Bouncing Beaver

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1 LAYERED TETRAD

The layered Tetrad is such that it effectively covers and further expands on the frameworks that essentially came before it. It is ultimately a powerful tool that aids in the understanding and essential cognition of the various and diverse aspect of what is known today as the modern game development. Using this tool, one is able to better visualize and plan different aspects of their game that they intend to produce. A proper encapsulation and understanding of the aforementioned framework will drive one to create a more rounded visualization and enhance one's ability to better analyze the game while it is in its development stages. Obtaining the aforementioned comprehension, as explained by Mr. Gibson in his book titled the *Introduction to Game Design, Prototyping, and Development*, one can grasp a more wholesome view with respect to the game's mechanics and what the game mechanics inherently imply [1]. This can be furthered expanded in light of the game experience. In addition, the layered tetrad also helps the developers understand the various elements that are needed to build the game incrementally. It also helps to explain the unique behaviour that is dynamic in nature of said elements while the targeted audience has the chance to play the game. It is further interesting to note that the Layered Tetrad has a direct and consistent affect of the game with respect to the culture, and also the other way around where the current culture has an affect on the game pushed to public [1].

1.1 Inscribed Layer

The inscribed layer is composed of several subsections that perform adequate justice to the proper and through understanding of the said layer. As Jeremy Gibson has mentioned in his publication, the inscribed layer is composed of the Game Mechanics, Aesthetics, Technology, and Narrative [1]. The gaming mechanics allow for more in-depth understanding on how the systems developed by the team will shape the experience based on how the players will react. As Gibson mentions, it is rather these factors that essentially separates developed game from the rest of the games. Thereby, creating a sense of uniqueness and even demonstrating craftsmanship. Furthermore, as outlined by Bruce Homer and his partners in a critical technical report titled *Learning Mechanics and Assessment Mechanics for Games for Learning*, game mechanics inherently are composed of what the game itself allows for the players to do [2]. This resonates more specifically with what actions the game allows for the players to perform while playing the game.

With respect to the Bouncing Beaver, the general audience, and more specifically, the game players, have the option to control the actions of the main character, being the beaver itself. As such, players can run, or more appropriately state, bounce, left and right. The game has been designed in such a fashion that would appeal to the general publics logic, especially in the sense that moving left directly corresponds to the player moving backwards, and moving right corresponds to the beaver moving forwards. Besides these moves, the player can also use the beaver to perform a vertically leap up. The game mechanics was designed in these regards to fully maximize the potential of a 2-dimensional digital video game. These actions are in line with the argument that Bruce has proposed in the aforementioned article. More specifically, when Bruce and his colleagues state such that the core mechanics encapsulates the actions between the set of moments that would essentially define the interactions that the player can have within the ambient environment of the game [2].

Bruce further expands on his and his colleagues idea on the gamming mechanics where he argues that a good embedded mechanics will go beyond just allowing for the player to interact with the object in the game, but rather that the game mechanics allows the player to live vicariously in the game environment, and even as far as to help the player understand the game from a more immersed point of view [2]. Our team, for the Bouncing Beaver, believe to have achieved this level of implementation as we have incorporated different animations for the beaver with respect to his physical position in the current action. This is entirely to say that when the beaver is running, whether that be left of right, the animation is different to when the beaver is stationary. To further add to this sense of intuition of movement, when the player performs the jump action, the beaver's animation is once again different from the ones described previously. This is to say that when the beaver performs a vertical leap, the beaver appears to be doing a summersault in mid air, or described differently, the beaver appears to be performing a front flip. Once again, this is to better allow for the players to be more immersed in the game, referencing Bruce's point of view from their technical report, as opposed to a static figure that performs a jump.

Another sub-category of the inscribed layer that was previously mentioned was the game aesthetics. As carefully depicted by Jerremy Gibson, the aesthetics layer is essentially composed of the specific and detailed visuals, tastes, sounds and smells of the game [1]. This helps to capture the true essence of how detailed and how successful the developers have been in allowing the players to be truly well immersed in the games universe. The goal is to ultimately capture as much sensation as possible. Of note is to comprehend the obvious limitations of developing a game in a strict 2-dimensional environment and its close ceiling in regards to allowing the player to be fully immersed in the video game. In the Bouncing Beaver, we the developers have based the different levels of the game with each a specific theme. More appropriately, we designed and decorated each level specific to the province it represents. This is to essentially state that he entire environment and atmosphere is catered to the provinces' specific mood. For example, for the Saskatchewan level, we the developers have embedded the legislative building in the background. We also added the famous Scotty the T-Rex. And lastly, to top it all off, we added a windy element to the foreground of the scene to capture Saskatchewan's strong, unwavering winds.

Fig. 1. A screenshot to demonstrate the Saskatchewan province level with the legislative in the background.

Hannah Sommerseth, in their technical article titled *Exploring Game Aesthetics,* asserts the idea that most modern video games still lack creativity, that could be categorized as true art, within the game [3]. Hannah's claim and point of view reinforces our efforts to capture the true feel of Saskatchewan, as we have used elements and objective to deliver the literal feels of the province.

Next, with reference to the technology used in the game creating. We, the development team, opted to lean towards a more 2-Dimensional focused gamming engine, ultimately steering away from the Unity game engine

due to the time constraints on the project deliverable. Thus, after some careful consideration and weighting the pros and cons, the team decided to proceed with the GameMaker engine. GameMaker essentially offered a low-learning curve approach to the development of the game. It had pre-envisioned static level with embedded character physics that a developer could quicky learn from and replicate. In an insightful article titled *The Role of Game Engines in Game Development and Teaching*, Branislav and Emilia shed light to the fact that most of information a human perceives is though light, and therefore, with respect to game development, the game engines the developers choose will have a significant impact of whether the target audience is delivered the envisioned and polished gaming product and experience [4]. Furthermore, in the research article titled *Game Engines: a survey*, several popular game engines were compared and contrasted, where the author of the article, Andrade, states the fact that the biggest advantage GameMaker has is its low-learning curve [5]. Thus, supported by the two aforementioned scholarly articles, the group proceeded with the GameMaker engine. Another digital technology that essentially enabled gameplay is itch.io, which has recently become rather popular with some game developers. Itch.io allowed the team to utilize some existing packages and assets.The assets were then used a presence to replicate skin colourations. Other factors that resonate of technology used in the past is the Figma designing tool where both low and high fidelity were envisioned. Lastly, tools such as Adobe Illustrator, Microsoft Word, photoshop to essentially recreate some high-quality water.

Now, the narrative sub-category of the inscribed layer intends paint a more direct visual with respect to the premise of the game, the game's designed characters, and lastly, the plot. The Bouncing Beaver delivers an interesting premise where bouncing across the great Canadian Provinces, a daring and adventurous beaver embarks on a journey filled with dangers, rewards, and challenges. Thereby creating a sense of light-mood adventure. As previously stated, the main character of this premise will be the protagonist beaver, a representation of Canada's national animal, and the poisonous mushrooms (antagonist characters) will serve as one of the games obstacles. The plot is such that the beaver (the main character) has to evidently face the dangers in his path as he hops across the Canadian landscapes to safely reach his home (objective), while also avoiding rough waters, sharp spikes, and poisonous mushrooms (obstacles). Combining the three of character, objective, and obstacles, one has created the intended Drama, as mentioned in the Gibson's work, *Introduction to Game Design, Prototyping, and Development* [1].

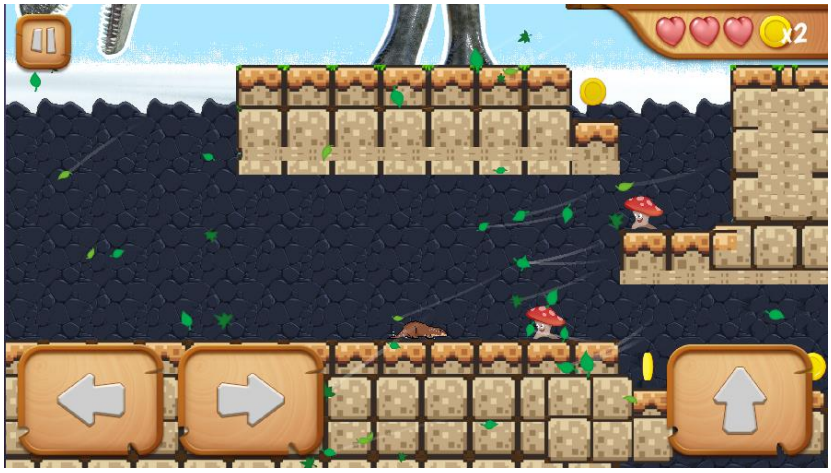

Fig. 2. Visual of the poisonous mushrooms in the game.

In a rather insightful technical article, Craig A. Lindley outlines their unique approach in regard to the narrative aspect of the game. In his article titled, *Story and Narrative Structures in Computer games,* Craig proposes the fact that there is a very high probability that players, who are unique by human nature, will also seek a unique experience from the game. This is to say that two players who are different in personalities (a fair assumption)

will also want a different experience from the same game. [6] We, the developers, have achieved this in the Bouncing Beaver as the different levels that are decorated with themes of different provinces, allows for the exact difference in experience that Craig aims to highlighting in his work.

1.2 Dynamic Layer

The dynamic layer is the consecutive literal to the inscribed layer, as it follows it directly after. This chronological process takes place in the game play when the players initiate the game, changing it from its idle state. Once the game is driven by a player. The inscribed layer shifts into the dynamic layer, as it is this point in time when the player employs strategy and craft, resulting in emerging choices of the player. This is to essentially say that the dynamic layer is what makes the game an actual game.

The current behaviour of the game is to allow the player to progress in the developed levels while they face some challenges along the way. It is therefore expected that the players will need to develop a unique strategy in order to pass the current levels. This where the dynamic narratives come into question where the players interaction with the game environment coupled with their intention will shape not only their game experience, but also an emerging behaviour of the game.

With respect to the dynamic emergent behaviour, the player has several options. A particular emergent dynamic behaviour could be such that the player strategies to uncover the fastest route to pass the level, which could be full of obstacles. Another possible behaviour is such that the player could also find the safest path to pass the level. Since there is not a time limit aspect to the game in the current version, it stands to reason that the emergent behaviour of the player to use the safest path holds higher probability.

Furthermore, there also exists a more narrative skewered dynamic emergent behaviour. This is to say that the player may interpret the games story in their own way, essentially resulting in an alternate storyline. Where the current narrative behaviour is for the beaver to safely travel across the provinces, an emergent narrative behaviour could identity the beaver as a treasurer hunter who is travelling across the great Canadian lands to collect the gold coins, where the poisonous mushrooms and other obstacles are barriers that the treasure hunter beaver must overcome.

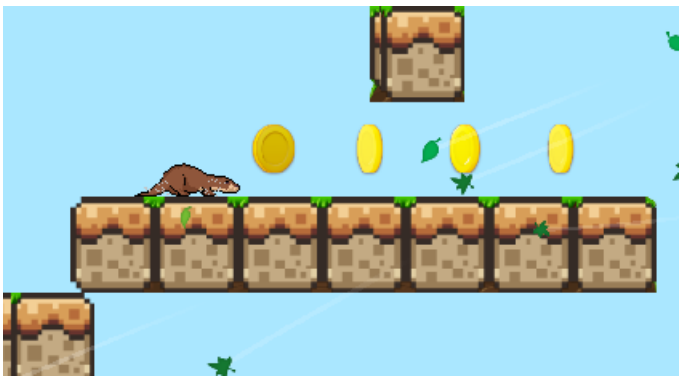

Fig. 3. A visual of the beaver about to collect the gold coins.

1.3 Cultural Layer

In the next chronological iteration following the dynamic layer, is the cultural layer. The cultural layer seeks to uncover the effects of the game beyond the game itself. It aims to unearth how the game might be affecting players in the communities and societies and even the other way around where the collective players forming

communities can have an impact to change aspects of the game, and in this specific sense the players appear to have more in-direct control over the game's future. Since the divisions in-between the mechanics, aesthetics, narrative, and technology are not prominently distinct in the case of the cultural layer, and especially in the case of the Bouncing Beaver game, we the developers, do not envision there to be an abnormal response.

With respect to the cultural mechanics of the game, we envision the game community to eventually and most likely create their own custom levels. This is because only a handful of provinces are virtually represented in the game, in light of Canadian provinces. Gamers from societies not represented in the game might be compelled to add and represent their own home province. Within that level they could also add fitting background architecture and sprites. Aside from this, game mods are another possibility we envision.

With respect to the game's cultural aesthetic layer, we envision the society to create either fan arts or even game art that could eventually replace (or be added) some existing scenes, especially at the beginning of the game and at the conclusion. The art style might also be shaped by the uniqueness of the society's norm. For example, a fan art from a more indigenous dense society might pay homage to their unique and beautiful art style, one that essentially tells a tale visually.

With respect to the narrative element in the cultural layer, the societal fans might even create stories within the game itself, using the existing characters. One potential story we envision is where the focus is on the poisonous mushrooms where they are an experimentation of an evil scientist, who longs to track down the bouncing beaver that has been stomping on them.

With respect to the technology element of the game, we envision that the after having played the game enough times. A particular gaming society could create map addon to the game that give the player a strong foresight of what to expect. While this would dial down the difficulty level of the game, it would make for a very useful tool for the new player who have had a little more trouble passing certain levels. Another general technological tool that could be created is essentially a game wiki website. On this website, we envision the fans could have detailed analysis on all the different aspects of the game, including the main character, all the levels, and each obstacle.

2.0 DESIGN GOALS

The genre of the game is based of a 2-dimensional platformer based video game. The motivation for developing a 2-dimensional game stems mainly form the developers childhood experiences with the popular game Mario. The game developers of the Bouncing Beavers wanted to essentially carry the same positive energy from the 2-dimensional Mario-styled games because of the positive and fun connotations associated with them. In addition, since both the developers of the Bouncing Beaver are originally from overseas, they were once new to Canada and there was much to learn about this massive country with beautiful nations. Since then, Canada has become the home of many new commers from over-seas. As such, the game developers planned to create a game that not only uses the Mario themed 2-Dimensional gameplay, but one that uses it to education the young audiences about the different landmarks and popular aspects of the different provinces. Lastly, a third motiving factor towards developing the game in the 2-dimensional environment was due to the rapid deliverables in the projects milestone agenda.

2.1 Designer-Centric Goals

It is a commonly held belief that innovation is usually the driving force towards a more safe, comfortable, and technologically advanced future. One that pulls the human intellect to the very ceiling of its limits. As such, the developers of the bouncing beaver have aspired to instill innovation within the game. Of the two that have been

highlighted by Gibson in his work, the development team aimed to encapsulate both, namely, the incremental and intersectional innovations. The concept of incremental innovation was applied as the team had originally used famous Canadian buildings in the background where the images of buildings were not in a .png format. As such, the background of the building assets did not match with the background scene of the level. Incremental innovation was applied when the image was pasted in Microsoft Word and later saved and exported as a .png format. The background removal tool was used in Microsoft Word to make the buildings assets appear more visually immersive in the game maker engine level designer. The Intersectional aspect is also represented as two different ideas were combined through the use of Microsoft Word, removing the backgrounds and converting to .png formats.

The developing team also applied the brainstorming and ideation aspects of game development. The team started with sharing a google document where several rough ideas were noted down around the central idea of a 2-dimensional Mario-styled game. This represents the expansion subcategory. Next, the general ideas where then group together with an emerging theme, which echoes the collection subcategory. Following this, the team picked two unique categories and combined them, resulting in the creation of a more unique idea, which reflects the collision sub-category of brainstorming and ideation. Thereafter, the newly emerged game ideas were then quantitatively ranked, which represents the rating subcategory. With the quantitatively analysis now at hand, the team dove into discussions with respect to the final idea selections, representing the discussion subcategory. This idea selection process was with respect to the main characters, block styles, background themes, and obstacles.

The third component that was well reflected on is the matter of scoping. During of the early iteration of the project, the team began to make strong progress with the game later envisioning and accumulating some fantastic ideas. The team later observed that the project strict deliverables will not allow for the exploration and implementation of the ideas envisioned. In light of such revelation, the team decided to essentially down-size the game, cutting off other envisioned levels and limiting to a maximum of four gaming levels with a maximum of three obstacles in each. The background assets were also cut down from the five originally discussed to two.

Focusing on the game developers as the designers, the most important designed centric goal the team hopes to attain is to achieve the greater good. This ties with the previous theme of the teams motivation where the primary goal is to help the younger newcomers of Canada gain the knowledge about their new home in a fun and easily digestible form. This was the target audience would learn about the unique Canadian spaces and cultures of different provinces. The second design centric goal is for the team to attain fortune. It is no shame in the team being rewarded for their hard work. The monetary funds gained through this game would be invested back into the later versioning of the game to further improve the experience with more technological enhancements. Lastly, the third designer centric goal the team would like to attain is the skill to become a better designer in general. Presented with a unique opportunity to conceptualize and implement with the end goal of client satisfaction will aid the team tremendously in their further development as a designer.

2.2 Player-Centric Goals

Following the focus on what the developer team wants for themselves, comes the chronological discussion on what the development team wants for the players of the game. In light of this, the first definite aspect the team wants for the players to learn to make the tough decisions and choices. Consider a scenario where the only way to pass a certain level is to purposely have to lose one health point. If this were to be an inevitability, the player would have no choice but to comply and lose a health point to pass the level. This creates a neat segway where the second envisioned player-centric goal is to have experiential understanding, such that the players would grasp a new understanding by playing the game. We have aimed to achieve such by incorporating several levels, giving the targeted audience to comprehend a new experience and be able to replicate a derivative of it in the next level. These interactive experiences are demonstrated by the player's interaction primarily with the games obstacles. The third player-centric goal is for the player to feel empowerment while playing the game, which stems from the motivation of the game to resonate a positive connotation by the bouncing beaver game when the

players engage with it. The development team has incorporated this through the logic of gold coin collection, as a reward mechanism. The players are also made to feel powerful as they hold the ability to eliminate the poisonous mushrooms threat by simply bouncing on them. With respect to the fourth player-centric goal, the development team seeks to fully challenge the players, reflecting the flow subcategory. The planned aim is to achieve this through the different levels, all with a unique theme and positioned obstacles, as opposed to a single level where the player would not be optimally challenged.

3.0 PAPER PROTOTYPING

Paper prototyping is a quick and efficient method to practice implementing the game mechanics before implementing the game logic formally into a digital environment. This is done so that the objects of the game can be superficially tested quantitatively before any commitments are made in the digital environment. This is because the paper prototyping method offers a low-risk and low-fidelity option to the development team. Allowing for informal assessments at minimum cost to the team.

3.1 Describe the used Paper Prototyping Tools

Standard note card were used to note down brainstorming ideas with respect to the title of the game, several ideas were noted down, but the team wanted a title that had the same first letters in all the words of the title. This was with known sense that titles that rhyme or have the same first letter are more easily remembered. The note cards were used where the following names were noted down: Hopping Hopper, Brave Bear, Bouncing Beaver, and Jumping Jasper. The notes allowed for easier manipulation of the titles at a very low cost to the developers.

When it was available to the developers, the white board was a very inviting option for the team to draw out the character designs and implementations in the game. This is because the white board offers a large space where the team could use different coloured dry erase markers to design different version of what they envision the characters in the game to look like. This low-maintenance and cost-effective technique was practiced for the beaver design and its different animations for different actions. The whiteboard was also used for the character design of the gold coins and the poisonous mushroom design.

Post is notes were another effective and low-maintenance tool used to note down the different game levels the team had envisioned to implement. Each sticky note was of a different colour and was specific to a single province. Originally the team had discussed to have three levels, but later this was improvised to four levels where each level was qualitatively represented by a sticky note. The sticky notes each contained the obstacles to include in that specific level, and most importantly, the different assets to use to decorate the background. More specifically, this is with respect to choosing at least three or four famous buildings to choose from to use in their respective levels.

Finally, a digital notebook was also used to visualize what the development team wanted the landscape to be designed like. This was a more conclusive effort to positioning all the different components of game that had been discussed thus far in the game development process. This included the land shape, positions of the background assets, locations of the coins in the map, and placements of all the obstacles. The two digital devices used namely are the iPad Pro and the Samsung Galaxy tablet. Both offered their lead designers a very effective, fast, and trackable way of producing and sharing ideas. With this technology, the developers did not even have to be in close contact or proximity to each other. The proposed ideas and designs were simply shared with the rest of the team online via the internet.

3.2 Give a Paper Prototype Example

A possible prototyping example can be crafted with the theme of the bouncing beaver game. The first step is to conceptualize the game idea. A proposed concept is to the main objective of the game where the beaver must face the various landscapes where there are challenges that await them.

The challenges will also include the ones described in the original game where there exists rough waters, sharp spikes, and poisonous mushrooms. Except this time the mushrooms are not poisonous upon contact, rather they can fire poisonous spores in the direction of the beaver. However, the spores can only be fired when the mushroom is facing the beaver.

Fig. 4. Depiction of the sharp spikes in the game.

The range of the spore projectile will also be limited. To add an interesting element of surprise and randomness, two dice can be used to measure the distance the projectile can reach. This can be done by subtracting the numbers shown on the dice when the beaver is in proximity of the poisonous mushroom. In this sense, the beaver will have his roll, and within he firing range of the mushroom, the mushroom will ger their roll.

On the map, different colours can be used to represent the different components of the game. For instance, the main player will be represented using the green colour. The mushroom will be drawn using a red utensil, mainly to capture the sense of danger. The blue utensil can be used for the rough waters and purple can be used for the sharp spikes. Finally, either grey or black could be used to draw out he 2-dimensional map and landscape where the characters will be positioned and can move according to.

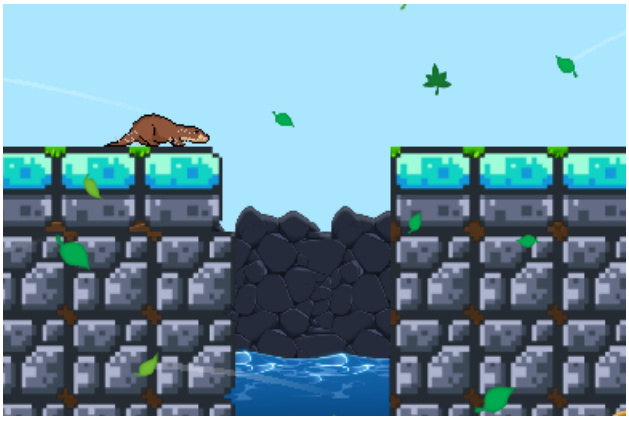

Fig. 5. A visualization of the rough water that the beaver can drown in the game.

A separate sheet of paper, or an index card can be used to track the health points of the beaver. Another index card can also be used to counter the number of collected gold coins. Different coloured index cards could be used to present a more visual separation between the two instruments of logic on paper.

3.3 Prototype Player Movement Through Space

The map of the game can be drawn on the a large sheet of paper, where the paper is further divined into a grid with rows and columns. Two dice will be caused to control the movements of the player across the gridded map. The design of the map remains constant, where a 2-dimensional side view is portrayed. Allocate one dice to represent the option of the beaver's vertical jumps and the other dice to represent the beaver's movements left and right throughout the grided map.

The even numbers on the moving dice represents the beaver moving forwards in the right direction. Whereas an odd number represents the beaver moving backwards in the left direction. In the jumping dice, only the odd numbers represent the jumps, meaning that the even numbers on the jumping dice has to be disregarded. Furthermore, if the player so chooses they can ignore the jumping die. This is to say that if the player rolls an odd number in the jumping dice, they can simply choose to not jump.

If the player is in the proximity of the mushroom and are fired a spore projectile upon, the player will have one chance to roll the jumping dice and essentially save themselves, where the odd number of the dice represents a successful jump to avoid losing a health point.

3.4 Include at least Three Mock-ups of a GUI

The first mock-up of a graphical user interface can be developed to represent the buttons in a game. A possible orientation is to have the standard left and right buttons in the right hand side and have the jump button alone on the left hand side.

Perhaps are more improved proposal would be to have the moving left and eight button on the left hand side. This offers the gamers a more familiar control navigation, due to the fact that most gamers prefer to use the "W-A-S-D" keys. To further improve this design, once can also make the buttons rounded, to essentially cover less screen space. Furthermore, once could also design the control buttons to be transparent, to allow the gamers to have the largest uninterrupted experience of the game.

Menus are another unique feature that essentially foreshadows the experience to come in the upcoming game play. If the main menu is poorly designed, it will most certainly cause the audience to lose interest in the game, and grow a negative connotation. On the other hand, when a carefully detailed and decorated loading screen or main menu is presented, it excites the player. In this sense, portraying a minimalistic view and approach with only two buttons works well to invite the audience. The first button can be a green coloured start button, and the second button can simply be a red quit button. This way the audience will spend minimal time on the main menu screen and more time playing the game right away.

The third mock-up can be the input fields in the game. This also means that the keyboard can be used to enter values for the said input field. For a sophisticated approach, the design could only show the values that are acceptable as an appropriate input for that specific input field. For instance, if one input field accepts numbers and not letters, then only a keyboard showing the numbers should be populated on the screen. This controlled approach offers a more inviting and eased gaming experience.

4.0 GAME TESTING

Game testing is an important accept of ensure that the designed experience that is being delivered is on par what was planned in the planning stages. This is also the phase where the iterative cycling of testing, debugging and fixing comes into play. There are various methods the development team should use regarding product testing.

Some of the methods the developers employed are as follows: developers playtesting themselves, conducting informal individual testing, performing formal group testing, and lastly, formal individual testing.

4.1 Playtest Yourself

With respect to playtesting ourselves. Both developers had decided to run the game on their own personal machines as opposed to the ones provided in the labs. The development team also ensured to use two different machines when playing the game. This was intuitively designed to make sure the game applicating runs smoothly on the two most popular platforms that public currently uses, Apple and Windows systems.

Furthermore, both developers also made sure to test each level and make notes on any observations that might indicate the possibility of errors or miscalculations. In doing so, the developers did identity the fact that the beaver was not able to perform some jumps on the terrain as the design was out of reach in some steps. This is to say that the beaver would eventually get stuck and not be able to access a particular area of the map due to the quantitative limitation on the beavers' vertical movements.

Once this issue was observed and documented, all other levels were tested. The team then grouped back together and shared the notes that were made during the individual self-testing phase, the team then pivoted into the debugging phase where attempts were made to resolve the unearthed issue.

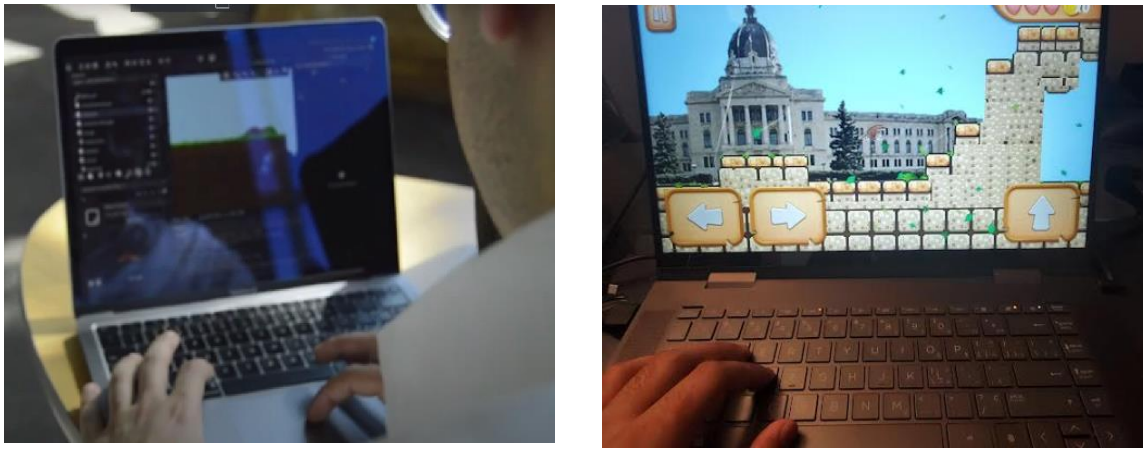

Fig. 6. An image demonstrating the self-play testing phase where a team member is testing the game. Mazen Abid on the left and Shahzil Siddiqui on the right.

4.2 Informal Individual Testing

Moving forwards with next stage of testing, the development team then began the informal individual testing where a friend was selected to essentially play the game and make their own observations, without any of the influences from the game development team or observations from other people. In this sense, the individual was able to test how intuitive the game mechanics were.

Doing so also helped the development team learn about what the minimum or maximum are required to make the game more intuitive where the players are spending more time enjoying the game and not guessing how the game is played. This suggests to be a very helpful phase, especially early on in the game development process.

The team also discovered that this was an effective way of testing any new feature that the developers wanted to implement in the final product delivery.

When conducting the test for the Bouncing Beaver, no leading questions were proposed and no excuses or reasons were made when the players noticed something that they felt was part of the intended gameplay. This is because the development team believes that components where the tester disagrees with the developers is exactly the point needed for documentation and further analysis. As these factors propose to be the aspect of the game that needs to be iteratively worked on and improved.

Find below the play tester's notes:

General feedback:

- Some areas of the game are not reachable and the beaver essentially can not travel any further on the map as a result.
- A glitch happens where the beaver is stuck suspended in the air when hitting the coin based blocks.

Underlying issue:

- The size of the beaver and the amount of blocks he can jump are both less than some of the stacked vertical walls. Leaving the beaver stranded.
- The glitch could be an issue in the physics of the character.

Severity:

- The issue where some areas of the map can not be reached halts progress in the game, and thus is a severe issue. Hence, a rating of 7 out of 10 was appointed.
- The glitch issue when collecting coins from the coin containing blocks is not very severe. An severity rating of 4 out of 10 was appointed.

Proposed Solution Items:

- Redesign the areas of the map that are not accessible to the player.
- Re-implement the character physics package and test again for any re-occurrence of the same issue in the same area.

4.3 Formal Group Testing

As the name of the phase suggests, formal group testing is the next chronological phase to the informal individual testing phase. This is the phase where multiple individuals are collected and summed in a room where all of them can simultaneously play the game on their individual machines.

Similar to the informal individual testing, little no information was given with respect to guiding the players on how to play the game, as this was part of, once again, testing how intuitive the Bouncing Beaver gaming experience was. With reference to what was instructed in Gibson's work, the gaming period was stopped around the half-an-hour mark, giving the group of players ample time to test all the different levels that were developed for the Bouncing Beaver game.

Survey Questionnaire:

1) What mood would you say the overall game resonated within you?
2) Were the game mechanics and controls intuitive for you?
3) Did you notice that there was a health bar in the game before you lost your first health points?
4) How would you rate the visual effects of the game, such as the beaver animations and the background scenery?

5) Which level did you find the most entertaining and fun, and conversely, which level did you find the most boring and why?
6) Do you see yourself playing this game again once you have completed all levels?
7) Would you share this game with you friends and family? Why or why not?
8) Does this game remind you of any other game you might have played before? Which is better and why?

4.4 Formal Individual Testing

Formal individual testing is the next progression to the previous testing phase. In this phase, the development team must observe and carefully document the experience of the game player as they are actively playing the game.

The first observation the team made with the game player in this testing phase was the play-tester's actions. Especially when the player approached different obstacles. This was done so that the development team can observe and note all the different input attempts made by the player. This helped the team understand what inputs worked well and what inputs did not. The initial jump input was by the up arrow key, but the play-tester's input action proposed that the space bar was a better option, as it was more intuitive to the player.

The next observation that was made was the play-tester's face. Once again this was given a closer attention when the player came into proximity with each of the different game obstacles, including the likes of the poisonous mushrooms and the sharp spikes. The team noted that when the heath points were lost by the mushroom, the play-tester had a more determined and motivated look than when they lost health points to the sharp spikes and rough water obstacles.

The third data stream that was observed and documented was how audibly the play tester was. In light of this, some audio statements of the play-tester were recorded. This gave the development team a more inter understanding of what the players might think thinking about as they interact with the game.

5.0 GAME BALANCING

Game balancing is an important concept for the game developers to comprehend and implement in the iterative process of game development. With respect to single player games, balancing ensures that the difficulty levels have been appropriately catered for the targeted audience.

Moreover, ensuring that the difficulty changes incrementally as the player gains more experience. The development team aimed to achieve this by making the first level relatively easy to pass and the later levels to consecutively grow in difficulty.

5.1 Spreadsheets to Balance Weapons and Abilities

As illustrate by Gibson in his textbook, spreadsheet can be a great tool to allow the development team to achieve the intended balance in the game. Especially since they let the team to swiftly grasp Gestalt information. Doing so equips the team in making better decisions that are based on mathematical reasonings, as opposed to instinctive reasoning.

For the current deliverable of the project, a spreadsheet was planned to be used for attaining game balancing. The spreadsheet below demonstrates the efforts of the development team. The number of levels refers to the all the different provinces that have been represent in the different levels of the game.

	A	B	C	D	E	F
1	**Number of Level**	**Terrain Length (pixels)**	**Active Enemies (mushrooms)**	**Stationary obstacles (water, spikes)**	**Number of background assets**	**Level Difficulty (1-5)**
2	1: Saskatchewan	< 20,000	10	2, 0	2	2
3	2: Ontario	< 20,000	12	2,1	2	3
4	3: Quebec	< 20,000	16	3,1	5	3
5	4: Nova Scotia	< 20,000	17	5,2	2	4

As represented in the spreadsheet above, the difficulty of the levels was carefully planned quantitatively. While the general terrain size of the map remains relatively consistent, more active enemies are populated for every next level, where the minimum is 10 and the maximum added was 17 poisonous mushrooms.

Furthermore, the combination of the static obstacles was also planned to increase as new levels are unlocked. Since the background do not hold any direct or indirect correlation with balancing the difficulty of the game, there exists no increasing pattern like for the other aforementioned columns.

Additionally, future additions had been a strong subject of discussion for the future iterations of the game, where more levels can be added in the game where the presented characters hold additional abilities such as attack, and defense moves. This is with reference to what was mentioned in the paper prototyping section of the report.

5.2 Positive and Negative Feedback System

It is well understood among the game developers that every game has a feedback system. This is to say that actions that are chosen and conducted by the players ultimately have their subsequent results and reactions that affect the rest of the sequence of the game.

As such, the feedback system is composed of both a positive and a negative feedback subcategory. Positive feedback appears to the game players in the form where the player is objectively winning the game, and as a reaction or a result, their odds and chances of wining grow, inherently becoming more and more likely.

In most games, this snowballing-like effect of the foreshadowed winning early in the game will eventually determine the winner. However, because of this, the game could become to bland and not joyful as the game becomes more of a one-sided game. This is especially off-putting inn multiplayer games.

The positive side to such am outcome, where the game becomes one-sided is that it keeps the game short, giving the opponents the motivation to play the game again where they can aim to take the early lead, suggesting the win to be in their favour.

With respect to single player games, positive feedback is used as a tool to hook the player by positive engagement. This essentially makes the player feel more capable and stronger in the game. With this positive feedback, the game developers intend for the players to keep playing their game.

The positive feedback system that has been implemented in the Bouncing Beaver is the unlocking of new levels are the player passes the current ones. This essentially increases their odds iteratively to win the entire game.

For future updates and versions, the development team has decided to implement a score system that will be based on the distance covered, coins collected, mushrooms stomped on, and health points conserved. The levels

will then also have a target score to achieve before they can unlock more levels, and where the high scores for each levels can be tracked in the gamming community.

On the other hand, negative feedback systems are used in the games to essentially slow down the winning player so that the other players can catch up to the winner. This helps to add balance to the one-sidedness in regards to the positive feedback in multiplayer games.

This also works to add cancelling effects to the game where the early lead in the game will no longer foreshadow that player winning the game. This is represented in multiplayer games by allowing the losing players to gain an advantage that is withheld from the current winning player.

An example of this is when in combat styled games, the losing player get a shied over their character as an additional defence mechanism over the winning player when significant health points are lost. This, as one would deduce and expect, makes the multiplayer game longer.

Interestingly, single player games are usually never equipped with negative feedback systems, as this could deter the player from playing the game, causing frustrations.

However, to make the game a little more interesting and challenging, the Bouncing Beaver game features a rule of the game where if the beaver comes into contact with the poisonous mushrooms, the player will lose heath points. Also, if enough health points are lost, then the game is over, and the player has lost.

For future iterations, another negative feedback system could be added to the game where, with reference to the paper prototyping envisioning, the poisonous mushrooms could be equipped with spores that can be fired as projectiles towards the beaver.

6.0 PLAYER GUIDANCE

Player guidance is a concept where the intuitiveness of the game must be carefully thought out and planned so that when the game is presented to its targeted audience, it is relatively easy to pick up on the game's general mechanics and dynamics.

Too often this requires a very methodologically driven and carefully planned guidance that are invisible to the player of the game on the surface level.

In the Bouncing Beaver, the development team aimed to achieve this effect by the end of the first level, where the gamers can take note of all the different aspects of the game. This will also aid them for when they play the next level because the level of difficulty proportionally increases with the assumption that the player has understood all the elements to the game.

6.1 Direct Guidance

Direct Guidance is a concept where the developer have embedded and carefully crafted certain elements of the game to openly guide the player. This is to say that the player is aware of the fact that certain elements exist in the game to evidently guide the player.

These elements of direct guidance can take various forms. One popular way is to incorporate a set of instructions that directly inform the player of what to do and what not to do. This is also where the game developers can plan to deliver the objective and goals of the game. Most often, these instructions come in the form of text or visual depictions.

Most modern games will also make use of NPC characters to convey these instructions ahead of the gameplay. The reason this is one of the most used methods of direct guidance is due to its simplicity on both ends. This is to

say that it is easier for the developers to implement and convey their game objectives, and because it is extremely easy for the players to pick up one. So much so that Gibson, in his textbook, calls it clearest form of guiding a player directly.

However, with all the aforementioned positive aspects of this accept of direct guiding, there exists certain drawbacks. When presented with the information, the player may feel overwhelmed and overburdened, especially if the target audience is kids. Moreover, if the player is constantly interrupted with messaged, they will feel annoyed.

These drawbacks, however, are also context dependant on the genre of the game and the age of the targeted audience. If the game is more story driven, then the players would probably not mind reading the additional instructional text because that is what they are expecting from the game itself. However, in a fast paced first-person perspective shooter game, this would be a very frustrating feature.

In the Bouncing Beaver game, signs appear in the background that inform the player of the province they are playing in. More instructional signs appear in different parts of the game where the player is instructed to play faster to avoid falling for the invisible tiles trap.

Fig. 7. Depiction of signs in the game showing guiding the players.

Another common method to guide the players directly is to make usage of mini maps that would stick on the players view showing them where they are. This is usually done using a bird's eye perspective or a GPS themed system. The goal of this feature is to direct the player to the games' objectives.

In the next update or release of the Bouncing Beaver game, the development team has envisioned to incorporate such a map, that would stick to the top left corner of the screen and would show a zoomed-out depiction of the level terrain and where the finish portal is positioned. The team also planned to show where the coins are located on the mini map as well for a more flavoured touch.

6.2 Indirect Guidance

Indirect guidance is essentially the opposite of the direct guidance. This is where the guidance is less apparent to the game and is carefully blended into the dynamics of the game. So much so that even the designers of the game may not notice the embedded indirect guidance.

Constraints are generally a good way to blend the guidance in the game. This method reflects on the concept that if the options of the players themselves are limited, then the player has no choice but to eventually chose one of the proposed options. This is a simple yet effective way to control the players actions. In the Bouncing Beaver, the game developers have added constraints such that players will not be able to access some areas of the map, by doing this, the game is indirectly guiding the player where they are, in fact, able to move.

Visual designing is another popular indirect guidance strategy that many developers use. Furthermore, it is also the broadest sub-section of the indirect guidance category. In the Bouncing Beaver Game, the developers have used a trail of the gold coins to indirectly guide the players with respect to where they are able to go and places that they cannot reach or should avoid, especially when those areas are cut off by obstacles.

In addition, the team also used visual clues that are aimed to help navigate the players. For instance, there are a few moments in the game, scattered across different levels, where the ground the beaver is running on disappears. This is an indirect hidden clue to the player that they must jump down.

This may seem un-intuitive; however, the player is not presented with any alternate path and no other suspend ground is visible in sight. To further add to this fact, any location in the level where there is a visible landmark, is a good indication of the right path to the finish portal.

6.3 Sequencing

Much like with most, if not all, educational institutions, new information to one's audience should be presented in a sequential manner. The same concept is used by developers in the gaming industry. Sequencing is, therefore, the strategy and method of presenting unknown information to the players unique ways.

Isolated introduction, in game development, is when a new player of the game is introduced to the gaming mechanics, must use those specific mechanics in order to be able to continue the game. In most cases, this strategy is used to train the player so that they are better prepared to both play and enjoy the game.

In the Bouncing Beaver, the development team implemented this strategy in the very first level that presents a small ladder styles mini hill that the play must be able to climb over in order to continue with the rest of the level and eventually pass through to the next level.

Another strategy, commonly used, to teach new skills and concepts is the addition of danger. This is done so that the player can be accustomed with how the health bar system works. This is to say that players will understand how much health is lost when placed under attack from the enemies or when damage is taken from the surrounding obstacles.

In the Bouncing Beaver, this method too was implemented to add some risks and excitement in the game but also to teach the players about how much health points can be lost. For this first minimal viable product, the development team had decided to simplify the learning curvy by only letting the players lose one of three health points when effected by any of the three obstacles.

In order to make sure the players understand the point, the mushroom enemy effects and attacks the player in a different way than the rough water and the poison spikes. This is because the mushrooms is an active character in the game and they are not a static obstacle. This is to say that they pace left and right for a measured length to be able to attack the beaver. However, as previously mentioned, the players of the game also have the ability to defend themselves by performing a vertical jump on top of the mushrooms. This inspiration was taken from the Mario-styled games.

7.0 GAME DISTRIBUTION

7.1 Virtual Reality Adaptation

When converting a game from its traditional input/output system to the Virtual Reality adaptation, the developers must delve into careful consideration on how to best translate the existing gaming mechanics and dynamics in the virtual environment, especially with respect to the games control. This process should start with consider how to translate the most basic controls of the game first, and once that becomes clear, the development team can then advance with the more complicated aspects of the game.

First and foremost, the development team must consider how to convert the 2-dimensional game into a virtual reality environment. For this, the Bouncing Beaver team believes that creating a high-fidelity prototype for the virtual reality environment might be the best solution, before the team rolls directly into the development phase.

If the team has some wiggle room and time with respect to the product miles stone and product delivery. The development team for the Bouncing Beaver would instead add a 3-dimensional stage to the gaming experience before moving to the virtual reality phase. This is because the development team envisions that all the rough edges that would otherwise surface in the virtual reality phase, can instead be ironed out prior, in the 3-dimensional game testing and analysis state.

The development team has conceptualized two ways to translate the game mechanics. The first method is a simpler translation because it makes use of the virtual reality controllers. For this scenario, the left and right movements can be controlled with the buttons left controller stick, and the vertical jumping action can be controlled with the right virtual reality controller stick. On the other hand, if the game is to be played without any controllers and only using the headset, then the translation become a bit more challenging for the developers.

However, a possible solution for the Bouncing beaver game is where the head movements of the player wearing the headset can be tracked, and actions within the game can be controlled through those head movements. For instance, if the player wants to move forward in the map, they will lean their head forward. Conversely, if the player wants to move backwards, then they would lean their head backwards.

Finally, if the player wants to perform the jumping action, they can perform a reverse-head nod. All these actions are intuitive enough to learn quicky and perform easily while playing the game. A third way to translate the game from 2-dimensional to virtual reality environment, is to use both of the previous two methods discussed. This is to say that the controllers can be used to move either forwards or backwards, and the reverse-head nod can be used to perform the jumping action in the game.

Additionally, the development team has also discussed to add another way to program the jumping action, where the player could perform the jump in real time. For using this method, the developers would use a similar system to detect the jump like for the reverse-head nod.

Even though these are all great options to translate the game, the developer have decided to include a playing time limit on the game and a warning for those with past neck trauma. This is because performing several reverse-head nods can cause an individual to get dizzy, and the continued head jerking is not a healthy practice. Therefore, a time limit will be imposed on the game by default. This restriction, however, can be removed in the settings of the game when the player agrees and signs a disclaimer.

If the game was originally developed in the virtual environment, and the translation and conversion was to be to the traditional devices such as a computer with keyboard, monitor, and mouse. In such a case, intuitive buttons on the keyboard would be used. For instance, to move the beaver forwards, the “D” or right arrow key can be used. To move the beaver backwards, the “A” or left arrow key could be used. Finally, in order to perform the jump action, the popular standard space bar key can be used. Additional support could also be made available for scenarios where the user prefers to use a console controller with their computer to play the Bouncing Beaver game.

7.2 Hypothetical Strategy to Generate Revenue

As a gaming developer grows in their craft, they become more skilled and produce polished industry level product. When developers reach this stage, they, in most cases, prefer a reward for their hard work in terms of a monetary value. There are different ways a game developer could choose to generate revenue.

An interesting strategy that has been discussed among the Bouncing Beaver team is to propose a case to the local education school board and convince them of the positive way games can be used to teach young student in

elementary about the Country we all love and live in. Once approved, royalties can be collected based on the number of systems the game gets installed on.

The other strategy the team has discussed is to set an initial cost to the game. The game can be made available to popular platforms such as MacOS and Windows for computers. Since a large portion of the modern society enjoys the flexibility of playing games on their portable devices such as phones and tablets. The development team can thus make the Bouncing Beaver game available on the popular apple and android portable devices.

Lastly, for the consol gaming community, the game can also be made available on the likes of PS4/PS5 and Xbox. The prices would be set a little lower than the games natural competitors with respect to game genre and style. This can be done initially, so that the Bouncing Beaver would stand out as a better option amongst its competitors.

Another strategy is to make the game free for a limited time, like for seven or so days to create exposure to the general public, and later when the free trial expires, the players would have to pay to play the game. While this is usually a frustrating scenario on the players end, especially if they do not realize the trial aspect of the game, it still, nevertheless is a viable option for the development team to generate revenue.

Once the game matures, where several more levels have been added. The developers could include some in-game purchases to facilitate revenue. These could be in the form of unlocking a new level with newer enemies, or being able to purchase a newer character style and look that matches the current popular celebrations at the time. For instance, during the month of October, a new level with a fitting theme could be released by the development team, along with newer beaver characters dressed in different costumes, that can be purchased in the game with real monetary currency.

Another popular method that most developers use is an ad-supported revenue generation. The way this would work for the Bouncing Beaver is that the developers could embedded the ads within the game that the players would be exposed to when playing the game. As such, the team would be collection ad revenue. In addition to this method, the development team also plans to create an option for those that would rather just pay a monetary amount and not exposed to the ads, effectively removing them for their login credentials.

Yet another method to generate a revenue could be to create weekly challenges where the players must pay a small fee to enter the competition can be able to compete online. The way this could be set up is to have the player either compete with respect to the best time, the best score, or best yet, a multiplayer level where a max of five players can compete to finish the level the fastest while surviving the dangerous obstacles. If this method becomes successful, a website could be created where such competitions could be streamed online on social media platforms. This will also work to expose and present the game to a wider audience, effectively generating revenue through streaming.

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