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HW02 Gears

1. Gears will initially run at 83.549 frames per second, then drop down to 59.844 and then stabilize at 60 for all window sizes. This is due to vsync being enabled and stabilizing the FPS.

   I also ran Gears with vsync disabled and got varying FPS for different Window sizes. At 1x1, the FPS ranged around 10,700 to 10,900. At 100x100 its stays around 5,000 to 6,000 and at fullscreen it stays around 460.

   The Difference in frame rates can be accounted for by the difference in the size of the image that needs to be generated. The GPU can calculate 1 pixel many more times in 1 second than it can 10,000 pixels which it again can calculate many more times than 2,073,600 pixels, the amount in my monitor. This is reflected in the differing frame rates.

2. When Gears runs at many thousands of frames per second, the GPU is updating the frames as fast as it is able to. This is how many times the GPU can possibly update the state of the image in a second.

   This is many more times over than the actual refresh rate of most computer monitors which are usually capped at 60 Hz, or 60 screen updates a second. If the frame rate from your GPU does not match the refresh rate of your monitor, then the monitor may draw an update from two different generated frames and you will get a disjointed image known as screen tearing.

   Vertical Synchronization or VSync is a feature used to combat this. It syncs the frame rate with the monitor refresh rate (usually 60) so that each frame corresponds to one monitor update. The graphics card must now wait for the monitor's signal to generate a new frame. As a result, the FPS is capped at 60, 90, etc.

3. 2 hours

References

https://www.digitaltrends.com/computing/what-is-vsync/