Department of Computer Science

Impact of Unity and Photon in Multiplayer Development: A study on Popularity Dynamics

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Introduction and Real-World Examples

In the modern era, the prevalence of online gaming has reached unprecedented heights, engaging a huge global community of **3.32 billion** individuals who identify as 'gamers.' This diverse audience participates in an array of different gaming genres, spanning from immersive Virtual Reality (VR) experiences that involve virtual headsets to 2D platformers like the iconic Mario series.

My study delves into the development of a gaming project that draws inspiration from these classics while strategically integrating modern elements, notably 3D implementation and a networking infrastructure facilitated by Photon's Network, This is so important due to the statistic suggesting that **65% of gamers** prefer multiplayer experiences, **with 87% of sessions** lasting longer than solo sessions.. This dissertation poster serves as a comprehensive guide on the ideas behind the incorporation of specific design choices and networked multiplayer features within my developing game.

Aims

- Examine the different trends causing the population strike of 2D and 3D games in recent years, and the features behind the increase.
- Create something like the traditional SNES Platformer games, with implemented multiplayer to add a modern touch to classics.
- Implement Photon successfully, to create a seamless connection between clients and server.

Popular Genres – Inspiration

The figure below displays the number of Global sales per year, showing a steep increase after the **2000's** hit, where gaming became more mainstream and popular. I have decided to investigate games released within the time and platformers with aspects **2D/3D games** were released, which is something I have chosen to implement into my project.

- Figure 1 shows the surge in the gaming industry from **2001 to 2009** was propelled by the successful integration of multiplayer functionality.
- The adoption of multiplayer features played a pivotal role in broadening the appeal of gaming during that period.
- The multiplayer trend transformed gaming into a social activity, fostering a sense of community among players.
- This phenomenon aligns with the theme of the dissertation poster, which focuses on creating a multiplayer game in Unity.
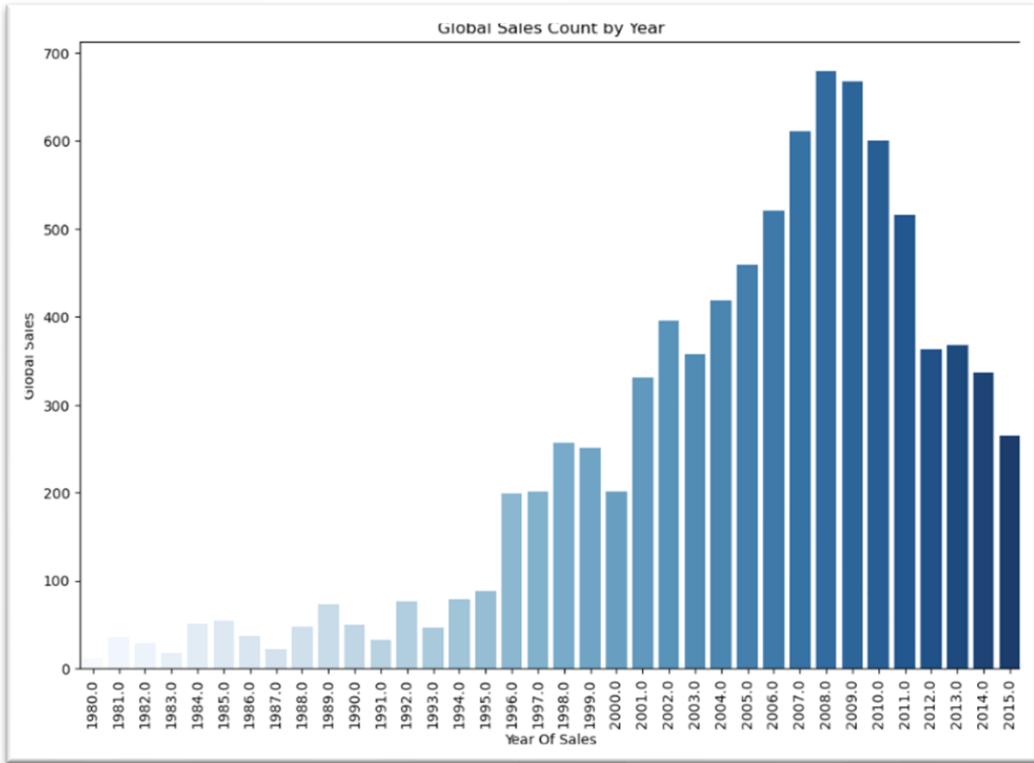- The dissertation aims to explore both the technical and social dimensions of multiplayer gaming.

Figure 1 Global Sale Count of Games, secondary information scraped from a csv via Kaggle

Figure 2 portrays the popularity of each genre of game and how it sums up to the global sales.

- Action – Being the most popular action games require fast-paced action scenes, leaving the users on edge.
- Sports – Following up is sports, this involves a sporting activity being replicated into an online form.
- Shooter – Shooter games, delving the user into an online usually 3D environment, using guns and other means to declare victory.
- Role Playing – Role playing games require users to act as if the virtual world is 'real life', more of a dream life.
- Platformer – Being the **5th** most popular genre, platformers are a staple within the game industry with many Nintendo games following this style.
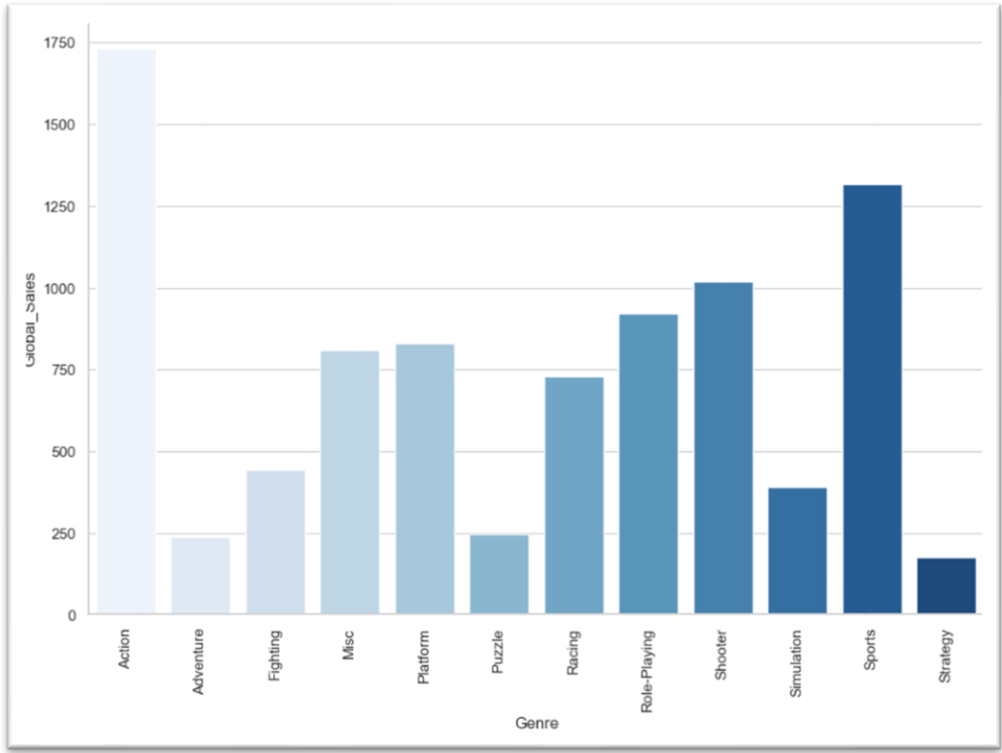

Figure 2 Global Sale Count of Genre secondary information scraped from a csv via Kaggle

With Action and platformer both being extremely prominent entities within this field, I decided to implement these two genres and their features into my application.

Research Objectives

Whilst researching for this dissertation project I aim to successfully integrate a multiplayer environment into my application, allowing for players to come together over a network. Aswell as this, for the player to enjoy and experience different features to the max, I have development plans to implement both 3D and 2D aspects within my application, meaning that players can move in both 2 and 3 dimensional aspects when interacting with others.

Photon Features/Methodology

When looking into the networking aspects of this project, I opted to use the Photon libraries to host and connect players to a server. Photon stands out as a versatile networking framework, streamlining the development process for multiplayer games. This choice aligns with the imperative need for efficient room creation, smooth player join/leave transitions, and synchronisation of player actions across network, some critical elements in the development of engaging multiplayer titles.

The Photon API offers robust support for essential multiplayer functionalities, notably, it incorporates techniques to minimise latency, ensuring a responsive and immersive multiplayer experience for players, these techniques are further analysed in the next section.

Both Photon and Photon 2 are networking protocols that can be used within unity that allows for the seamless integration of multiplayer functionality, allowing for players to connect to a client and complete levels together. However, before the release of Photon 2, Photon had PUN and Photon Realtime. Slowly Realtime phased out and is now being bundled with PUN as PUN 2. Essentially PUN 2 is the "better version" of PUN 1 after they've received loads of feedback and worked on it for years. So, you could basically see it as an upgrade from the old PUN. Both versions used a client server model, meaning all synchronisations are handled by the **server, not between peers.**
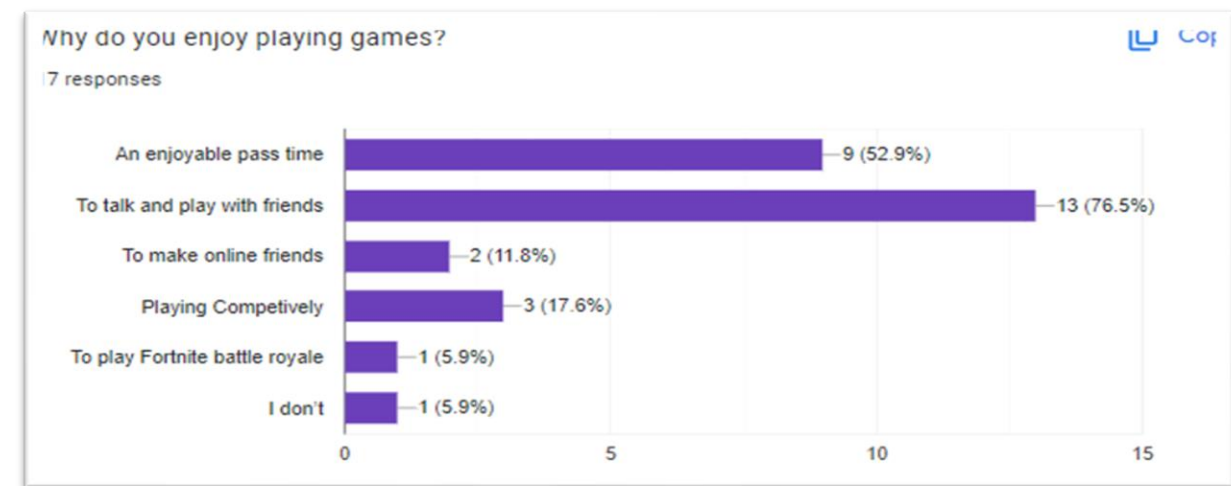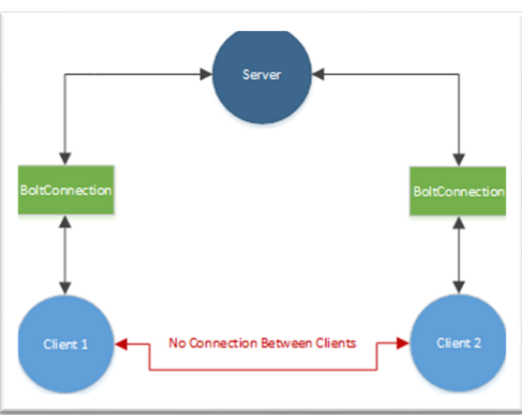

Figure 3 Survey based on why people play games

- Figure 3 is another piece of primary data source, This information informed me of how important of a factor of having and implementing multiplayer within a title is **with 50%** of responses being positive.
- Online sources suggest that 65% of gamers prefer multiplayer experiences, **with 87%** of sessions lasting longer than solo sessions.

Photon Networking and Game Design

My selected game architecture seamlessly integrates both 2D and 3D elements, providing players with a dynamic and engaging experience. In this design, players navigate through a series of levels in a 2D platformer style. However, the innovation lies in the transition to a 3D environment within the level selection, similar to the gameplay seen in Super Mario Wonder, with unity.engines multiple scene integration and photons loadlevel() smooth transition. This choice not only enhances the variety and complexity of the game but also allows for a more immersive player experience. The combination of 2D platformer dynamics and the introduction of 3D elements contributes to the uniqueness of the overall gaming environment.

Implementing Photon API - This would further enhance the application with the addition of multiplayer features listed below:

- **Room management –** *Allowing for players to join listed rooms created by different individuals (**Figure 4**)*
- **Chat features –** *Allowing for in-game communication between players with a filtering technique, using photons inbuilt functionalities.*
- **Player connectivity –** *Players connecting in different lobbies with different Photon Nicknames*
- **Seamless synchronisation across networks –** *Synchronised movement between players. Photon ensures that multiplayer is seamless, and players can collaborate with their friends while playing through the title smoothly with a latency below* **100 milliseconds** *and an uptime percentage of* **99.9% guaranteeing** *a reliable connection. (**figure 5**) Photon uses different algorithms and methods in their networking structure such as client-side prediction, server-side interpolation, and network smoothing algorithms to smooth the experience for players.*
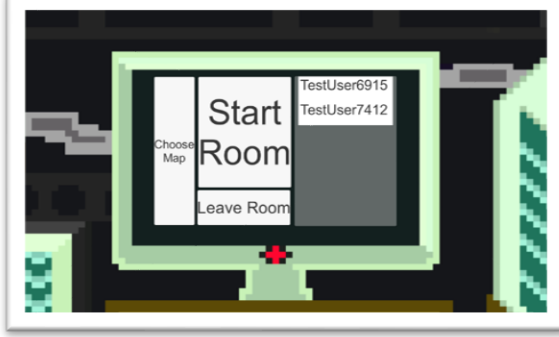

Figure 4, Room Management Example

The implementation of photon is immensely popular among developers, with it being used in over 400,000 game titles worldwide.

Figure 5, Connection and Username Example

- Figure 6 would display some primary data that I had collected over time during initial development and planning stages.
- This figure shows the fact that people prefer a mixture of dimensional aspects within games for a more enjoyable experience, which is what I have chosen to implement.
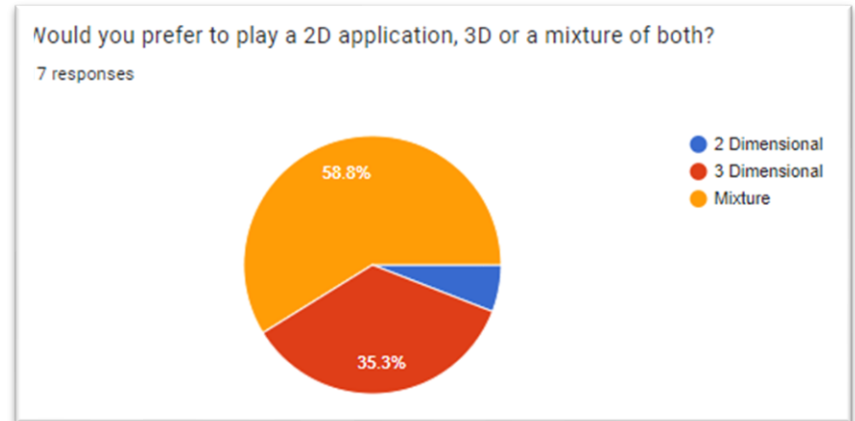

Figure 6 Survey determining dimension of game

- I have chosen to go for a platformer title as it is a familiar aspect that everyone enjoys as seen in the demographic on the right.
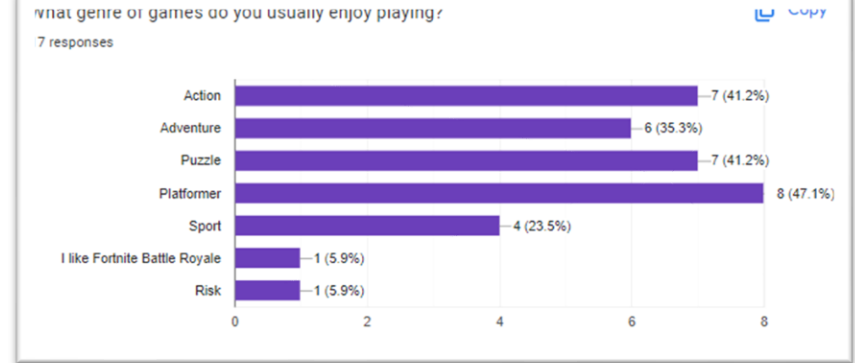

Figure 7 Survey determining genre of game

Primary data sources are extremely important in game development, as it means that developers can gain an idea of what to implement into their game to reach target demographics successfully. To do so, I chose to create a survey that reached **20 responses**, which provided valuable insights into the preferences of my target audience and the importance of networking.

Challenges and Solutions

- A challenge would be gamepad implementation, however, due to the solid increase in PC Player, seen in figure 8, this feature will not be used as much so may not require as much focus in future development stages.

- Synchronisation of Animations between characters, Photon includes a feature that allows for animations to be synced being **PhotonAnimatorView(),** however I need to investigate its implementation.

Figure 8 Global Sale Count of Genre

Results So Far

So far, I have been able to provide good development results for my Photon application. With the implementation of a successful multiplayer, allowing for the creation and joining of specific rooms, with usernames, and chat features. This would allow for players to communicate with their friends. Aswell as this, basic 2D and 3D sprites have been created with multiple character types, integrated into both a simple 2D and 3D environment. The user is greeted with animated starting, loading and lobby screens upon launch of the title. Overall, the skeleton of a multiplayer game has been developed successfully.
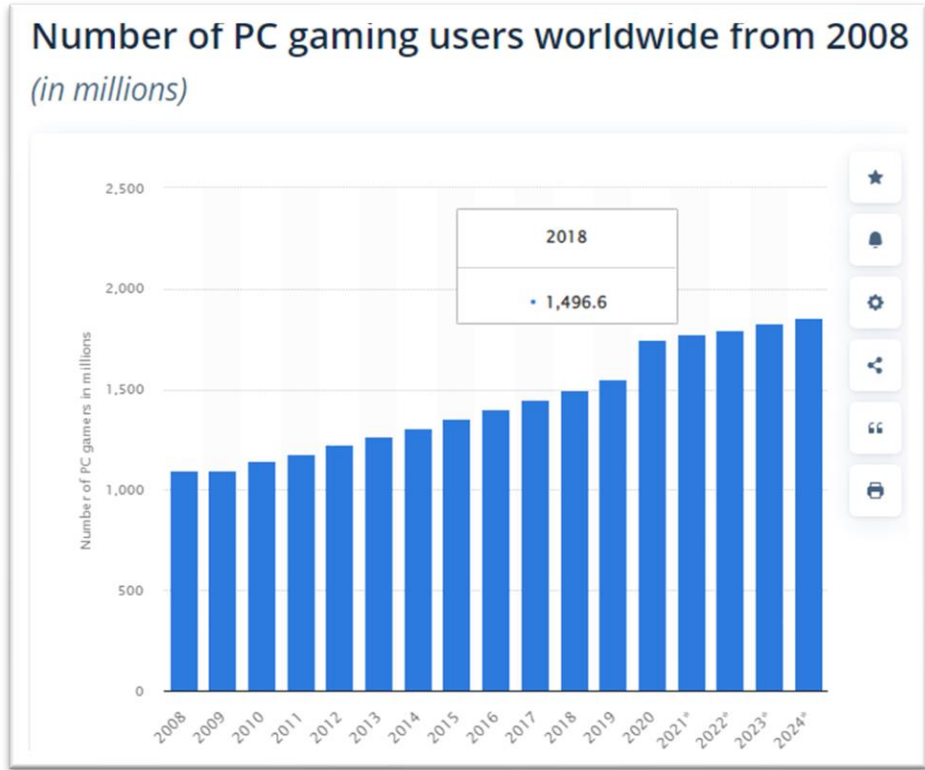
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Degree programme

BSc Computer Science