

Survey on Modern Technology in Gaming Insight on the tools of Production and Designing

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Abstract -Achieving significant performance while picturing a large animated scene in a complex video game, is extremely the difficult and challenging task. Gaming is considered to be the area having most profound impact on the people's lives. This review paper provides overview of the various aspects of the gaming technology that are being developed in the current date. It more importantly focuses on the CPU, GPU and the leading designing tool called UNREAL ENGINE 4. The paper is divided into eight sections: Introduction, Processors, comparison between processors, GPU, Comparison between GPUs, What to choose, Related Work, and Conclusion.

Key Words: gaming engines, processors, GPU's

1. INTRODUCTION

The era of gaming has emerged with the creation of designing tools that enable their user to create lifelike, if not real, graphical illustrations that have the capability of being programmed to behave in a designated or (with the introduction of A.I.) independent manner. The tools that enable the users to create such remarkable illustrations are termed as "Engines". These "Engines" are required in any Modern Gaming Titles. These tools are provided by organizations that work on developing and enhancing the quality of their tools and Engines. Despite the type of game, every game needs a game engine and game loop to run where game loop is the block of code which repeats itself. Better the game loop, better the game will run. There are numerous types of game engines depending upon the aspects of video requirements. They include: engines that can work without any programming knowledge, professional engines, open source engines, and those which depend on web technologies [10].

As of 2018, the leading organization with the best "Engine" is the Epic Games. Their game designing and formatting tool "Unreal Engine 4" is the leading platform for game publishers and editors alike. Unreal Engine 4 tops the list of all the engines we have seen so far. It by far surpasses its predecessor Unreal Engine 3 in the game-world and conquers the graphical paradigm of gaming. Besides making the games all beautiful and realistic, these engines, and in particular Unreal Engine 4 also focusses on core physics of the game i.e., the motion shifts, the wind, the cloud, the soil. Water and grass physics has been a challenge for almost every game engine as long as the gaming world has existed. With Unreal Engine 4, this problem is to some extent resolved. With all its jewels and its glory, it still cannot compete with its ready rival Cryengine 5 that cuts through all the grass and water animations and effects like a scissor would cut through silk.

With all its little textured details and solid, life-like animations, Unreal Engine 4 is not easy on the G.P.U (Graphics Processing Unit). With the introduction of Nvidia's 10 series

graphics card though, it is quite easy to run the Engine even on low end processor units. But how high have we to score. Can we run an Unreal Engine 4 on a current processor unit say a core i7? Can a powerful GPU with the support of a powerful CPU become eligible enough to actually render lifelike Graphics? All these questions will be answered after we have discussed what a processor is, what is its current ability in the market and the latest GPUs with their calibre as well..

2. Body of Paper

This paper is divided into three parts. Part 1 is the introduction part. Part 2 is further divided into six sub-sections discussing about processors, comparison between gaming processors, graphic processing unit and comparison between them, how to choose the suitable one and related work.

2.1 PROCESSORS

The processor is a small chip that resides in a computer's core functioning element. The processor provides the computer with the ability to manipulate and handle information. Modern processors can handle trillions of calculations per second.

With that being said the general information of a processor is fairly obvious in the world of technology today. The two leading or to say dominant organizations responsible for producing the super-fast processors are Intel and AMD, both of which use x86 processor architecture. Mobile devices such as laptops and tablets may also use Intel and AMD CPUs, but can also use specific mobile processors developed by companies like ARM and Apple

2.2 COMPARISON BETWEEN PROCESSORS

The CPU market has had a staggering improvement ever since the first microprocessor chip was introduced. If we have been keeping track of the CPU market in the last few years, lack of competition from the AMD has always been a major problem. The company has always been considered as an inferior to the Intel CPUs especially due to their outdated FX range of desktop processors which were no match for Intel's core i7 processors. Well, this year the tides have changed with the introduction of AMD's Ryzen line-up of desktop processors. Intel though does not plan to sit and let AMD thrash its business as with the introduction of its core i9 processors, it plans to put its cards back on the table. AMD should be scared, right? Well think again. With its new Ryzen threadripper processor and an ultimate gaming performance, AMD's Ryzen literally threadrips through anything we throw at it.

2.3 GPU (Graphic Processing Unit)

With all the details about the processors and their leading rivals, let us take a quick look at what a GPU is.

For all the wikipedians out there GPUs can be a little difficult to understand. But for a gamer, it's quite easy. A GPU or a

Graphics Card(the more formal way of addressing it) is something that helps you render high quality images and motion while image processing .Their definition also states that the bigger the price tag, the better the performance.

A GPU is a crucial part of your gaming setup if you wish to render beautiful images while gaming. The solid work and effort put in by the designed is only addressed with the help of a powerful GPU. There are many names currently in the market of GPUs. They are produced by Nvidia , AMD, Intel, Gigabyte , EVGA corporation ,Zotac etcetra. NVIDIA tops the list as the best GPU we have seen so far.

2.4 COMPARISON BETWEEN GPUS

The two competing rivals in the field of GPUs are the Nvidia and AMD with their Geforce/Gtx series and RX series respectively. Though AMD might have an upper hand over Intel in the raw processing power of the Ryzen but it doesn't even come close to beating the latest desktop performance Nvidia GTX 1080 ti. Nvidia latest entry into the GPU game boast to provide visuals never seen before and the raw output potential of unmatched numbers. But the fact that Nvidia is the best does not deem AMD as unusable. Both AMD and Nvidia have produced some of the best GPUs the market has ever seen. Biasing to one would not be a wise option as AMD is responsible for 27% of the share market in GPUs.

So are the ultimate gaming visuals are delivered by the top-end GPU's. Well for those who think that, let me also put forward a necessary information that the current price tag on the GTX 1080 ti is \$1000. So not everyone's first choice when it comes to choosing graphics card. Then what does an average gamer who intends to view the latest visuals and outstanding performance do. In this next section we will discuss how the right processor paired with the right GPU and softwares can make a hell of a lot difference in the gaming performance.

2.5 WHAT TO CHOOSE

Now that we have discussed the basics of the various components, we can focus on the topic at hand, what we choose to obtain maximum performance without having the beauty of the game compensating for the same. Do we pair the best CPU with the best GPU? Well for one thing, an average gaming pc with Ryzen threadripper and a GTX 1080ti can cost anywhere between \$5000-\$10000 and even more and for other, to be able to successfully establish and grasp the feel of such amazing performance with leisure, we need to pair it with over the top video output hardware, meaning that we need the best screen out there to render intense graphics while maintaining the refresh rate and the frame rates. A good enough gaming display can cost about a \$1000.

So no, we are not going to buy the most expensive gaming modules out there and stick them against each other, that would be simply practically not feasible.

But what most people would be surprised to know is that the latest AAA titles that render almost real graphics thanks to Engines like Cryengine and Unreal Engine, do not necessarily need the most powerful pc to run them. With the current available technology, we have optimized the gaming performance with the visuals so that people with not so hefty budget(which is almost everyone) can play games without any kind of backlashes.

The minimum requirement to successfully run a modern AAA title like the Witcher 3 or Crysis would have be a core i5

processor, Nvidia GTX 940mx and at least 8 GB of RAM. The RAM plays a crucial role here as it provides the processor with memory to allocate to the processing Unit. This is as low as we can dip if we wish to get respectable framerates with stunning visuals. So does that mean that the latest entries in the GPUs and the CPUs market are a hoax. Well absolutely not. They promise to deliver and they do. They take the Output performance to the peak while also pushing the beautiful visuals that have been rendered in the game and deliver solid performance throughout.

2.6 RELATED WORK

Firas Safadi et al. 2015 in [6] stressed on utilizing artificial intelligence in modern games. According to the researchers, the online AI tools available for implementing complex video game lacks in distinguishing similar features of two independent but same genre video games. A video game generally contains two aspects: game and context, where game determines the challenges and objectives that each game player has to achieve in N number of stages/levels, and context include the game setup through which the problems will be visualised such as area or plot. The paper focused only on the game aspect.

Yangzi Dong et al. 2019 in [7] introduced an effective rendering system which can handle heterogeneous types of character data (approximate thousands of animated characters) on GPU by storing them in a buffer objects. As a result, this helped the researchers to increase CPU utilization and reduce memory consumption. In the first stage, they applied mesh simplification algorithm to all the characters in a game. To ascertain shading effect, vertex normal vectors are used. Moreover, geometry instancing technique is used which reduced the number of drawing function calls, thereby, improving the time complexity of the program.

DiMarzio J.F 2015 in [8] discussed the pros and cons of android game development. Most android games are developed in Java language which requires some packages that are available in Android SDK (software development kit). However, the first issue that most developers may find is the availability of packages needed for 3 dimensional visualisation in android games as those packages do not come under android SDK. Second, games developed for PC mostly use low level language such as C or even Assembly which gives more power to the developer to control the system or environment in which the program runs. On the other hand, android uses Java which is high level language, so the developer has to go through number of interpreters to run the game effectively. As a result of which, developer loses full control on the environment.

Muhannad Quwaide et al. in [9] performed a case study on two opposing facts where one group of researchers claimed that there is a relationship between the video game and users' behaviour, and other group denies this fact. According to the former group, video games may have positive or negative effect on players' skills, imagination, thinking ability, cognitive skills, and problem solving skills. However, the authors of this paper concluded the existence of relationship between the video game and player's behaviour as the opposing group used weak evidence or small sample set to prove their results.

Christopoulou et al. 2017 in [10] did comparative analysis on desktop and mobile game engines on their own shooter game. The game engines used for analysis were Game Maker,

JMonkey, Marmalade, Ogre3D, Shiva, Sio2, Turbulenz, Unity, and Unreal Engine 4. The features or properties on which these game engines were compared are:

- Rendering properties: texture, lightening, shadows, special effects.
- Animation properties: forwarding and inverse kinematics, KeyFrame animation, Skeletal animation, morphing, and blending.
- Sound: 2D, 3D, and streaming
- 3D graphics for mobile clients
- Scene editor
- Scripting features
- Artificial Intelligence features
- Physics
- Import/export content
- Developer tool kit
- Usability and price
- Networking properties

The primary purpose of the article was to assist the developers in selecting the best game engine depending upon the game project and user profiles. They concluded that Unity engine is suitable for the beginners whereas Unreal engine 4 is better suited for the professionals. However, programming bugs were encountered while transferring the desktop games to android.

3. CONCLUSIONS

From all the data collected so far we can safely assume the gaming market is only going to expand with new innovations in technology. The tough rivalry and the tinge of enthusiasm to achieve the unachievable will lead to new inventions in the Game World. For now it is the job of the Gamers to choose their gear wisely and not get into the all expensive gaming gear. The upcoming technology will not only be better performing but will also ridden the technologies from their price tags.

The one thing gaming has taught many people, “When you’re facing many enemies, it only means you’re heading in the right direction”

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