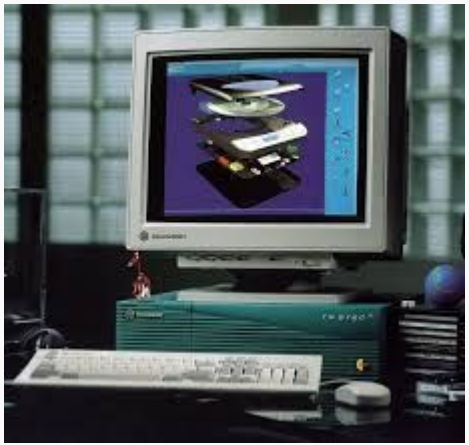
Game Development

Framerate

The past

- Computer graphics was late (1980) and initially for businesses:
- Silicon Graphics

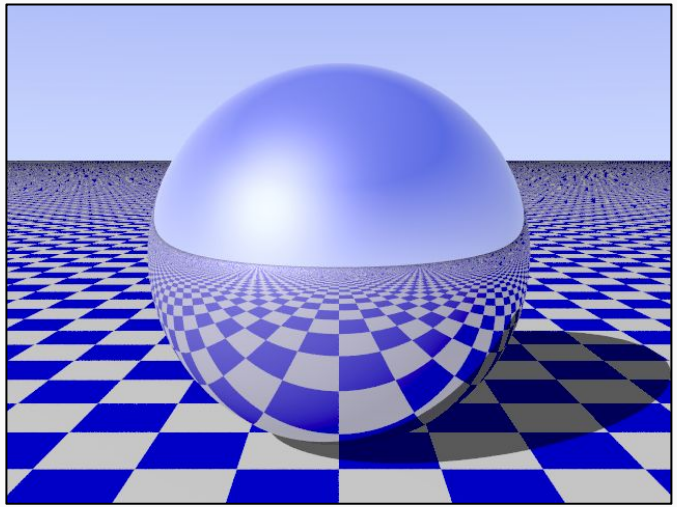


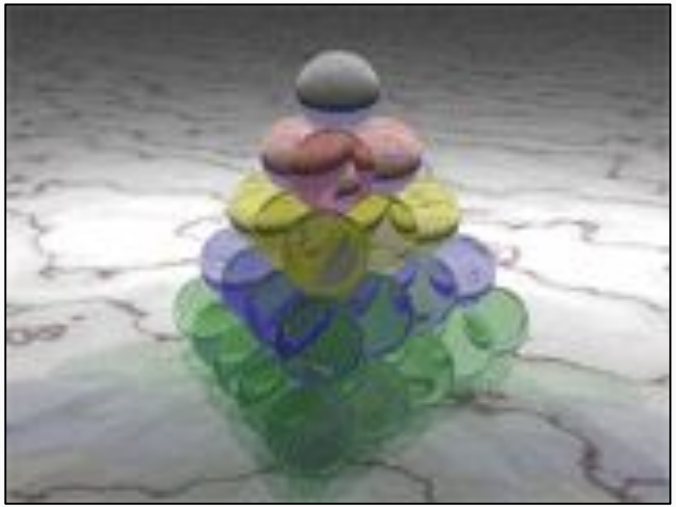
The past

- 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!





The past

- The revolution of the GPUs (1995):

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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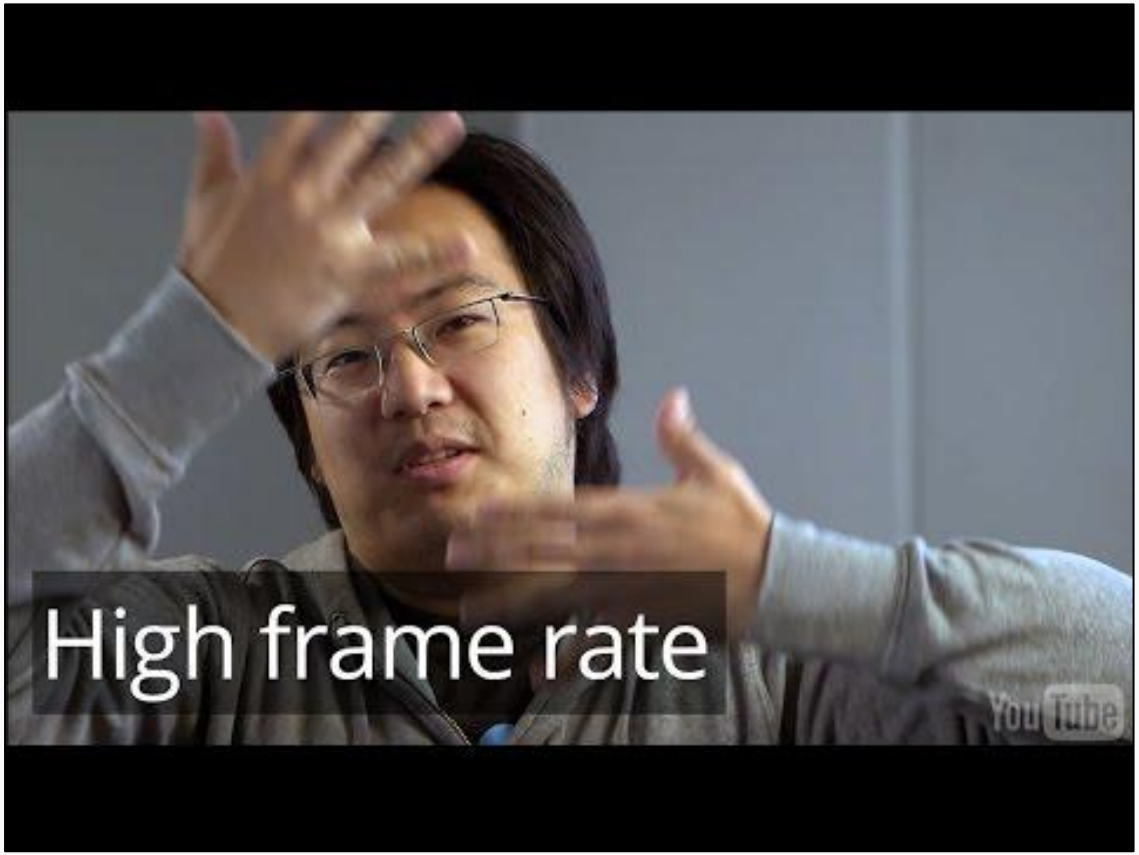


“Lowering” quality because of artistic reasons

How do we measure time ?

- We want accurate measurement to the **microsecond (µs)**
- 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 (1ms)
  - Enough for **most** profiling

TODOs - The Plan

- We will create two timers to handle game measurements
- **j1Timer** for faster, less accurate measurements
- **j1PerfTimer** for slower but more accurate measurements
- Then we will start measuring our game functions

TODO 1 - j1Timer

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

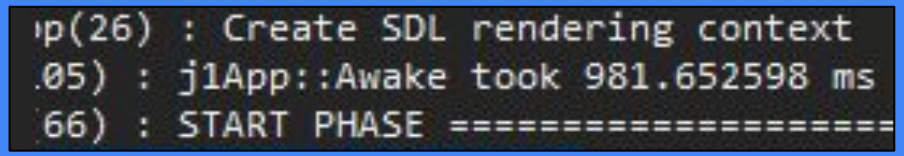
- We will use this class for logic, we do not need precision
- This means that **SDL_GetTicks()** is enough

TODO 2 - j1PerfTimer

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

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

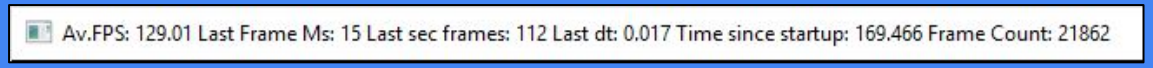
TODO 3



"Measure the amount of milliseconds 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 taken in 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
- Check printf format for zero padding and other cool stuff

Homework

- Measure Init() and Start() milliseconds for each module
  - Show each of them in the LOG
- Try producing lag to drop to 30 FPS under vsync