Lecture Review Sheet: Graphics
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Terms and Definitions

See lecture slides for definitions of:

- *state* and *dynamics*
- *memory*, *processor,* and *CPU*
- *program*
- *read-only* and *read/write*
- *volatile/non-volatile*
- *RAM* and *ROM chips*
- *Cartridges, memory cards, floppy disc, hard disc, CD-ROM, DVD-ROM*
- *CRT*
- *vector graphics* and *raster graphics*
- *frame, image buffer, pixels, bitmap, screen refresh, resolution*
- *grayscale, RGB, colour depth*
- *framerate*
- *aliasing*
- *sprites, transparency, collisions, collision-detection, parallax scrolling*
- *game engine, content*
- *rendering, scene, pre-rendered*
- *camera, frustum*
- *surfaces, polygons, vertex, coordinates, mesh, normal vector, models*
- *culling, volume partitioning, portals*
- *software/hardware rendering, GPU*
- *transform*
- *wireframe, flat-shading, smooth-shading, texturing, texels, texture mapping*
- *level of detail*
- *alpha values*
- *diffuse/specular lighting*

Historical Context

First successful game: Pong (Atari, 1972)
First microprocessor-based game: Gunfight (Taito, 1975)
Advent of personal computers: around 1976

Main Ideas and Concepts

- Computing consists of *state* and *dynamics* that change the state.
- Game complexity limited by the speed and memory capacity of the machine.
- Smaller, simpler games require fewer developers.
- Increases in storage size have had profound effects on games.
- Scene complexity is limited by the ability of the machine to store the necessary information and draw the necessary lines or polygons quickly enough
- Vector graphics made the developer's job more complex by having to directly control the CRT hardware.
- Raster graphics simplified development by putting an "image buffer" between the game and the CRT.
- Vector graphics died (long live vector graphics!)
- Bitmaps can describe images by a set of grayscale or RGB colour values.
- General-purpose processors can run many different programs.
- Special-purpose hardware (e.g., sprite hardware, 3-D graphics accelerators) can do specific tasks much faster than general-purpose processors.
- More powerful machines ⇒ larger and more complex games ⇒ larger teams.
- Teams composed of specialists, led by the generalist *game designer*.
- In modern games with large teams, teamwork is paramount.
- Swings back and forth between specialization and generality in technology and the games industry.
- Role of the camera.
- Camera as an artistic device, a game design decision, and a technical problem.
- Construct world out of surfaces made from polygons.
- Drawing by ordering triangles and displaying them from farthest to nearest.
- Impact of scene complexity on drawing process.
- Purpose and methods of culling.
- Managing scene complexity through volume partitioning.
- Static vs. dynamic objects in the game world.
- Precomputation for static objects.
- Portals.
- Lighting and materials.
- Graphics is a constant battle to increase screen complexity and visual information (textures, bump maps, light maps, etc.) with the available computation and memory.
- Dynamically changing complexity (level of detail) allows more complex scenes by dropping the computational and memory requirements for things that are far away.