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Wireless Gaming

Wireless Gaming is a framework for playing video games that transfers where the heavy calculations are taking place. In traditional video game frameworks, the video rendering and in-game computations are all run on the machine that is playing the video game. In wireless gaming, most of the video rendering and in-game computations are run on a separate server, and then images and game controller commands are transferred, via the network, back and forth between server and client. Another form of wireless gaming is Massive Multiplayer Online (MMO) gaming, where there are a number of people, anywhere from 4 to over 80, playing the same game on the same server. MMOs also require much of the in-game rendering and calculations to take place on a remote server, and then images and locations are fed back to each client. Mobile gaming on a smartphone is yet another form of wireless gaming. While there are offline mobile games, many mobile games rely on connections to a host server to facilitate playing the game against another live player.

In most cases of wireless gaming, a challenge that presents itself is the massive amounts of data that need to be transferred over the wireless network, synchronized among however many players are on a single server, and sent back over the network. If the data is larger than the network can support, the data will have more latency, which causes game lags for the players. Thus, the programmers and engineers involved all have a goal to decrease the delay for transferring this amount of data as much as possible to mimic the effect of playing on a local machine. The delay in transferring mass amounts of data is often characterized in terms of the latency in sending and receiving data between the host server and the client machine, also called a *ping*. A ping (delay) above 100 ms is considered among many gamers to be a bad ping, and a ping below 50 ms is considered a good ping. If the network is not able to transfer that much data that quickly, the player will experience a “lag” in gameplay. If the lag is large enough the player may have a negative experience on the platform and may not be as likely to return to that platform.

Game developers invest a lot in wireless gaming for multiple reasons, and so they find the issues of ping size highly relevant. For instance, shifting the heavy computations to servers reduces the number of hardware architectures that game developers need to support while still allowing gamers to choose the platform on which to play. This versatility allows the business of gaming to serve varied interests, and it also allows the gamer more flexibility in how and when to play. Gamers would also need to spend less money upfront on expensive gaming consoles and could pay for the service of hosting the game on one of the company's cloud gaming servers. Specifically, mobile gaming becomes a much bigger field of play when much more of the game doesn't need to be computed on the smartphone, which has less processing power than the servers. This framework doesn't need to end at gaming either. It is currently being used in other applications, such as AI training, to reduce the cost that a developer needs to pay to be able to train their AI. Google CoLabs is a service that takes the code and runs it off of the developer's laptop, thereby reducing the need for all developers to have heavy-duty hardware. The framework can be tested and built up using the gaming industry, and when it is very usable, many more industries can take advantage of the discoveries made in wireless gaming.

The scope of this paper will discuss how wireless networks affect cloud gaming on PCs and consoles, as well as mobile gaming (as on a smartphone). This paper will review studies on wireless gaming on the aforementioned devices, how these devices' cloud gaming perform relative to each other, how different platforms perform wireless gaming on the same client hardware, how the gamer's experience in cloud gaming is affected by the chosen server and client platforms, how the field of wireless gaming is progressing, and how the additional field of wireless networking is evolving.

The research questions I hope to answer in this paper include the following: How close are we to developing the technology required to sustain wireless gaming, or do we already have the required technology and infrastructure? How scalable is the wireless gaming framework? What are potential future issues the wireless gaming framework could encounter? These questions were chosen because they encompass the problem as it is and the problem as it is evolving.

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Because I rather enjoy gaming myself, I hope to learn from this research paper what platforms support good wireless cloud gaming, what steps the players need to take in order to have a good experience while playing the game, and what challenges game developers will face. This research will show how the wireless gaming framework will evolve and, therefore, how the whole gaming industry will continue changing. This research paper will evaluate the wireless gaming framework in general, looking at specific platforms to see if they are as playable as traditional gaming setups and what the future of gaming might look like.

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