# Final Release

# ChronoQueue

## Team Team

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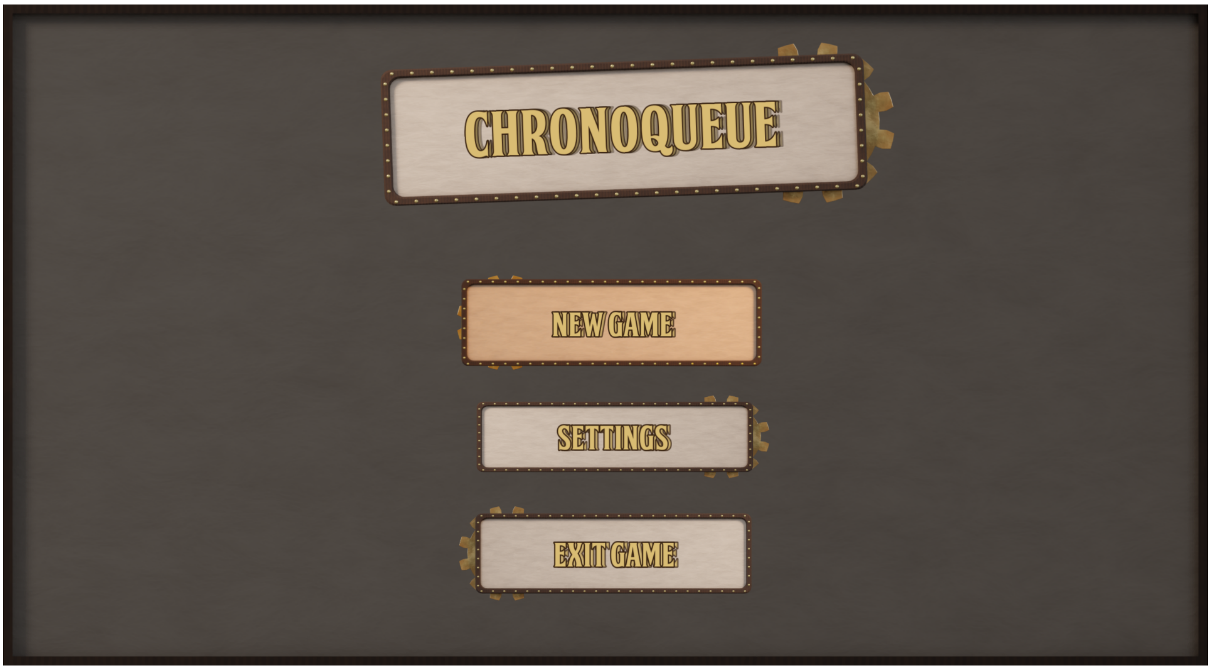
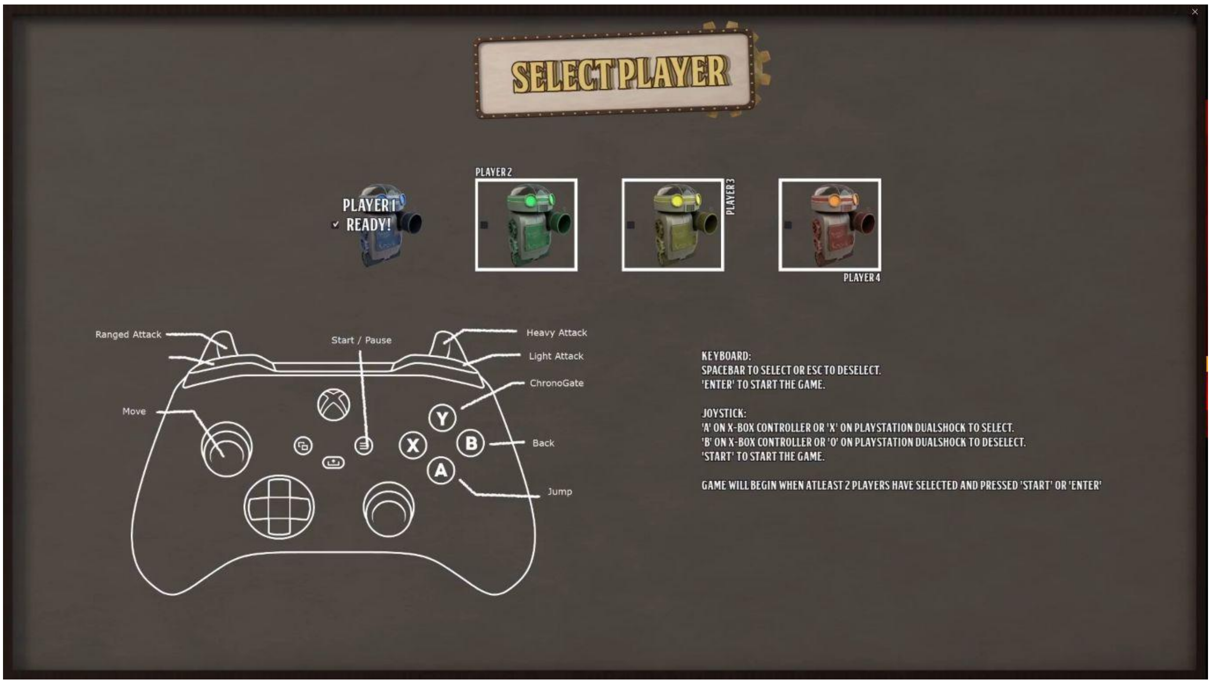
## Summary of Final Results

As we are reaching the Demo Day and the Final Release Presentation, we are concluding the changes on our game, working on the final missing points and making small fixes to make sure the game is in a presentable state. We are happy to present a few screenshots representing several different aspects of the final state:



*The Main Menu.*

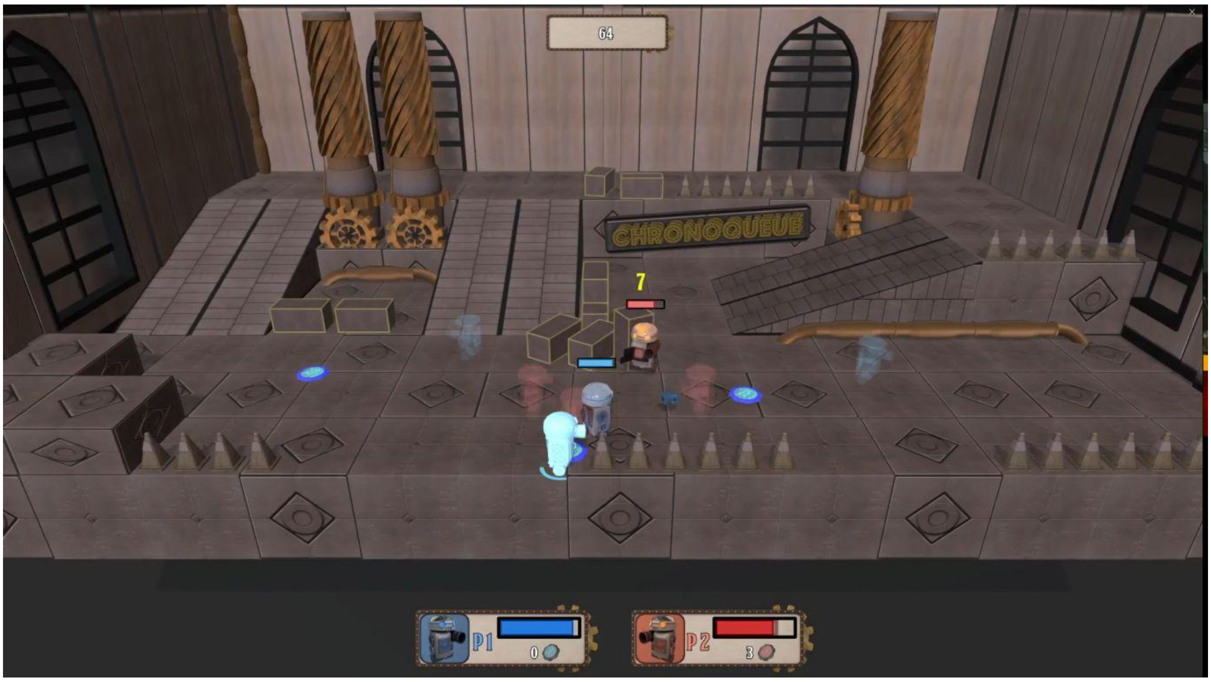


KEYBOARD:
SPACEBAR TO SELECT OR ESC TO DESELECT.
'ENTER' TO START THE GAME.

JOYSTICK:
'A' ON X-BOX CONTROLLER OR 'X' ON PLAYSTATION DUALSHOCK TO SELECT.
'B' ON X-BOX CONTROLLER OR '0' ON PLAYSTATION DUALSHOCK TO DESELECT.
'START' TO START THE GAME.

GAME WILL BEGIN WHEN ATLEAST 2 PLAYERS HAVE SELECTED AND PRESSED 'START' OR 'ENTER'

*Character Selection Menu.*



*Gameplay with our new arena and UI.*

# Progress over the Semester

## Initial Design vs. the Final Product

Our initial design, which was the result of our brainstorming and organizing process, has allowed us to focus on a clear vision and converge into our final product as a team of 4. While the resulting game turned out to be loyal to our initial design, there were also significant changes in our plan and how we approached our intended experience.

When it comes to our primary mechanic of producing ghosts replaying the past actions of the player and being activated to affect the current state, we implemented this part to highly accurately represent our vision, with only slight changes. Therefore, it would be safe to say that the game that we produced was the game we initially had in mind after all.

One thing that was expected is that we started the project with a number of different possibilities for implementing advanced features, such as picking up power ups and choosing weapons to fight with; and we finished by compromising on some of these additions and instead adding some features that were not in our initially intended feature set.

Another difference between our initial design and the final product is the design of our arenas. While our current arenas also provide an entertaining gameplay experience, they are simpler in terms of environment design and interactions, compared to our initial vision.

## Changes from the Alpha Release

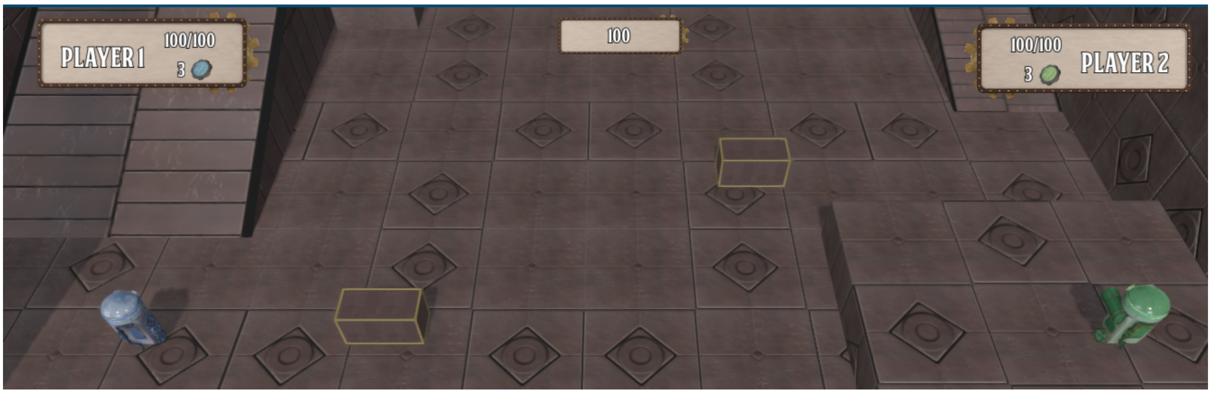
### Dashing Ability

In the alpha playtesting, it was apparent that melee attacks did not achieve the desired impact. Running away and using the ranged attack reduced the effectiveness of melee attacks and resulted in them being used less often. To make them more viable, we decided to add a dashing ability. This ability can be triggered actively by the user to quickly traverse a short distance while also being temporarily invulnerable. This should allow the user to catch up to an enemy and use a melee attack which can do more damage than an uncharged ranged attack.

Walking or dashing directly towards an enemy can be risky as one is easier to be hit by attacks. Adding invulnerability prevents this risk and also allows the player more strategic choices like dashing into a projectile to block it or dodging enemy attacks on purpose. This ability can be very strong so we restricted its use with a relatively high cooldown of 3 seconds. Direct counterplay to dashing is also possible because a player cannot change direction or distance while dashing, making him an easier target when it's used thoughtlessly. Dashing is indicated by particles left behind the player.

## Damage and Health Indicators

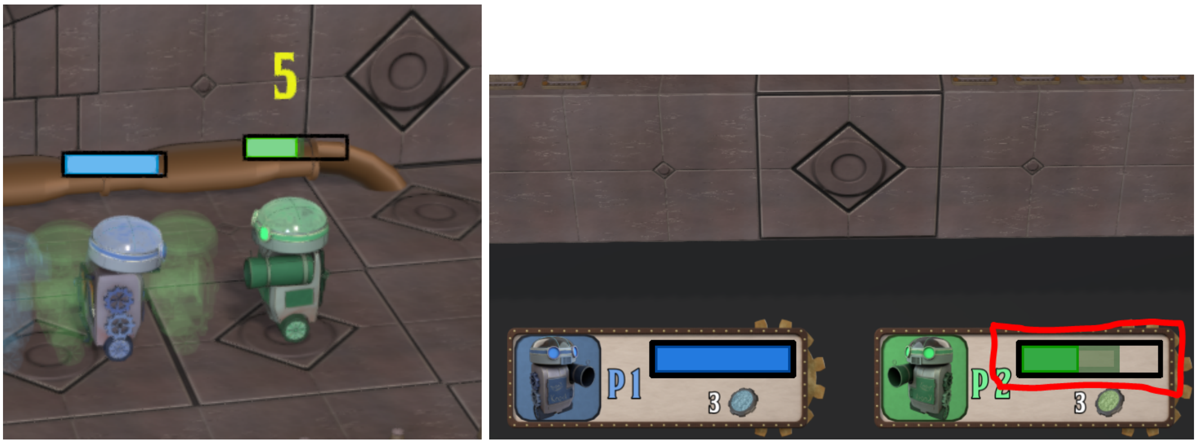
In playtesting it was observed that players had difficulties in evaluating the impact and damage of different attacks and charging times. The Damage could only be evaluated by comparing the health in the HUD from before to after an attack. The data for a player was displayed in one of the corners of the screen and the health was displayed by numbers. Doing this while also focusing on the character was leading to the players losing track of the character. We introduced multiple changes to resolve this problem.



*The HUD in our alpha version.*

### Damage Numbers

We introduced number popups above a character displaying damage he just received.



With these numbers a player can immediately understand the damage of his attacks.

### Animated Health Bars

We changed the health indicator from text based to an animated health bar. This health bar makes it much easier to quickly see the health of a player. It displays the current health as well as an indicator for the health the player had a few moments before. This allows the player to also see the combined change of health from all received attacks in the last seconds.

These health bars are also displayed above the player characters so they act as indicators to find the characters in the arena. A health bar can be seen from behind obstacles so a player cannot hide. They also distinguish a player from revenants as its health is indicated in a different way as described in one of the following sections.

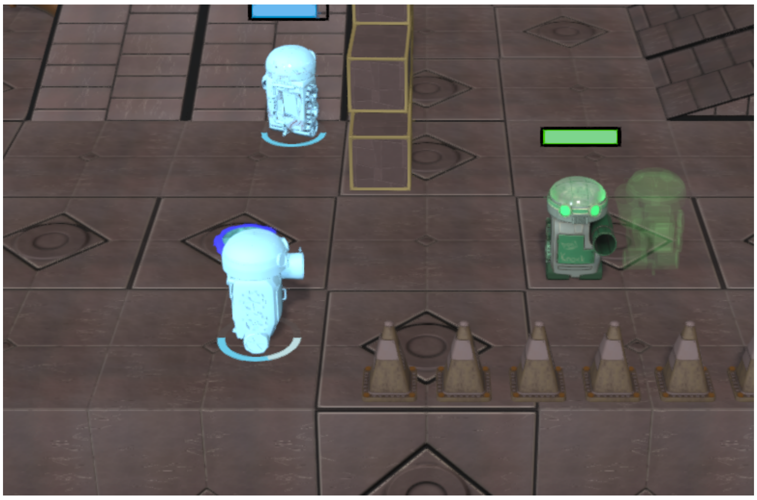
### Camera Controller

The game demands a camera controller that is flexible with a maximum of 4 characters and arenas with different dimensions. As we added another level with a wide scene whereas our original arena had a high depth we had to experiment with different Field Of Views, Z - depth and X movement of the camera. Eventually we decided to keep the FOV and the Z depth the same, however we added a rotation to fulfill the demands of different scenes, the camera would look at the same spot as before but now with a different position with a higher depth if players are positioned deep into the scene. Additionally, a minimum and maximum X value that the camera can move was added, this prevents the camera to not look majorly beyond the game boundaries.

### Ingame HUD Layout

Instead of displaying a player's data in each corner we adjusted the layout so all data is in a row at the bottom of the screen. This makes it faster to see the combined state of all players. This also better fits the shape of our arenas as there is less obstruction to the left and right of the screen in which our arenas tend to expand further than downwards.

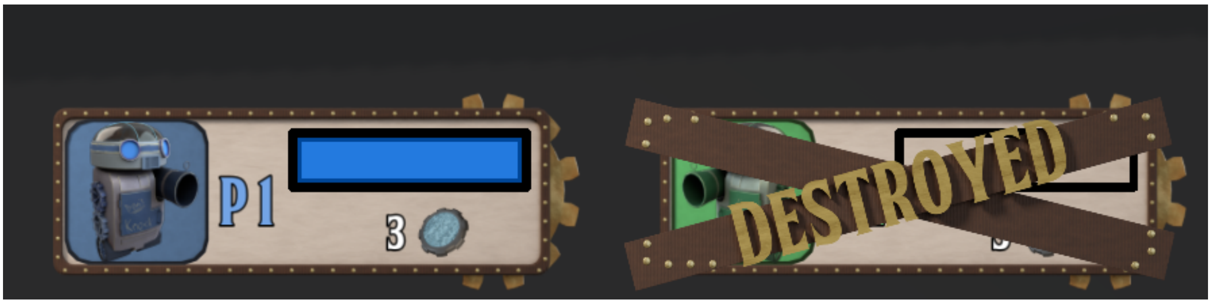
### Revenant Health indicators



In our alpha version there was no health indication for Revenants. As it is an intended feature to destroy them it only makes sense to show the progress of that. First we were testing using the same health bar as for player characters but this impacts the ability to distinguish between player character and Revenant which was the initial reason why we added them to the player characters.

Instead we chose to change its shape and display it at the tires of the Revenant. They will not be seen behind obstacles.

### Adding 'Destroyed' Indication



After a player dies without any lives left, the HUD of that player can show that now.

### Created a second Arena

With our project structure we can easily add new arenas to the game. To bring a bit of variety we added a second arena. The arena can be selected in the settings menu.

### Adding Settings Menu

Our game contains many tweakable parameters. Some can even be dependent on the number of players like Phantom spawn delays (Time between Phantom spawns) or Revenant activation time (Time a Revenant is active until converted back to a Phantom).
We added a settings menu page to allow players to change some of these parameters manually.
Currently there are settings for:

- Phantom spawn delays
- Revenant time
- Round time
- Fullscreen
- Arena

We also included some presets a player can choose from if they want guaranteed ‘quality’.

- Normal (default)
- Controlled (less Phantoms)
- Chaos (more Phantoms and longer round)
- Unplayable (way to many Phantoms, longer Revenant time and even longer round)
- Boring (No Phantoms)
- Revenant (extremely long Revenant time and longer round time)

The settings menu can be accessed from the main menu.

# Our Project Development Experience

## Initial vs. Actual Schedule

We started with a very rigidly determined development schedule, grouping features by various levels of priority and assigning related tasks to our milestones with high correspondence. However, as we started working on the tasks, we noticed that our predictions of start time and task durations changed significantly. This was partially caused by our responsibilities outside the course, as well as inaccurate estimation. This includes underestimation and overestimation of the task duration, changing the task contents or canceling them all together, and changing their order due to unexpected interdependencies.

As we continued with our work on the code, it became more difficult to work on the management process. However, most of the time, we had a clear idea of what each team member would be working on next in order to fulfill the requirements of our next milestone. In other words, while we had a high-level timeline, in practice we used an on-demand project management system. As we progressed, we simplified our project management methods, and prioritized being on the same page about what each task should implement.

## The Impact of Project Plans

Despite this deviation from the initial plans, it was useful to practice this planning process as some of the aspects of development that we discovered during this process allowed us to mitigate several risks that would cost more if we discovered them in a later phase. Our initial task list helped us rework our timeline and still focus on the same outcome.

## The Theme

The course-assigned theme for the games, "Duplicate", provided a starting point for our team to generate project ideas around. It helped us refine our initial ideas towards a certain concept. In our experience, "Duplicate" as a theme was generic enough to allow a diverse range of games to be implemented in our class, while also being specific enough to apply design thinking in terms of providing duplicating mechanics. One thing to note about the theme is while it shaped our thinking during our design process, we did not think about it after this phase, once we started with prototyping. Therefore, it could be considered as a first step for us.

Having a theme worked well in our design and development process. However, we are confident that we would be just as productive with design ideas, while not having an initial theme. One related risk is that having no constraints for the initial game mechanic idea might make it too experimental, reducing the probability that it will work as a game mechanic.

While generating project ideas may or may not require a predetermined theme, having a common theme imposed on all class projects helped us share a common aspect and evaluate other projects from this perspective throughout the semester. Moreover, it was enlightening to see other teams coming up with much different ideas, starting from the same theme.

## Course Feedback

This course was a beneficial experience for learning about the entire pipeline of a game development process, from conceptualization to designing as a team, planning the implementation and working on the game development, playtesting and iterating, logging the development process and presenting our results and development processes.

Having an imposed timeline for the development process and synchronizing with the rest of the class at milestone points was informative and helped us organize our time around this schedule.

An important aspect of a practical course that could also be incorporated to this course is stronger communication with classmates, specifically around the course content and possible improvement points. For instance, the instructors and the students defining several technical themes and having a communication platform where we can focus on these could help everyone learn about their intended aspects of game development more efficiently. As an example, if audio programming is one of the intended technical themes of the course, those interested in it could be in touch over the semester, sharing their experience and resources. This could strengthen the technical improvement outcomes from this class.

## Final Impressions

As with all projects, we also had intermediary successes and failures. We succeeded in realizing our initial core mechanic and we were happy to see it providing fun and promising gameplay. We were able to more or less meet the requirements for the Alpha Release and were able to conduct playtesting sessions. Finally, we have overcome the technical and organizational challenges that we faced during this process.

In terms of technical difficulties, some main aspects were using Godot Engine without extensive prior experience, providing Controller Support and management throughout the menus and during the gameplay, implementing the Phantom mechanic, timing and synchronizing the animations and balancing quick development with a sustainable code structure.

However, one of the biggest difficulties was neither of these; it was a bug that we had a lot of trouble reproducing and troubleshooting. We had several cases where after an attack, the player would have reduced movement speed and would not be able to do any actions any more. This was a very indeterministic behavior, and only some members of the team would experience this. After a lot of debugging and thinking about the problem, we figured out that the issue would only happen when the game ran with 60 FPS. A specific animation that calls a method to release the previous action was not being played, and this was breaking the player state. Achim, who was running the game at 144 Hz, did not have this problem. We were able to fix this problem by setting the maximum FPS to be 59, and it worked.

Our greatest success during the project was to implement the phantom mechanic by using our initial technical design, which worked successfully without a significant change. Moreover, we managed to implement this mechanic without any performance loss, which was one of our concerns.

Despite being happy with the results, there are several changes that we would make in our technical and organizational efforts. One aspect would be to have more flexibility in the timeline, iterating on the tasks at an early stage with playtesting sessions. We could also spend more time on the physical prototype process to further refine our core mechanic. Lastly, our future projects could benefit from spending more time on mitigating the risks of the development process, including having to make significant changes in our design or facing several technical challenges that would impact our development process.

Overall, we would consider the outcome of our project as a success, as we followed through the entire process and realized the idea we had in mind.