

Measuring the Latency of Graphics Frameworks on Microsoft Windows

Thema:

Measuring the Latency of Graphics Frameworks on Microsoft Windows

Art:

MA

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Hintergrund

Latency is an inherent property of all interaction between human and computer. A system's end-to-end latency - the time it takes from a user input to a perceivable system response - comprises several partial latencies. For example, hardware components such as input devices [1] and displays [2] contribute to a system's end-to-end latency. It is important to measure those partial latencies to find performance bottlenecks and gain a deeper understanding of latency.

In earlier work, Schmid and Wimmer [3] developed a method for measuring the latency of graphics frameworks. Their method currently works only for X11-based Linux systems. In practice however, many time-critical applications, such as video games or user studies, use the Microsoft Windows operating system.

Zielsetzung der Arbeit

Goal of this thesis is to port Schmid and Wimmer's method for measuring the latency of graphics frameworks to Microsoft Windows. Due to Windows' proprietary nature, access to low-level system libraries might be restricted. Therefore, different methods for obtaining the start and end point of the latency measurements have to be compared. Additionally, several small-scale studies on the influence of certain system settings, such as full-screen vs. windowed applications, vertical synchronization, and Windows version could be conducted. Lastly, measurement results should be

compared to Schmid and Wimmer's data and additional software (e.g., game engines) should be measured.

Konkrete Aufgaben

- Implementation of a framework latency tester on Windows
- Implementation of test programs using different graphic frameworks
- Systematic collection of different methods to get input events and read the video card's frame buffer on Windows
- Comparison of those methods with a ground truth to find the most suitable method
- Measuring the latency of different graphics frameworks in different conditions

Weiterführende Quellen

[1] Wimmer, R., Schmid, A., & Bockes, F. (2019). On the Latency of USB-Connected Input Devices. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 1-12.

<https://doi.org/10.1145/3290605.3300650>

[2] Stadler, P., Schmid, A., & Wimmer, R. (2020). DispLagBox: Simple and replicable high-precision measurements of display latency. Proceedings of the Conference on Mensch Und Computer, 105-108.

<https://doi.org/10.1145/3404983.3410015>

[3] Schmid, A., & Wimmer, R. (2023). Measuring the Latency of Graphics Frameworks on X11-Based Systems. Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems, 1-7. <https://doi.org/10.1145/3544549.3585779>

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