One-handed Visual Novel Controller For Relaxed Gameplay

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***Abstract*—Visual novels have been played most commonly through traditional gaming setups such as the computer with a mouse and keyboard or a console with a game controller. This paper will explore an alternative controller to play visual novel games with and how visual novel games can be further enjoyed in a more leisurely way. Players should be able to engage with visual novel games in a more relaxed and comfortable manner. Thus, Sea Drive Lackeys wants to explore how a one-handed remote controller can enhance and better visual novel gameplay. The controller discussed in this paper, after many iterations, was made to be compact and ergonomic and follows the conventional ways of a TV remote. This paper further discusses the design and iterative process the product went through to reach the final prototype and what we learned throughout the project's progression.**

***Index Terms*—visual novel games, controller, iteration, design process**

I. Introduction

Visual novel games are a genre of games that interact with players through narrative elements, distinct visual elements, and unique gameplay. They are also able to dynamically control aspects like plot, transition, speed, story beats, media, and delay [1]. Through our design process, it was determined that traditional gaming setups limit and reduce the quality for visual novel gameplay. Players often remain in a stiff position with their hands glued to their standard gaming setup when playing visual novel games. Players should be able to immerse themselves into the gameplay to fully experience a visual novel. We believe it is unnecessary for players to use two hands for simple commands, such as going to the next scene or choosing a dialogue option/choice. For players to feel more immersed, visual novel games should be enjoyed in a leisurely manner, similar to watching a movie. From our design thinking process, we observed players engaging with visual novel games in a traditional keyboard and mouse setup. Most players had their hands glued to their devices in a stiff position with poor posture. Visual novel games engage the players through its interactive elements; however, from our analysis, we learned that many players are unable to fully immerse themselves into the game due to discomfort in their gaming setup. We, the Sea Drive Lackeys, believe it is unnecessary for players to be uncomfortable and have to commit two hands to their stationary controller to play visual novel games. In this paper, we will explore a one-handed controller specifically designed for the player to experience casual and relaxed visual novel gameplay, as well as the methods and results used to reach this design. We will also perform a literature review and examine various commercial devices as inspiration and justification for our final product. Finally, we will look into the iteration and design process of our prototype throughout the project as well as the workflow we used to get to the final iteration.

II. Literature Review

In our literature review, we examined the definition of a visual novel and applied it to our controller. One important defining feature was the frequency of interactions. Often, they're simple and require limited player input, the frequency from their interactivity in visual novels survey revealing 0.37 interactions per minute [2]. When we compare this to video game controllers and a mouse and keyboard, they're designed to have far more controls and inputs than required for the context of visual novels. Our findings justify the need for a simpler controller suited specifically to visual novel gameplay, something that all-purpose controllers may not be as effective for.

Often, custom controllers designed for specific games offer possibilities by enabling interaction styles that are not possible using standard controllers which enhances the user's experience [3]. To evaluate our controller, we used Mcnamara and Kirakowski's three factor model for understanding the interactions between humans and technology. Firstly, the developers must consider the functionality and the level of support for the controller in-game. A controller with numerous inputs and outputs would be of little benefit if the gaming software does not support it. Having a simple button scheme on our controller for visual novel games was therefore justified by the limited number of interactions required for visual novels. The second and third factors include usability and experience. For our controller, we made our usability efficient by taking out the directional buttons and adding a sliding potentiometer, giving the user a memorable experience since potentiometers aren't as commonly used as multiple buttons. Our controller is unique with its functionality and button scheme.

The devices we were inspired by are the Samsung TV One remote and Nintendo Switch Joy-Con. We looked at many TV remotes and decided the Samsung One remote best fit our vision for our controller. Our first iteration followed a button layout similar to the Samsung remote and our design included some of their ergonomic features from that remote. However, the decision to remove the directional buttons was done after receiving feedback through multiple iterations. Later in our iteration process, we positioned our buttons closer together and made the overall remote more compact. We took the Nintendo Switch Joy-Con as inspiration for a compact remote design. Joy-Cons are one-handed controllers so it aligned well with the goals we had for our controller.

III. Methods

Our workflow for the design process started with brainstorming ideas for the design of the controller. Some ideas we explored were a voice activation walkie talkie, a visual novel mouse controller, TV remote, and more. We decided to use our TV remote controller idea. We used the design thinking template to narrow down on our controller's functionality and appearance. We then proceeded to get feedback on our design by early October from our peers, TA, and professor. The feedback we received included reducing the complexity of our buttons, adding more sensors and actuators to engage with players, and more. We started to iterate on our design which led to updating our fusion model and paper prototype. From our first initial concept design we were able to determine what buttons we want on our controller. We worked on TinkerCAD to figure out what components we needed and how they needed to be wired to make a functional controller (Fig.1). After determining our components and case design, we started working in Fusion360 to make our first model. We translated the model into a paper prototype to get a better understanding of how it would feel in the player's hand (Fig.2). We would then receive feedback and loop back on iterating and updating our models until mid-November as you can see from our flowchart (Fig.3). By then, we had a solid prototype of our controller and we were able to conduct a QFD analysis and SUS assessment. From these assessments, we were able to make final changes in our design and update our fusion model and paper prototype for its final iteration. Our final changes included reducing the size of the controller to make it more compact and ergonomic as well as rearranging out button layout for better accessibility.

IV. Results

For our QFD results, we started by asking customers what was important to them, and they mentioned it had to be lightweight, be comfortable, have good button placement, have mobility, be one-handed, and have functionality. Then, we translated these into technical requirements which included component weight, case design, ergonomics, cord length, case dimensions, and input quality assurance (Fig. 4). From here, as part of the iterative process, we defined the relationship between consumer and project requirements, which helped us align our goals with customer wants. From the customer competitive assessment, our controller excels in having lightweight components compared to its competitors (Fig.5). Our controller was ranked highly alongside the PS4 Move controller as nee an easy to use, one-handed controller, which was one of our main goals. It was also ranked as lower in functionality to the other devices, but this was an intentional design choice. We wanted our controller to divert focus onto visual novel game experiences rather than the means to experience them since this genre can be further utilized in other fields, such as education [4]. Our controller strays away from traditional controller designs as to mimic the control designs of a TV remote. We felt that the control design of the TV remote better suited visual novel gameplay. Similarly, we did our QFD analysis on our fourth iteration (Fig.6) and received a lower score for button placement. We reanalyzed and designed our controller for its fifth iteration with the buttons being placed in a more compact and ergonomic design. For our SUS survey, we asked six participants to evaluate our controller. Our overall score was 87.1, which is considered excellent (Fig. 7). From the results, we conclude that our overall design was well-received; however, according to our question ten results, our participants felt that they needed to learn some things before using the system. This was expected since we used a potentiometer, which is not commonly found in other systems. We decided to keep this component since it simplified our controller by reducing the number of buttons needed. After five iterations, the final design of our controller ended as a square-like shape that could fit in the user's hand. It included buttons for rewind, confirm, fast-forward, and home; a sliding potentiometer for filtering through choices; a switch for special gameplay events; three LEDs for visual feedback; a vibration motor for haptic feedback; a speaker for auditory feedback; a breadboard; and an Arduino Nano for communications between player input and the game (Fig.8). Each of the buttons are secured in small cases, and all the electrical components are secured to our breadboard. Our final controller model was then exported into Unity for our visual novel game, which features a story around Mithunan Bear's surprise birthday party.

V. Takeaways

From our design process, we learned that more buttons added complexity to our controller's design. We wanted our controller to be lightweight and comfortable to use for players. In our first few iterations, more buttons meant a bulkier and more uncomfortable case to hold since all the components needed to fit inside the remote case. For future projects, we'll first consider the most optimized components layout and then design the controller from there.

From our prototyping stage, it was evident we needed more practice in using Fusion360. This software helped us model our controller, but it was difficult and time consuming to implement our design due to our lack of knowledge in Fusion360. After watching multiple online tutorials and attending the in-person labs, we were able to learn the software better, which made iterating easier for the later assignments. We were also

interested in making a physical prototype, but we anticipated difficulties obtaining 3D printing time and supply shortages for our electrical components. Similarly, after making our first paper prototype, we realized we would need many more iterations to find the most comfortable controller design. Thus we opted to go with a virtual prototype, spending more time on the controller's design without worrying about construction costs or 3D printing time.

For our assessment procedures,we started our assessment procedure later than intended due to the time taken during early iterations. This made our next iteration process slower which disrupted our workflow and overall design process. However, the feedback we received allowed us to make significant changes in our controller size and button placement. For future projects, we need to manage our time better and start testing earlier in the design process, so more iterations can be done to improve our design. To test earlier, we should have filled our gaps in knowledge by being prepared to ask more questions in our in-person labs. We could have also asked for more feedback from our peers to see their perspective of our controller throughout our iterations to get feedback faster.

REFERENCES

[1] Shah, A. (2013). *Visual Story Engine*. (U.S. Patent No. 20140019865A1). Whamix Inc. https://patents.google.com/patent/US20140019865A1/en

[2] Camingue, J., Carstensdottir, E., amp; Melcer, E. F. (2021). What is a visual novel? *Proceedings of the ACM on Human-Computer Interaction*, 5(CHI PLAY), 1–18. https://doi.org/10.1145/3474712

[3] Brown, Michael Kehoe, Aidan Kirakowski, Jurek Pitt, Ian. (2010). Beyond the Gamepad: HCI and Game Controller Design and Evaluation. 10.1007/978-1-84882-963-3-12

[4] Oygardslia, Kristine Weitze, Charlotte Shin, Jh. (2020). The Educational Potential of Visual Novel Games: Principles for Design. Replaying Japan, Vol. 2.. 2.

VI. APPENDICES

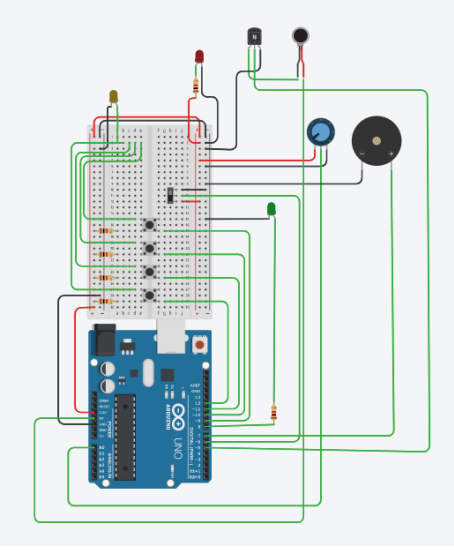

Fig. 1. TinkerCAD components for our one-handed visual novel controller.

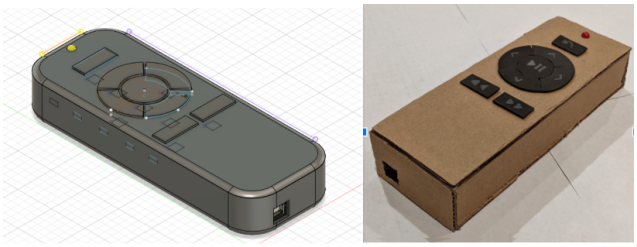

Fig. 2. First Fusion360 prototype [left] and first paper prototype [right].

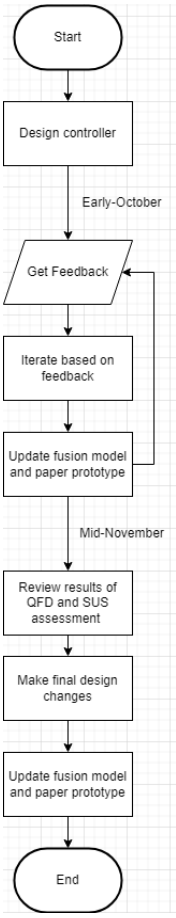

Fig. 3. Workflow diagram for our one-handed visual novel controller iterative design.

Customer Requirements (Explicit and Implicit) \ Functional Requirements	Components Weight	Case Design(comfort survey)	Ergonomics	Cord Length/Flexibility	Case Dimensions	Input Quality Assurance
Lightweight	●	○	○	▽	○	
Comfort	○	●	●	○	○	▽
Good button placement		●	○		○	
Mobility	●	○	●	●	●	
One-handed	○	●	▽	▽	●	
Functionality		○	○			●

Fig. 4. QFD analysis for our one-handed visual novel controller. This analysis was conducted for the 4th iteration.

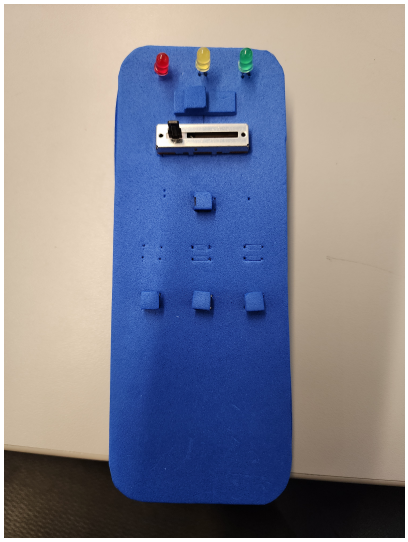

Fig. 6. Our visual novel controller's 4th iteration from a total of 5 iterations.

Customer Competitive Assesment						
Our Product	Competitor #1.PS5 controller	Competitor #2. Xbox Series S controller	Competitor #3. *PS4 move controller*	Competitor #4. Standard *keyboard & mouse*	0 1 2 3 4 5	Row #
5	3	3	4	2		1
3	4	4	5	3		2
2	4	5	4	3		3
3	4	5	5	1		4
4	2	2	5	1		5
2	4	4	3	5		6

Fig. 5. QFD analysis for our customer's competitive assessment.

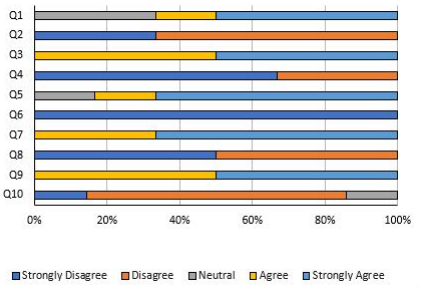

Fig. 7. Side bar graph to represent the responses received from the participants who completed our SUS survey.

Fig. 8. One-handed visual novel controller project progression from September to November.

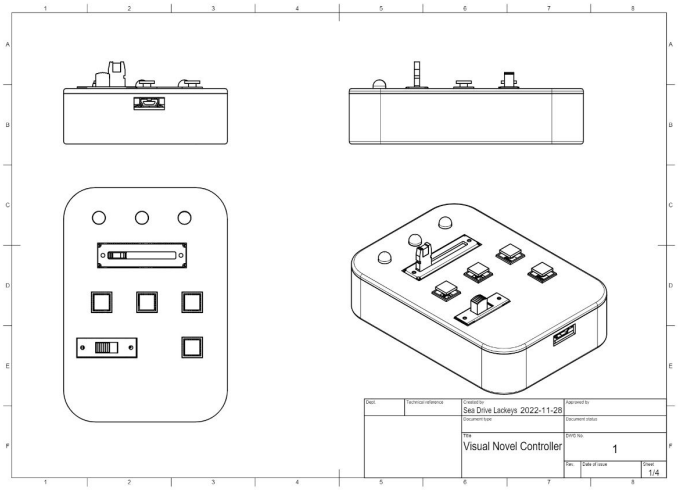

Fig. 9. Fusion360 controller model technical drawing page 1/4

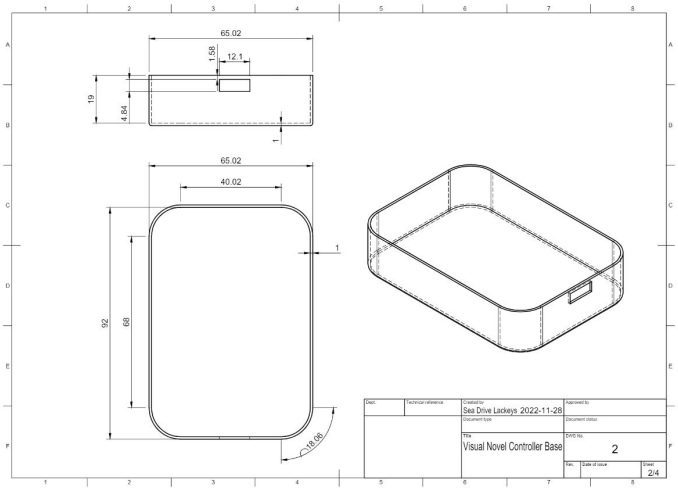

Fig. 10. Fusion360 controller model technical drawing page 2/4

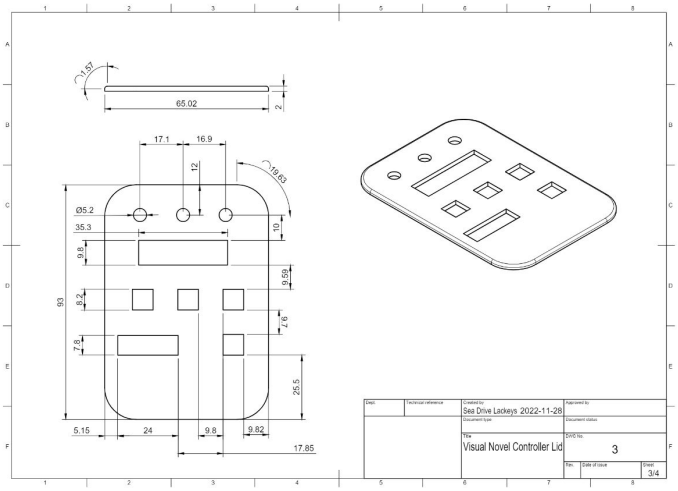

Fig. 11. Fusion360 controller model technical drawing page 3/4

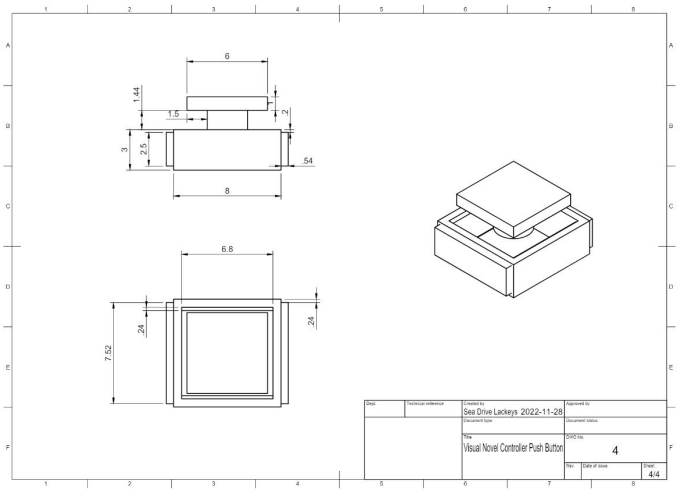

Fig. 12. Fusion360 controller model technical drawing page 4/4

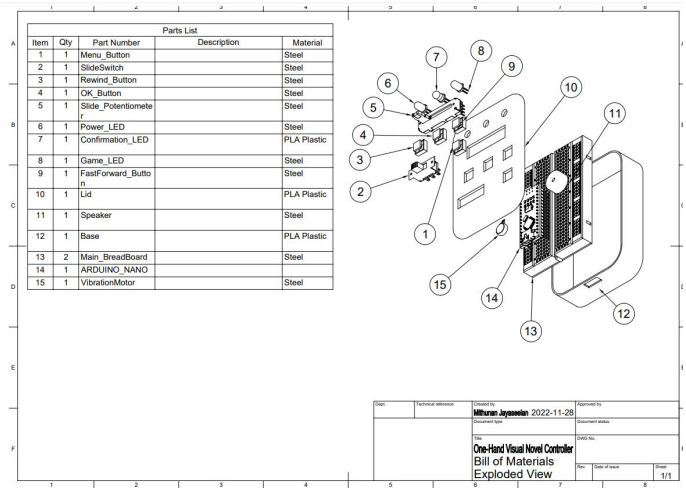

Fig. 13. Fusion360 controller model exploded view and bill of materials