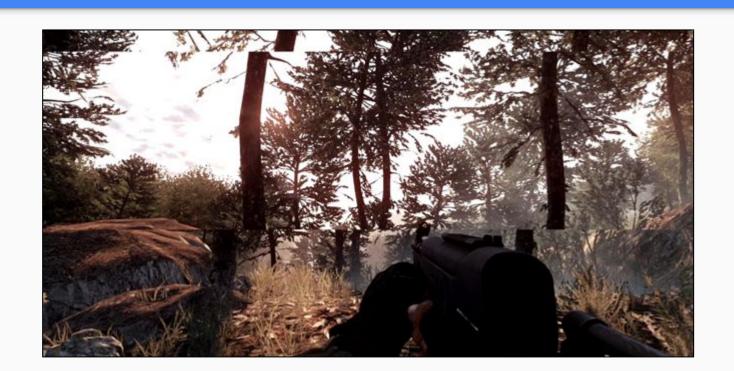
Game Dev: limits, ticks and dt

Ricard Pillosu - UPC

Back in the days ...



Why do we limit the framerate?

- We want a smooth experience
- We can hide peaks of slow code
- The code becomes more predictable
- Variable time step vs Fixed time step
- My take: a mix of both: limit framerate but use variable time step
- Actually frame rate ALWAYS fluctuates a bit :(

How do we wait

- Every time we wait we give that time back to other OS processes
- It is a bit unpredictable when waiting will finish
- Two main ways:
 - <u>Vsync</u>: it will wait until screen refreshes (very accurate)
 - "With double-buffered VSync, the framerate can only be equal to a discrete set of values equal to Refresh / N where N is some positive integer. 60Hz: 60, 30, 20, 15, 12, 10, etc."
 - SDL_Delay: stop and give time back to the OS (not so accurate)
- Understand that SDL2 automatically uses <u>double buffering</u>

"Read from config file your framerate cap"

- Simply add the variable as an integer in the format "16" or "30"
- Mind that we could not have that value specified
- That would mean that no cap is going to happen

"Use SDL_Delay to make sure you get your capped framerate"

- You already have current ms in a variable
- You can calculate the amount of milliseconds you need to wait

"Measure accurately the amount of time it SDL_Delay actually waits compared to what was expected"

- Use a j1PerfTimer
- Print your result with LOG
- Test and check the results

You should have something like that ...

We waited for 29 milliseconds and got back in 28.845800 We waited for 29 milliseconds and got back in 28.687000 We waited for 32 milliseconds and got back in 32.058500 We waited for 30 milliseconds and got back in 29.791500 We waited for 32 milliseconds and got back in 36.402700 We waited for 31 milliseconds and got back in 31.195300 We waited for 32 milliseconds and got back in 32.048200 We waited for 32 milliseconds and got back in 32.142200 We waited for 32 milliseconds and got back in 32.217400 We waited for 32 milliseconds and got back in 32.125800 We waited for 32 milliseconds and got back in 31.348000 We waited for 31 milliseconds and got back in 30.200800 We waited for 32 milliseconds and got back in 31.605700 We waited for 32 milliseconds and got back in 32.154500

"Calculate the **dt**: differential time since last frame"

- We use a float with the amount of seconds since last frame
- We will use it a as a multiplier

"Send **dt** as an argument to all updates you will need to update module parent class and all modules that use update"

- Potentially any Module could use it
- So we distribute to everybody :)
- Actually just SceneModule has an update

"Make the camera movement independent of framerate"

- Most likely won't move if you keep 1 as the speed (try 100+)
- Note that if you press left and right at the same time there is still some movement! This is due to float precision problems
- Use ceil/floor to solve that
- Try capping to 10 30 and 60 and notice that the speed movement is now stable, independent from frame rate

Al Ticks



Documentation

- Game loops can become quite complex. Read carefully this <u>article</u>.
- GPU manufacturers are constantly trying to reinvent the vsync:
 - NVidia's <u>adaptive vsync</u> and <u>G-Sync</u>
 - AMD <u>enhanced vsync</u>

Homework

- Game loops can become quite complex. Read carefully this <u>article</u>.
- Create a module player that only gets updated 10 times per second
- Use a different method that Update, like UpdateTick()
- We still want Update for graphics!
- But decisions can be taken safely 10 times per second