Game dev: Framerate

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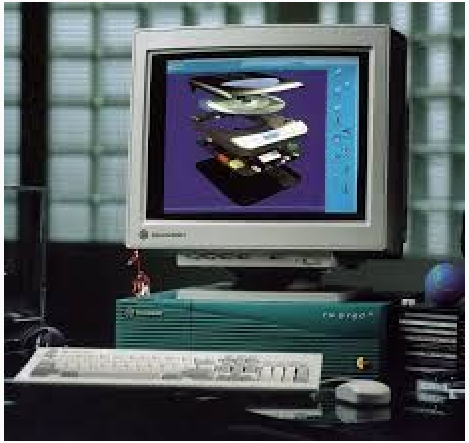
The past

- Computer graphics was late (1980) and initially for the business:
- Silicon Graphics
- Later they founded Pixar :)

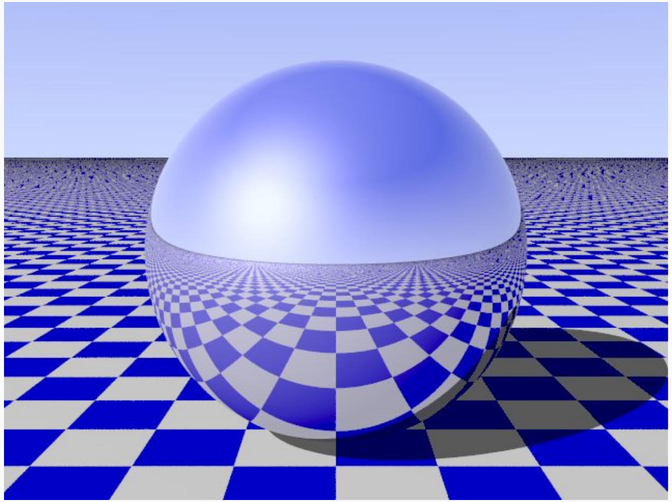


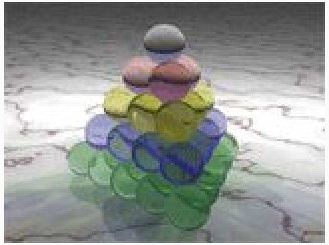
The past

- Home computers with multimedia was way later (1985):
- Commodore Amiga
- It features graphical multitasking OS
- … in 1.4 Mb!

The past

- The PC took market advantage (1992). Still rendering was expensive!





It moves!

The past

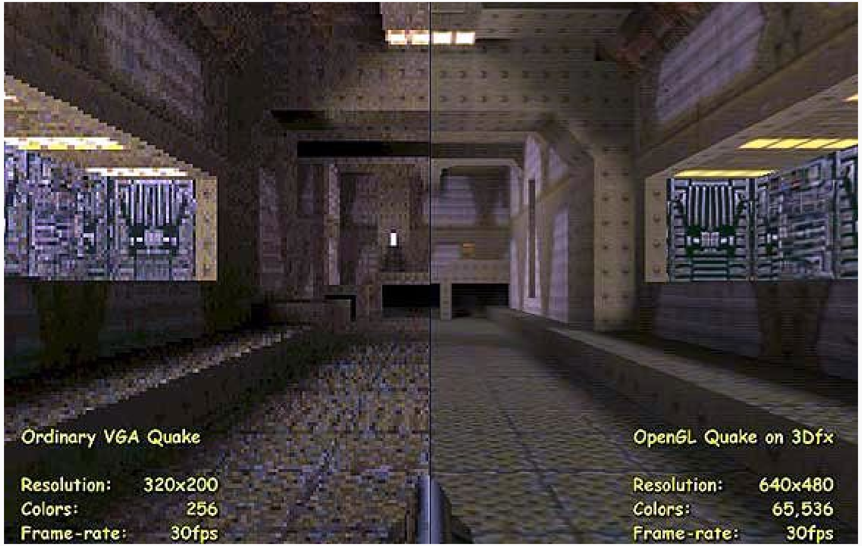
- The revolution of the GPUs (1995):

1995

NVIDIA LAUNCHES ITS FIRST PRODUCT, NV1

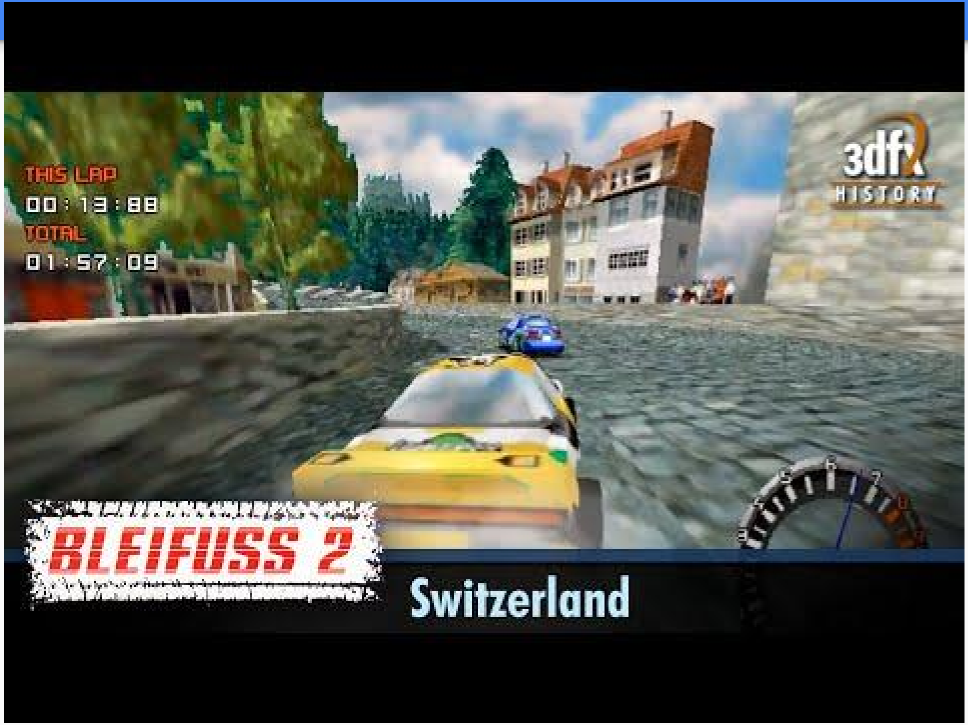
Sega, the leader in arcade games, ports Virtua Fighter to be the first 3D game to run on NVIDIA graphics.

NVIDIA NV1, the company's first product, is launched. The PCI card was sold as the Diamond Edge 3D, featuring a 2D/3D graphics core based on quadratic texture mapping.



3dfx Vodoo!

More info on history of real time graphics on video games here.



Real Time applications

- Rendering-computation fast enough, so that the series of rendered images induce the illusion of movement in the human brain of the user.
- This illusion allows for the interaction with the software doing the calculations taking into account user input.
- The unit used for measuring the frame rate in a series of images is frames per second (fps).

Lot’s of wisdom here!

Frame rate

- We exploit a limitation in the Visual Cortex called Persistence of Vision
- This optical illusion is created when images cycle of less than 60-80 ms
- This means that motion is perceived starting at 12-16 fps
- Movie industry uses the 24 fps standard for historical reasons
- Frame rate also applies to sound and input!
- Humans are better at detecting low sound framerate.

Movement is just an illusion: 30vs60.com

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How do we measure time ?

- We want accurate measurement to the **microsecond**
- This is a not fully solved problem! … measuring time takes time :(
- Back in the days, using rdtsc intrinsic was standard in windows
- Microsoft discourages it since:
  - We have multiple CPUs sending tasks to each other
  - We have complex power-saving systems that could hibernate CPUs
  - We have out-of-order execution CPUs

How do we measure time ?

- Solution came from two functions (windows platform):
    - QueryPerformanceCounter: Returns a high precision timestamp. Only make sense relative to other previous measure.
    - QueryPerformanceFrequency: Returns the frequency of the counter. We can transform intervals to human readable time. It should be constant during execution.
- SDL offers platform independant versions of this functions.
- Also a simple **SDL_GetTicks()** wich is faster but less accurate (1us).

TODO 1

“Fill Start() and Read() methods they are simple, one line each!”

- We will use this class for logic, we do not need precision
- THis means that **SDL_GetTicks()** is enough

TODO 2

“Fill Constructor, Start() and Read() methods they are simple, one line each!”

- **j1PerfTimer** will be for precise measurements of code execution
- Frequency is the same across all timers, that’s why we use a **static**
- This means that we need **SDL_GetPerformanceCounter()** + **SDL_GetPerformanceFrequency()**

TODO 3

“Measure the amount of ms that takes to execute: App constructor, Awake, Start and CleanUp. LOG the results”

- Create a timer in j1App as a property
- Then use it to print in output window (LOG) the amount of ms that each method takes
- Try to guess the times before starting, which will be slowest ?

TODO 4

“Now calculate: Amount of frames since startup. Amount of time since game start (use a low resolution timer). Average FPS for the whole game life. Amount of ms took the last update. Amount of frames during the last second”

- You may need to add code in **PrepareUpdate()** method
- Create as many properties you need in **App** class
- When it works try activating / deactivating vsync

Homework

- Find out you slowest function
- Try producing lag to drop to 30 FPS under vsync