

# Pong

*A ball game that motivates people to do their household chores by making it fun and interactive, using the tools as part of the game.*

Exploring the domain of enhancing mundane spaces, we targeted a related variation – enhancing mundane tasks. We aim to do this by creating a game that allows each member to interact with the other in the form of a ball that passes between each member of the household, and motivates them via a scoring system that incentivizes interaction.

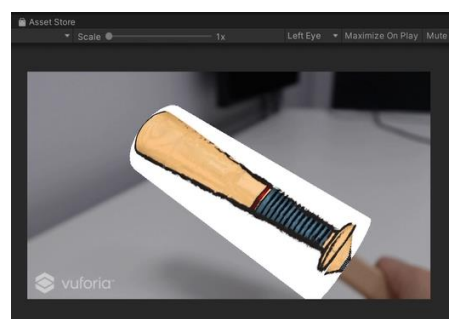
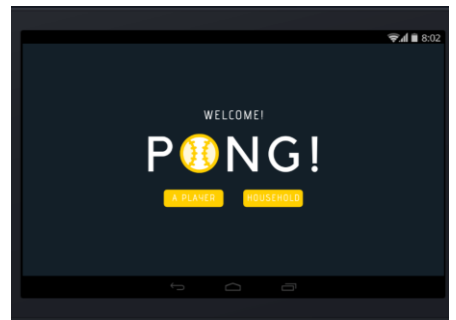
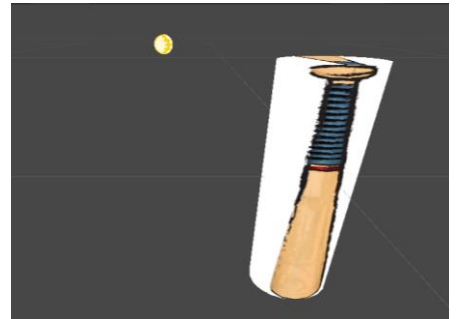
This aims to have each member of the household clean at the same time, ensuring that every member takes part in an equal share, while making it fun and encouraging bonding. Other small features would include for example the ball hitting the dirtier areas of the floor more times, leading users to clean it without even realizing it.

While there are no existing similar products, we found many research articles to suggest that gamification is a viable way of encouraging people to do things they otherwise would not, as well as providing an incentive. Perhaps the closest system found is that of OurHome, an application that allows users to split tasks between the household, keeping track of what has been done or not. Similar points, apart from the end goal, include using rewards to incentivize users, as well as prioritizing relationships, both factors that are proven to work with encouraging users positively. However, that being said, the actual concept and how they achieve these goals are very different.

In relation to this, my area focuses on the team aspect of it, where the aim is the same, but instead users work together as a household competing against another household, rather than against each other. This not only broadens the scope for those living alone, but also provides an alternative to encourage teamwork, potentially especially for those with children who bond differently.

Link to video:

<https://www.youtube.com/watch?v=x6Br8whJQog&feature=youtu.be>



# Design Process

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Our concept was gamifying household chores, including all chores such as laundry, cooking, cleaning, mopping, sweeping, and so on in a ball game that involved hitting the ball using whichever tool is involved, for continuous gameplay

After feedback from the initial pitch, we made several changes to the concept. Among the feedback was that of the game being too repetitive, and having no end point of goal. As a results, we incentivised it by a live scoring system as well as countdown timer, creating a sense of competitiveness and urgency.

Another major concern were the possible safety issues that could arise, namely in the kitchen where knives and hot surfaces are involved. As such, we decided to focus in on cleaning tasks, since other chores such as laundry would have different motions, rather than the constant back and forth motions of wiping, sweeping, mopping, etc.

The final improvement from the feedback was that of adding sound effects to increase the users' sensitivity to changes in ball trajectory, hits and misses, difficulty, time, and so on.

Discussing on how to improve our concept even more, we realised that adding more practical uses to the concept would also make people more inclined to use it. Therefore, sensors to detect dirt could be used, and the ball would then hit those areas more frequently, allowing users to target those areas that need cleaning more, without even realising it.

This concept would work particularly well in families with multiple children, and so with the new social distancing guidelines and having to split up the project, I decided to explore a team gameplay, which would allow a household to compete against another household, rather than within the household. Other reason was that this allowed those who live alone to still be able to play with this game since they could still compete.

Adjustments to the concept for different number of players in each household, for

example, a household of 1 competing with one with 4 occupants would need to be made, since it would cause an unfair disparity in scores. While the obvious solutions would be a different in difficulty, a more consistent and fair way of managing this would be an increase in frequency of ball proportional to the number of players, with the total score then averaged, while the progression in difficulty throughout the game would remain the same.

Prototyping the initial app setup portion of the game, using InVision, allowed me to conduct several user testing sessions, since it could be shared via a link, with interviews conducted over the phone. The one main change from the feedback received was to allow users to end and quit the game as needed, as is now reflected in the prototype linked below

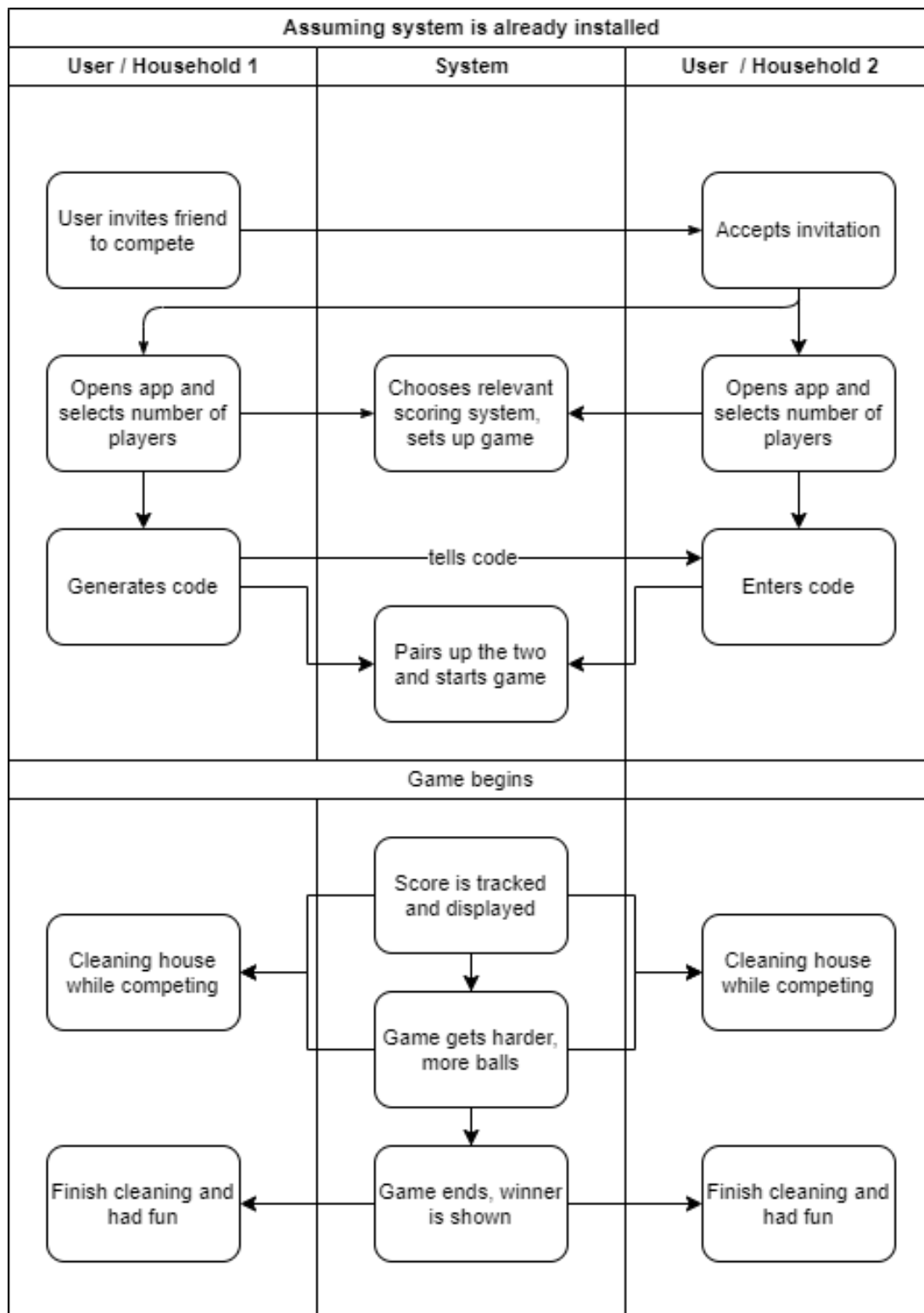
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Further surveys are yet to be conducted, mainly focusing on the areas of the importance scoring systems and charts being available to view, as well as a leader board potentially showing either top scores or past records of wins and losses.

With regards to prototyping the gameplay, the initial plan was to use a projector for the ball, while using a position sensor for the cleaning tool, and using the x and y positions to be able to interact with each other. Given that we no longer have constant access to the labs, we explored multiple alternatives, including different sensor alternatives for the Arduino as well as other ways of projecting the ball, such as a laser pointer on a pivot, a phone projector, and so on, eventually settling for using the Vuforia engine in Unity to simulate the ball and bats movement using augmented reality.

As such, the scope of the prototype is limited, most notably by the movements of the brush limited by camera angle, lighting, focusing when it is moved too fast, and so on. We hope to still be able to test this concept further, taking into account the limited capabilities.

# Interaction Plan



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The initial part of setting up the app is done on an app, prototyped using InVision. The actual gameplay would include walls inbuilt with sensors, however for the prototype's sake being augmented reality.

The game is intended to be used as motivation for users to complete their chores, or when they are feeling bored. The competitiveness also intends to give the user something to focus on, distracting them from the mundaneness of the task.

Winning would further give users a sense of pride in their accomplishments, especially if a leaderboard is added. Those unsuccessful would hopefully be unsatisfied and challenge other friends for a chance to redo and get a better score.

Users interact with the physical system using any object from daily life, where in the case of the prototype, is read by a poker card.

Different cards can be developed for different sized bats / racquets to fit whatever is being used to clean, allowing it flexibility.

Vuforia can then track multiple targets, allowing different bats to hit the ball at different angles, simulating normal gameplay.

# Project Objectives and Success Criteria

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Given that based on current user research, the concept we have developed works well, fulfilling the brief of a novel, physical interaction. As a result, the success of this prototype depends on its ability to fulfil key parts of the concept, and this is shown below.

## App (Setup)

- Given the concept, 90% of users should be able to set up and navigate gameplay without help, taking no longer than 5 minutes to set up a typical game.
- 90% of users should be able to complete tasks such as quitting a game, accessing the leader board, and scoring charts instinctively, taking no more than 3 attempts to be able to complete it correctly.

## Augmented reality (Gameplay)

- 90% of users should be able to find a card that would spawn the relevant image to fit the cleaning supplies reasonably well.
- Given good lighting, Vuforia should be able to sense the image targets and produce the relevant objects, as well as track at least 3 objects at the same time.
- At least 2 can be interacting with the ball at any time, on screen hitting and interacting with it by being able to change its direction in a logical way.
- A score is kept count when the ball is hit, accurate at least 75% of the time
- A sound is emitted when the score is added to
- At least one increment in the frequency of the ball throughout each game cycle to simulate the game getting harder and more intense.