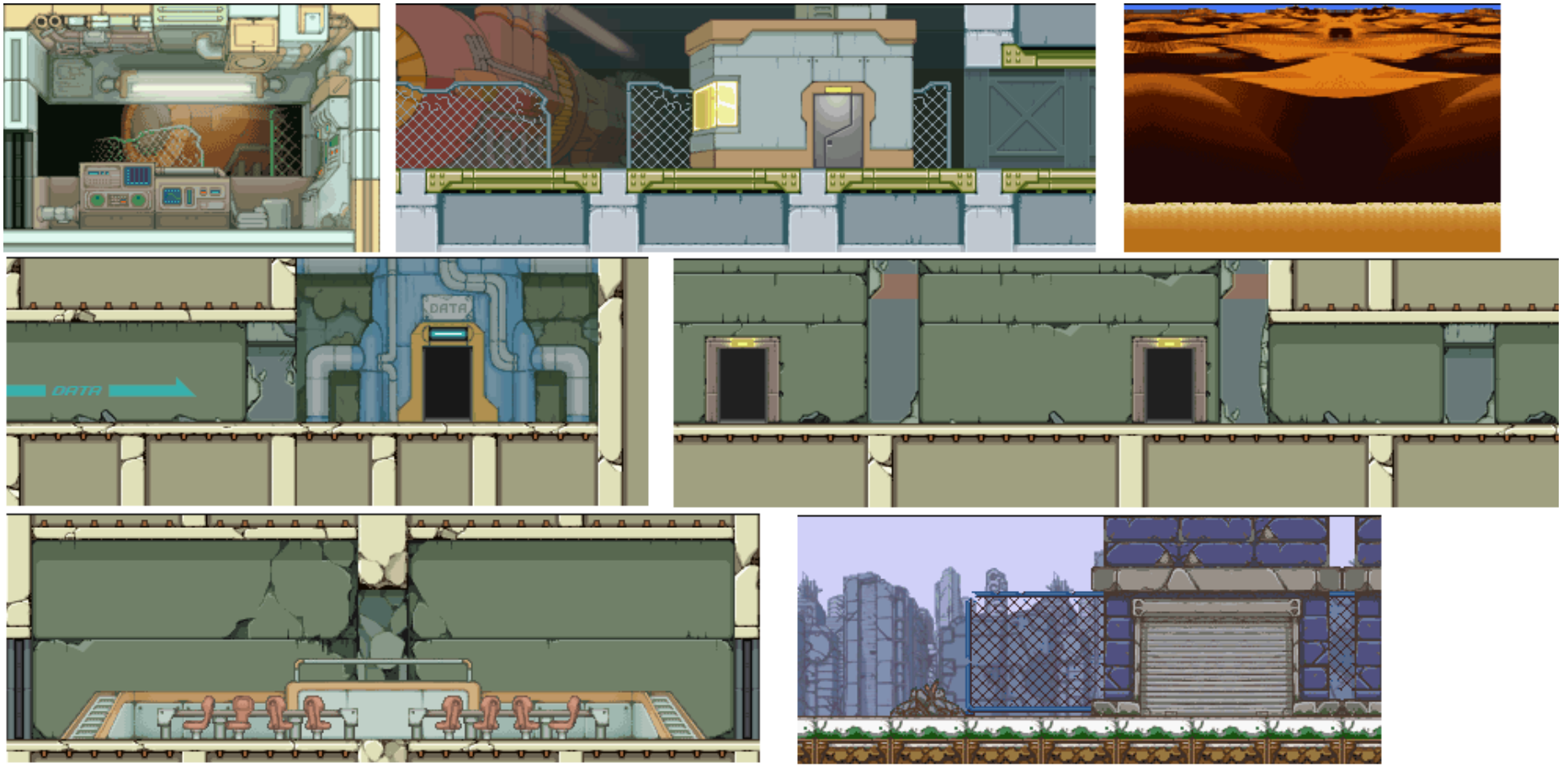
- Sprites are the small fast moving elements of a game.
  - Characters
  - Enemies
  - Vehicules
- Sprites are often stored as sprite sheets.



Megaman X sprite sheet.

Backgrounds

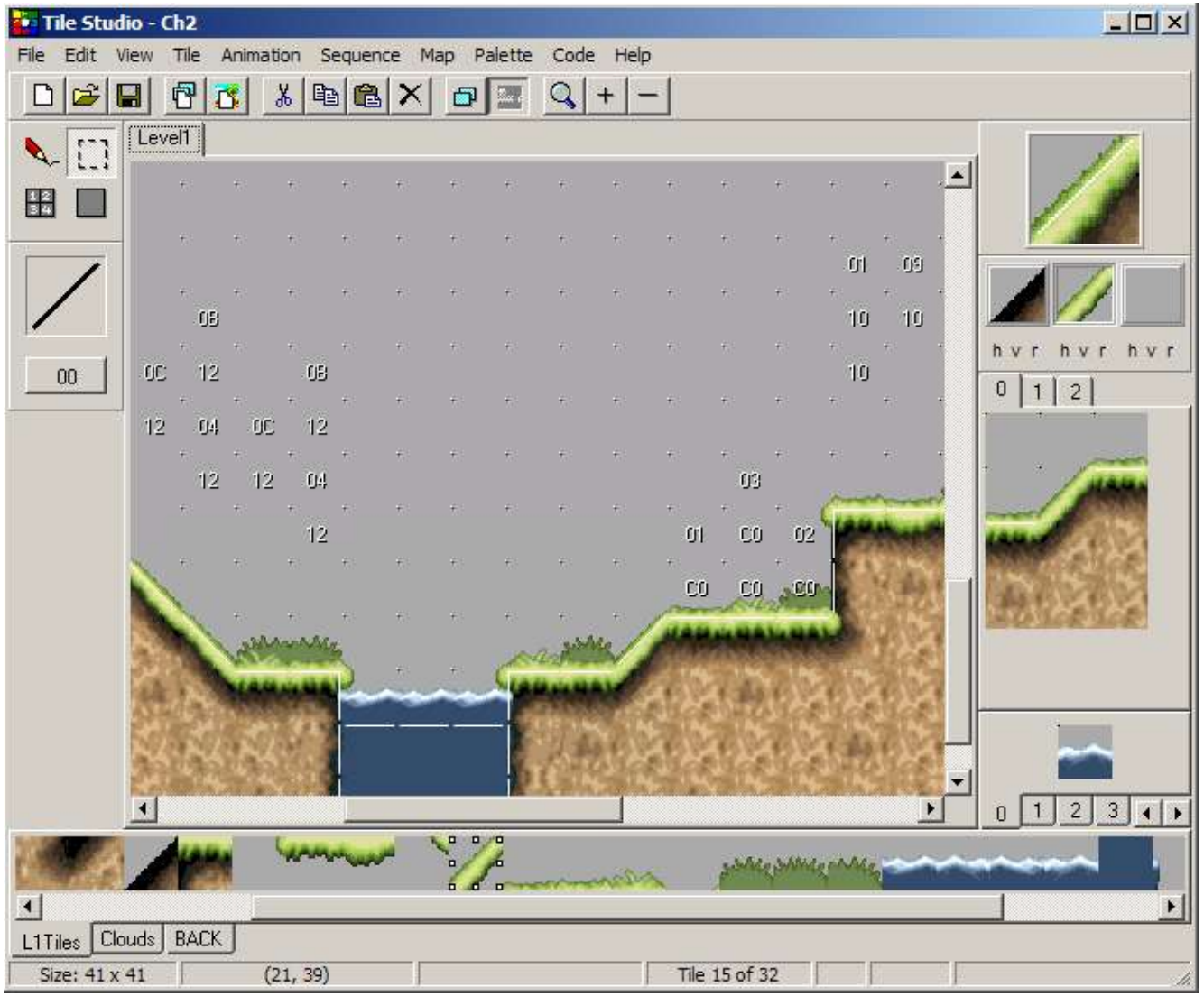
- Backgrounds are the large slow moving elements of a game.



Megaman Zero backgrounds

Tile Maps

- To save storage space, 2D games often use tile maps to store backgrounds and large characters.



Tile Studio

Demo

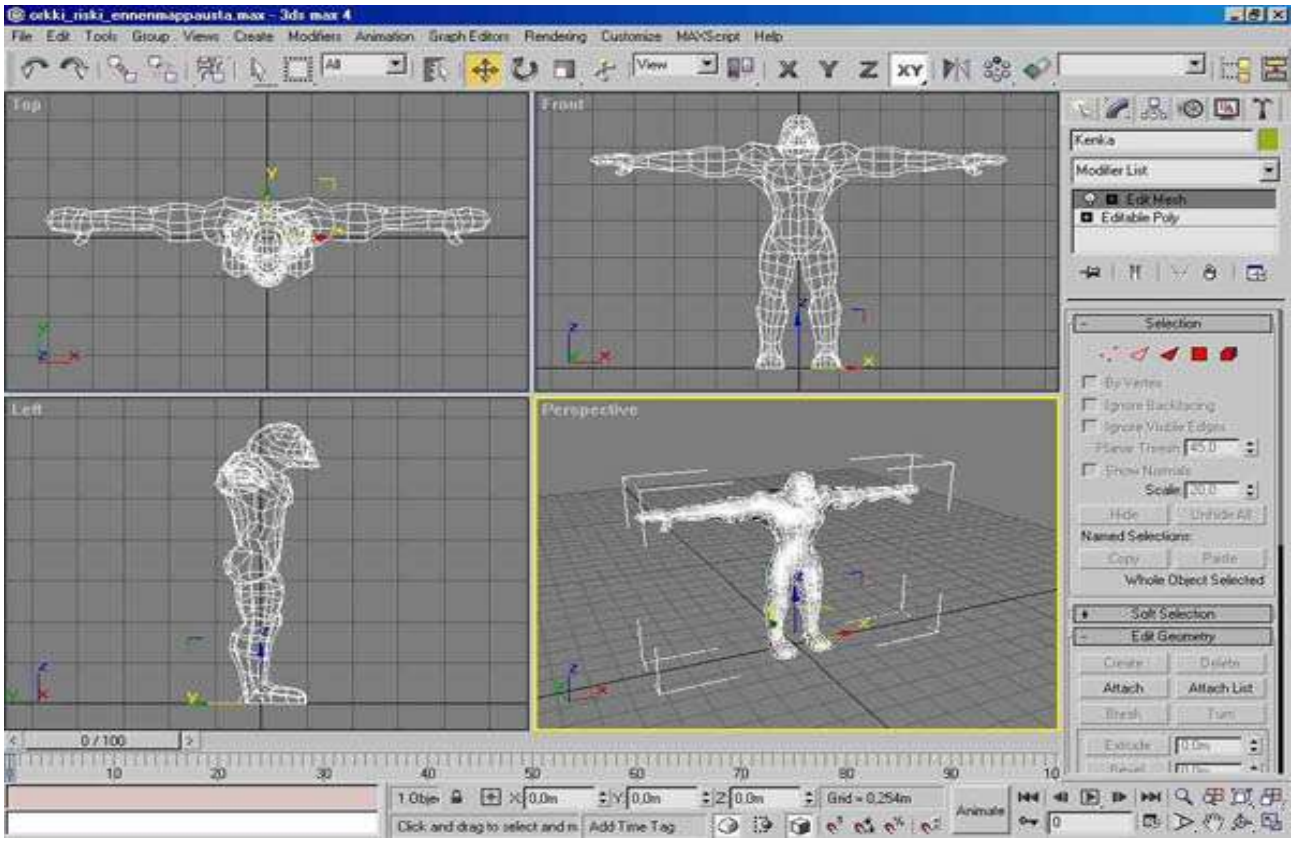
- Strider

3D Graphics

- The content of the screen is stored as a list of polygons.
- A camera determines the point of view on the scene.
- Using the camera and polygon information, the computer (or the graphic card) determines which polygon can be seen and how to draw them.

3D Model

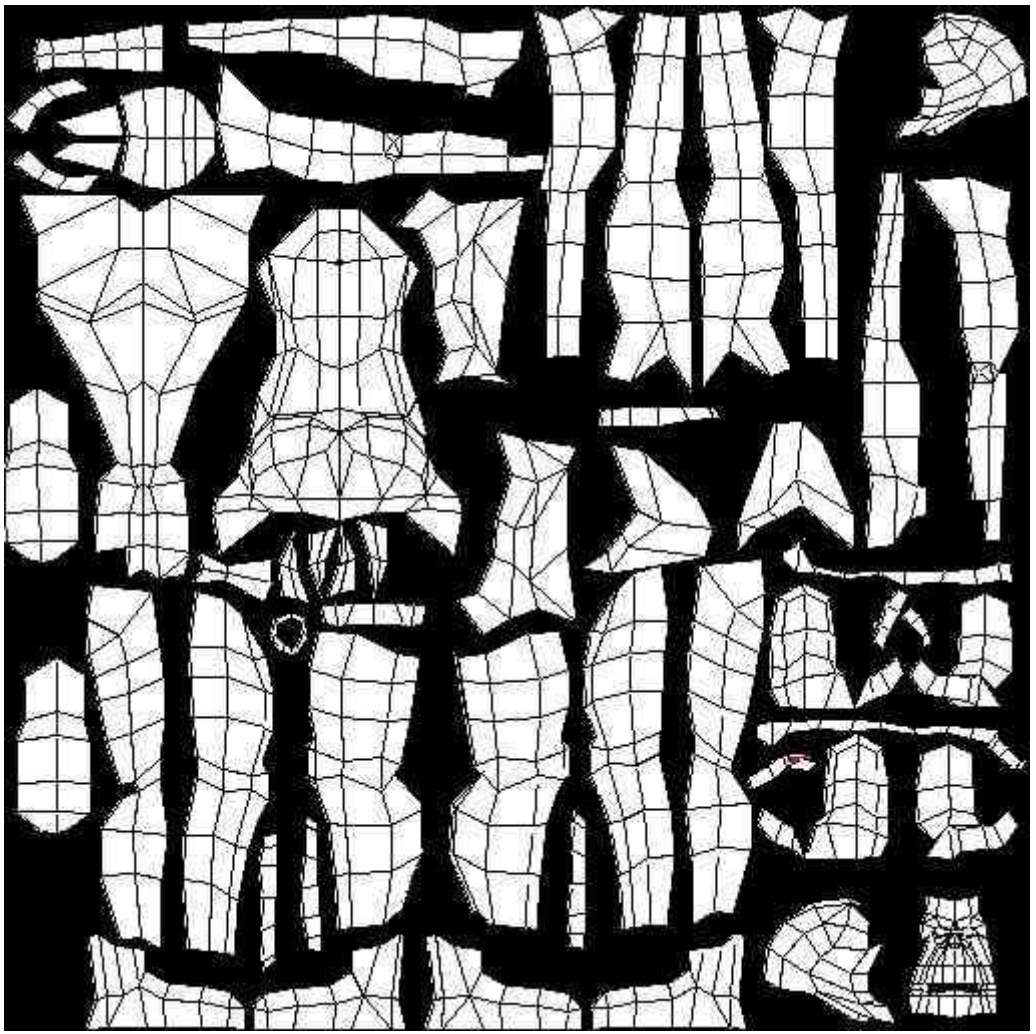
- The first step is to build the model using basic polygonal shapes.
- This collection of polygon is called a mesh.



Quake 2 model in 3DS Max 4

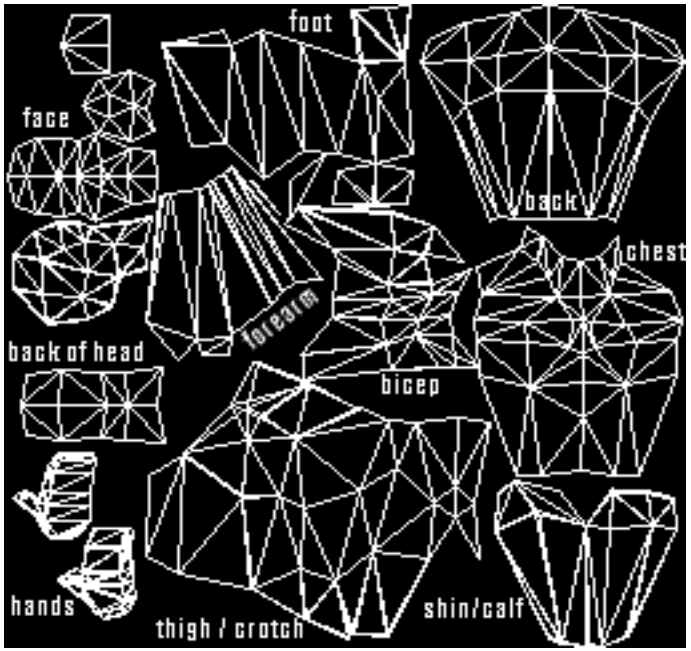
Texturing Models

- We can break the model into surfaces so we can texture it.
- There exist many kinds of texture:
  - Texture Map
  - Light Map
  - Bump Map



Texture Maps

- Texture maps determine the base color of your model.

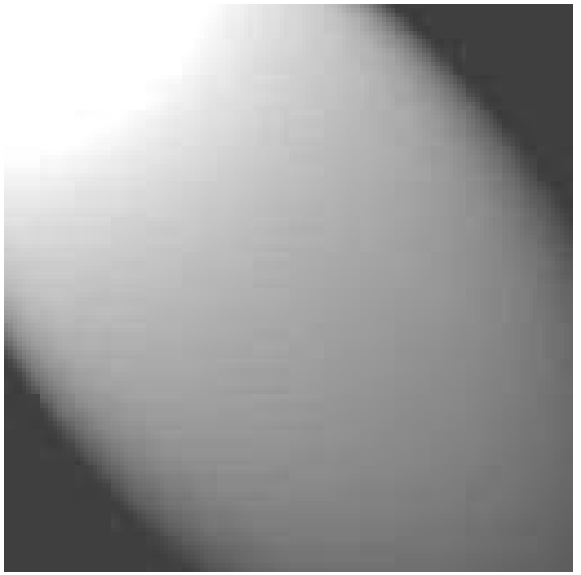


Light Maps

- Light maps define how light sources interact with textures.

Texture map

x



Light map

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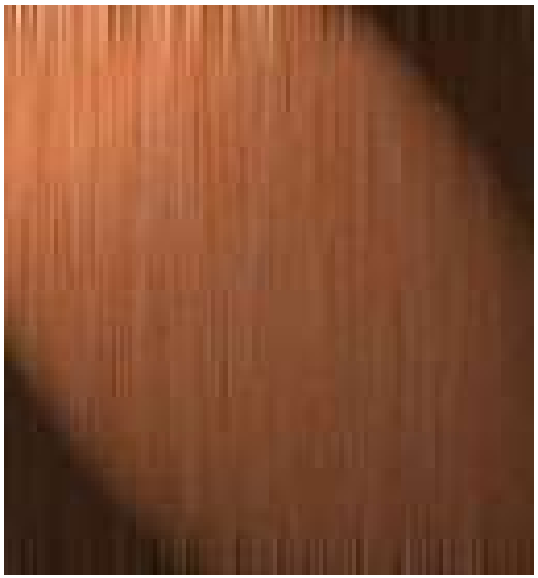


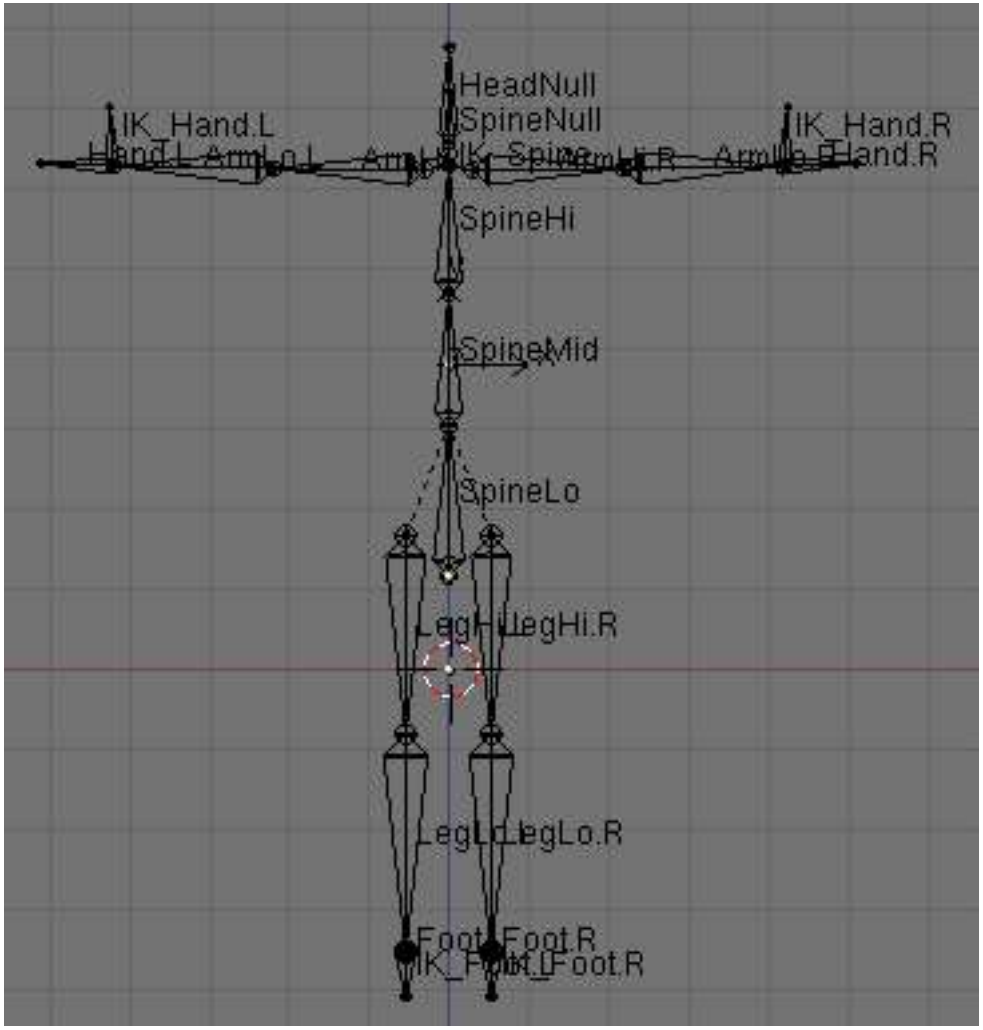
Shadow

Bump Maps

- Bump maps store the normal values (vector) of a surface, allowing the 3D engine to create surface effects.

Animation (Keyframe)

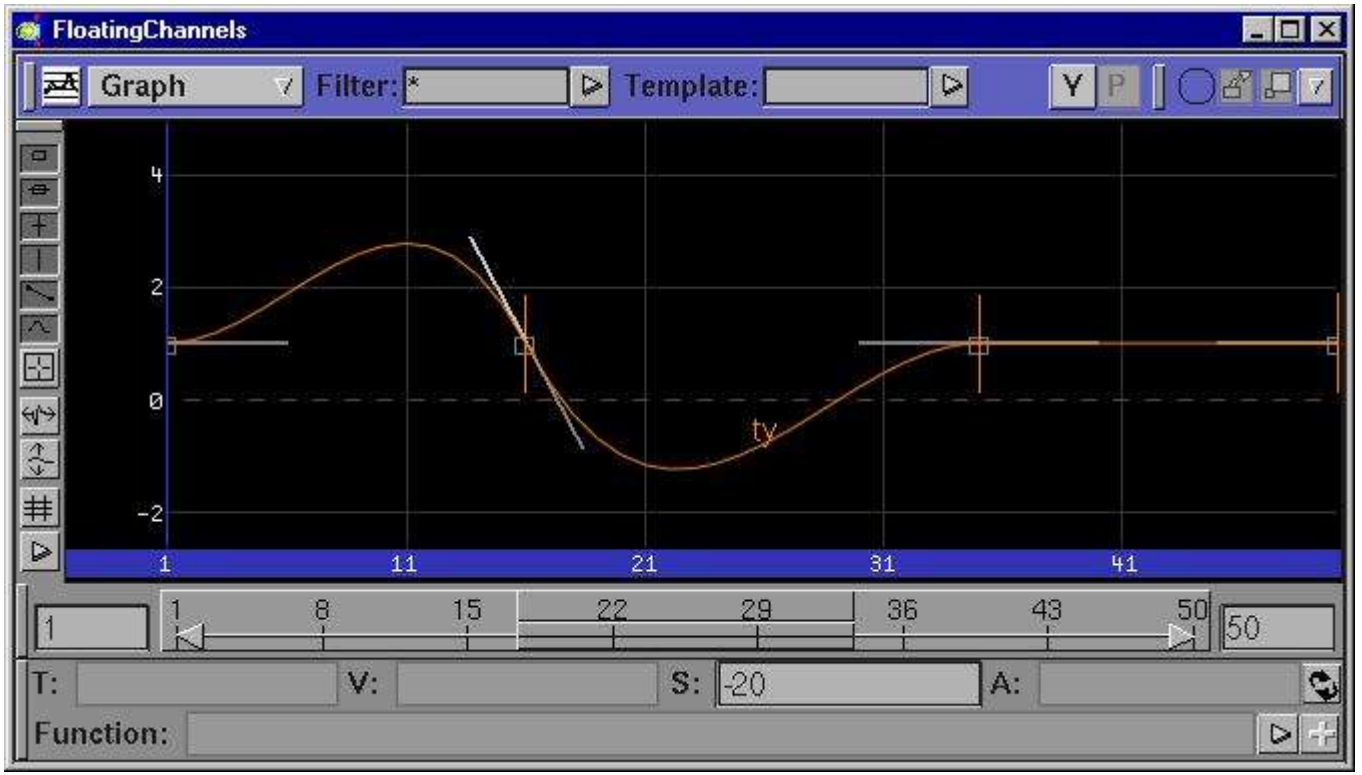
- First, you need to define a bone structure for your model.
- You then need to define how those bones can move.
  - Rotation on the x,y,z axis.



Bone structure on Blender

Animation (cont.)

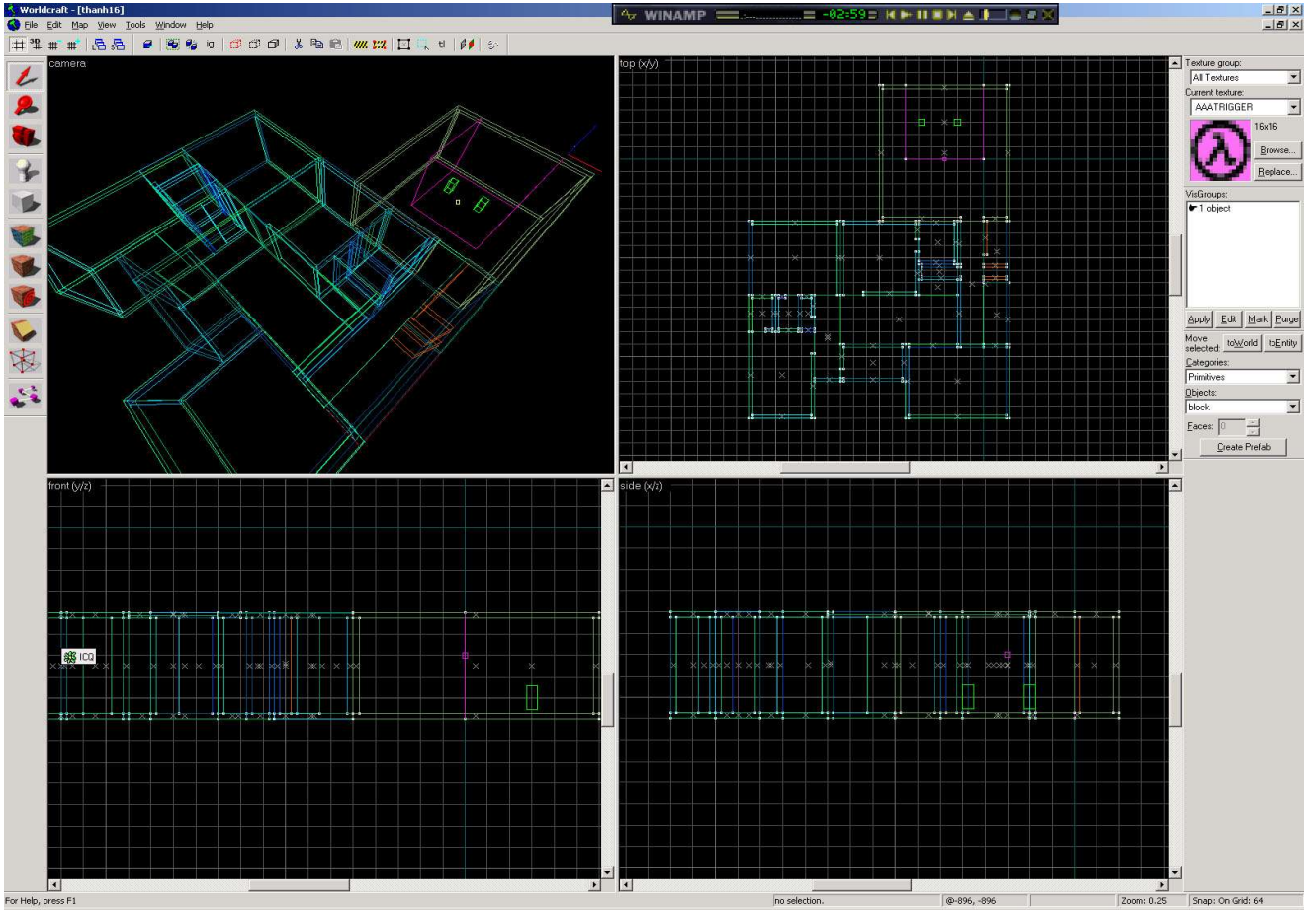
- You can create movement by defining the position of the bone at key moments (frames).
- The engine interpolates the movements of the other frames using the values of the key frames.



Modeling Environments

- Modeling environments is similar to modeling characters.

Worldcraft



Camera Positioning

- Correct placement of the camera is a key element in 3D game.
  - Trivial in a 1st person shooter
  - Very difficult to do in a 3rd person adventure game.

Demo

- GlQuake
- Quake

Content Pipeline