CASE STUDY

How Graphics Cards Make Games Look Awesome

ETHICAL DIGITAL LITERACY (ICTF 0513)

SECTION: 130

TEAM MEMBERS:

1. UMIE UMMAIRAH BINTI SYAHARUDDIN (248460)
2. NUR SYAKIRAH BINTI MOHD ZUKRI (245810)
3. NUR MARIAH ANIS BINTI MAHAINI (245578)

INTRODUCTION

A Graphics Processing Unit (GPU) significantly enhances gaming performance by handling complex visual computations, leading to smoother and more immersive gameplay. Keyways a GPU improves gaming performance include higher frame rates. A powerful GPU renders more frames per second (FPS), resulting in smoother motion and reduced input lag, which is crucial for fast-paced games. Other than that, enhanced visual quality. GPUs manage intricate graphics, enabling higher resolutions, detailed textures, realistic lighting, and advanced effects like ray tracing, thereby enriching the visual experience.

Furthermore, offloading tasks from the CPU. By taking on graphics-intensive tasks, the GPU frees up the Central Processing Unit (CPU) to handle other processes, improving overall system performance and responsiveness during gaming sessions. Finally, support for advanced technologies. Modern GPUs support technologies such as DirectX 12 and Vulkan, which optimize game performance and enable developers to implement more complex and efficient rendering techniques.

This study case is mainly intended to understand the technological principles behind how graphics cards process and render graphics in games. Other than that, we also examine how advancements in GPU technology have transformed the gaming experience and highlight the impact of graphics cards on game visuals, such as resolution, texture quality, and special effects.

Moreover, the objectives of this study case are to explain the core functions of a GPU, like how GPUs handle rendering, shading, and processing tasks that make game visuals realistic and immersive. Additionally, this study aims to analyse features key of modern GPUs. For example, investigating features like real-time ray tracing, AI upscaling, and hardware-accelerated performance. Crucially, the impact on gamers' experience. By evaluating how better graphics contribute to player immersion, realism, and overall satisfaction with gaming.

LITERATURE REVIEW

Based on the research that we made from the article that investigates about the topic on graphic cards, where the quality of graphic card that affects the VR environment and user experience. It proves that the graphics quality play crucial role in adopting user engagement and enjoyment during gaming sessions. The high-quality graphics has made users feel more connected when interacting with games. This article states that the further examination of VR technology will reveals its potential to revolutionize graphics quality within game play.

High-quality graphics contribute to user immersion and enjoyment in VR. It explains on how a good graphics card enables realistic visuals and special effects that enhance the sense of presence in VR. It also emphasises on graphics quality which states about the importance of high-quality graphics for a good VR gaming experience. A powerful graphics cards are crucial for rendering detailed visuals, high resolutions, and smooth frame rates in VR. Furthermore, the role of a graphics card in handling dual-eye rendering and maintaining high frame rates to prevent motion sickness.

ANALYSIS

Graphics card is responsible in producing output to monitor. It has a connector(s) for monitor(s) and another connector to computer motherboard. Graphics card has its own memory modules and most importantly the graphics processing unit that creates the display we see on monitor screen. While primarily used for gaming, it's possible to use an array of graphics cards for speeding up tasks that require parallel processing like password cracking. You can also, in some cases, get identical cards to work together through crossfire or SLI (Scalable Link Interface). You might also get a graphics card to add more monitors to a system.

But as any other computer components, graphics card also have its own pros and cons. And here are some of their backfires. Firstly, artifacts. These are strange visual anomalies that disrupt your gaming visuals, manifesting as flickering textures, strange colours, or geometric distortions. Other than that, a game crashing could also happen which is akin to the plot taking an unexpected twist. Your game abruptly exits, leaving you staring at your desktop, perplexed and frustrated. And the most popular, stuttering. Imagine a story told in fits and starts, where sentences break into fragments. Stuttering in games disrupts the flow of action, making it feel like your character is moving in slow motion.

For that reason, we concluded some of their potential causes and suggested solutions. First on the list, hardware overheating. High temperatures can cause artifacts and crashes. This could be handled by ensuring graphics card and CPU are adequately cooled. Clean out dust, consider better airflow, and invest in cooling solutions if needed. In addition, outdated or corrupted drivers could also cause crashes and poor performance. Prevent this by regularly update your graphics card drivers from the manufacturer’s website. Lastly, insufficient power supply. A power-hungry graphics card requires a robust power supply unit and inadequate power can lead to crashes or underperformance. So, make sure your power supply meets the requirements of your graphics card.

FINDINGS AND RESULTS

Graphics cards play a crucial role in rendering visuals on monitors, utilizing their dedicated memory and graphics processing unit (GPU). While primarily designed for gaming, they are also capable of handling parallel processing tasks like password cracking and support multi-monitor setups. Advanced technologies like SLI and Crossfire enable multiple graphics cards to work together, boosting performance for demanding applications.

However, challenges such as artifacts (visual anomalies), crashes, and stuttering can disrupt user experiences. These issues often stem from hardware overheating, outdated or corrupted drivers, or insufficient power supply. Solutions include improving cooling systems, regularly updating drivers, and ensuring the power supply meets the card’s requirements. By addressing these challenges, graphics cards can deliver optimal performance and reliability across various applications.

BOOLEAN SEARCH USED

1. (“Graphics card”)* NOT (“GPU”)
2. (graphics card* AND “games” AND “challenges”)
3. "GPU" AND "improve gaming performance" AND "frame rates" AND "visual quality"
4. ("GPU" OR "graphics card") AND ("gaming" OR "video games") AND ("improve" OR "enhance" OR "better graphics" OR "realistic experience")
5. minecraft "concept" gpu

CONCLUSION

In conclusion, this study shows how important Graphic Processing Units (GPU) are, in improving gaming experience. GPU help make games look better, run smoother, and perform faster by increasing frame rates and adding realistic effects like ray tracing. It also help CPU by handling some tasks, which makes the whole system work better. Modern GPU support technologies like DirectX 12 and Vulkan, which improve gaming performance.

This research also looks at how GPU help with virtual reality (VR), making the experience more lifelike and engaging. Although GPU's do have problems like overheating, old drivers, and power issues, these can be fixed with good cooling, regular updates, and proper power supply.

Moreover, when choosing graphics card, you need to decide on the amounts of memory that you'll be needed and the type of PC that you own whenever it's a laptop, computer, desktop, etc. Whether you want a separate GPU, or one built into the CPU, and the type of power connectors the card uses. Besides, you should also check the thermal design power (TDP) of the card. All these factors will affect whether the graphics card will fit in your PC and if it will get enough power and cooling.

There are two main brands we would recommend for those gamers out there; AMD and NVIDIA. These both manufacturers offer high-powered, quality graphics cards. For example, the Oasis AI project used an NVIDIA H100 GPU to create a fully playable version of Minecraft at 720p resolution with 20 frames per second. This technology uses generative AI to generate each game frame based on the user input, without relying on traditional game engines. And that's how graphics card makes games look awesome.

REFERENCE

1. Paulasto, E. (ed.) (2013) What is the difference between a GPU and graphics card in a pc? Available at: https://superuser.com/questions/575177/what-is-the-difference-between-a-gpu-and-a-graphics-card-in-a-pc (Accessed: 31 December 2024).

2. Baker, J. (2023) The Impact Of Graphics Card On Gaming Visuals . Available at: https://medium.com/@j.baker_75984/the-impact-of-graphics-cards-on-gaming-visuals-e73da966ba2e (Accessed: 31 December 2024).

3. Amanda, K. (2024) *How to optimize your PC for gaming in 2024: Ultimate Guide, How to Optimize Your PC for Gaming in 2024: Ultimate Guide*. Available at: https://www.hp.com/us-en/shop/tech-takes/how-to-optimize-pc-for-gaming (Accessed: 31 December 2024).

4. Jumani, A.K. et al. (2024) Quality of experience that matters in gaming graphics: How to blend image processing and virtual reality, MDPI. Available at: https://www.mdpi.com/ 2891458 (Accessed: 03 January 2025).

5. Amanda, K. (2024) *How to optimize your PC for gaming in 2024: Ultimate Guide, How to Optimize Your PC for Gaming in 2024: Ultimate Guide*. Available at: https://www.hp.com/us-en/shop/tech-takes/how-to-optimize-pc-for-gaming (Accessed: 31 December 2024).

6. Andreadis, K. (2024) *Oasis AI and a single Nvidia H100 GPU has created a playable 'ai minecraft' at 720p 20 fps*, *TweakTown*. Available at: https://www.tweaktown.com/news/101466/oasis-ai-and-single-nvidia-h100-gpu-has-created-playable-minecraft-at-720p-20-fps/index.html (Accessed: 03 January 2025).