Endless: A Scrolling Game

by

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Abstract
Endless scrolling is well-known to any user of a smartphone or tablet; Endless is an intuitive narrative game based around this familiar act of scrolling. Every mechanic in the game uses scrolling to have the player make choices and solve puzzles; these puzzles include erasing, sorting, and a combination lock. These mechanics are strictly limited to vertical movement to simulate the feel of scrolling. The story itself reflects the “endlessness” of scrolling, being about reincarnation and time travel; it also incorporates the repeating of a level due to failure into the story itself. The narrative and mechanics are tightly bound into a single, immersive experience. Playtesters found the final version of the game engaging and easy to interact with, though there are still improvements to be made both to the usability of the mechanics and to the narrative. Future development will improve on these elements to provide a tighter and more engaging experience that remains intuitive to smartphone users.
1. Introduction

The "endless" or "infinite scroll" is a relatively recent development in digital media, originally created to make viewing image results from search engines easier (Williams, 2012). Now, it is frequently found in apps and social media, and has been found to increase the time a user spends on the app or website in certain cases (Holst, 2016; Babich, 2016), which has lead to claims that apps are designed not just to engage, but to addict their users (Francis, 2017). Whatever the arguments about it, however, the endless scroll is undoubtedly something best suited to the digital realm. While similar things have been attempted in the physical realm, such as the 53-foot scroll Ten Thousand Li up the Yangtze River (Hui, 1699) or the 1,275-foot panorama Grand Panorama of a Whaling Voyage 'Round the World (Russell & Purrington, 1848), nowhere is it as easy to use and ubiquitous as on the web and on our phones.

Whether or not it is truly as addictive as some people claim, there is no denying that for users of smartphones, the act of continuously scrolling up or down a page with a thumb is a familiar, almost mindless action. I designed and developed a game that uses this act of scrolling as its only mechanic. It is a narrative game with scrolling-based puzzle elements, and includes themes of the infinite and, by extension, time, to relate to the familiar "endlessness" of the action itself. The ultimate puzzle of the game is escaping the “endlessness” on a meta level by exiting the game itself. The purpose of this project was to learn if a usable and immersive game could be made entirely around the concept of endless scrolling.

2. Background

Scrolling has been part of games in the form of menus and inventories for decades; as a user interface (UI) element it is well used. There are also plenty of games that make use of two-
dimensional up-and-down or side-to-side movement—side scrollers, for instance, like the original Super Mario Bros. Though we may not think of it as “scrolling,” games like these conceptually have a lot in common with works like Ten Thousand Li up the Yangtze River; instead of simply viewing the depicted journey, though, you must make the journey yourself with the protagonist as an avatar.

By using strictly scrolling for input, I hoped to make a game that is intuitive to interact with and that therefore does not detract from immersion in the narrative. In many ways, this meant designing it as one would design a UI. Fagerholt and Lorentzon split game UI into spatial and fictional categories; UI elements that are both spatial and fictional—that exist in the game world as something the character, not just the player, can see—are diegetic (2009). This model was built in regards to immersion in 3D game spaces specifically; this is not to say it cannot be applicable to narrative games. As Murray says, "the act of reading is far from passive;" anyone who has gotten lost in a good novel can attest that written words can be immersive even without the graphics and sound of a video game (1997). The reader must visualize the story themselves, making them an active participant even in a "passive" medium. In this case, the text is the representation of the game world instead of graphics, and the player interacts directly with that representation; alternatively, you could say that the game exists entirely in the UI. Rather than leading players to "use their knowledge of the real world and knowledge of genre conventions...to solve game world problems," the game assumes players have a familiarity with the act of scrolling on a touch screen, and will scroll to read more of the story (Fagerholt & Lorentzon, 2009). It may not be immersive in the sense of making the player feel they are in a
richly detailed world, but the point of using the scrolling mechanic is that it does not get in the way of the narrative; it is intuitive to anyone who has ever read something on their smartphone.

It is not enough for the controls to be intuitive, however; they must also be usable, and to feel good. The latter is especially important given that the interaction is so strictly limited; if the scrolling feels slow or laggy, there is only the narrative to keep the player’s attention. But before it can feel good, it must be usable, and before usability can be assessed, it needs to be functional (Nielsen, 1993). Once it is functional, then it can be evaluated. User testing—though in my case, it can also be considered playtesting—is key to evaluating a UI; unlike many sorts of playtesting, though, usability can be easily quantified through a rating system, such as the one Nielson suggests using the categories of learnability, efficiency, memorability, error rate, and satisfaction (1993). I was not that rigorous in my testing, but I did ask testers questions about usability as well as the feel of the game and the emotional impact of the narrative.

As for the feel of the game, Swink defines game feel as “real-time control of virtual objects in a simulated space, with interactions emphasized by polish” (2009). Real-time control is applicable to the scrollability of the elements of the game; if they do not move with the user’s finger, then the game feels laggy and slow. Due to the minimalist aesthetic, there is not a lot of room for polish (though minimalism is itself part of the polish which creates that aesthetic), but there are a few things that qualify: arrows that change color from orange to blue to indicate a correct solution to a puzzle, scrolled elements retaining some velocity when the user lifts their finger, and moveable elements such as sorted words and the tumblers of the combination lock snapping into place when let go. Color indicators provide immediate feedback that the user has done
something correctly; objects having velocity is expected from experience scrolling other things on touch screens; and snapping makes movements pleasantly precise. These all contribute to the aesthetic sensation of control Swink describes (2009); the player’s actions are directly and immediately reflected in the game.

Games with a single input are not unheard of, either; there is a whole genre of “one-button games,” often simple click-based flash games found on websites like Kongregate, or similar tapping games for mobile (e.g. Flappy Bird). Some text-based games, like A Dark Room (Townsend, 2013) and narrative games made with Twine (Klimas, 2009) can also be considered one-button games, though these too rely on clicking. Scrolling as input is more commonly found in other media—web art and webcomics, for example. I TYPE NY (Groznov, 2018) is a good example of one way to use the scrolling paradigm to create interactive art—the only way to experience it in full is to scroll, but the act of scrolling itself changes the experience. Some comics, too, are changing format to reflect their medium; many long-running or older comics still use a “comic page” format, but comics hosted on Instagram, for example, tend to separate panels into distinct images so that readers can click through each in order, and each image is clear enough to still be readable on mobile devices. Some webcomics have more fully embraced their medium—comics such as Homestuck (Hussie, 2009) use animations to enhance otherwise static pages, and the latter goes further to remove the text from the images entirely, placing it below each panel or page. Comics and images on other websites like Tumblr, where posts often come in a vertical format, take advantage of scrolling as well; an infamous example is the “Do you love the colour of the sky?” meme (2012).
Homestuck is also an inspiration for this project in terms of narrative. As a non-interactive story primarily about a video game, it presents much of its narrative text in imitation of classic choose-your-own-adventure games, while dialogue is usually in chat log form, as you might find on an instant messaging service. Its self-awareness of its medium extends into the content of the narrative as well; a popular analysis of the comic’s finale suggests that the characters escaped the unkillable “final boss” by leaving the narrative itself, causing the story to end abruptly—but leaving the villain trapped within. This is supported by a spin-off webcomic series and a series of Snapchats released shortly after the comic ended, focusing on the main characters but notably not including the aforementioned villain. An example of this in a game can be found in Undertale (Fox, 2015), where, on certain routes, a villain can send you to a past save file or cause the game to close. Upon completing the full pacifist route, if the game is opened again and a new game started, a character will plead with the player to exit as the characters have gotten their happy ending already and replaying the game will force them to repeat their “suffering.” This is a direction I explored in the narrative of this project, as the story is about an “endless” cycle of reincarnation, reflecting the endless scroll mechanic--the player enables the cycle by virtue of playing the game, and therefore choosing to stop playing is a sure way of stopping that cycle.

Stylistically, I am also taking inspiration from some Twine and experimental web games; examples are Godblood (Perry, 2015) and All Your Time-Tossed Selves (Porpentine, 2016). Both games use their interactive nature to bring the player to the realization that the character they are playing is not living in a linear way. Both also use writing that is more poetic than prosaic, therefore disguising the hints in the narrative that the characters are reincarnating or time-traveling. It creates a dreamlike experience that helps the player suspend disbelief and
become more engaged in the game. For this project, the “endless” nature of the scrolling reflects the “endless” cycle of reincarnation, and vice-versa, creating a meaningful story experience.

Fullerton et al. call "the integration of story and gameplay" a "difficult problem" and argue that attempting to solve it leads to innovation; current attempts to change game narrative according to player choices, specifically, include branching, emergent story (as in The Sims), and artificial intelligence (AI), but there are other possibilities (2008). This project attempts to make gameplay and story essentially the same; the story is what the player does, emergent but still authored, and ends when the player stops playing. When the player takes a wrong turn and must repeat a level, that itself is part of the story, too.

3. Design Plan

3.1. Game mechanics/Technical aspects

My initial design for the game, before beginning development, was a mobile game that takes swipe gestures as input. If possible, the game was to include haptic feedback as well. Most if not all movement on the screen would be vertical; the game is locked into portrait mode. Though it is a narrative game and therefore text-based as well as scrolling based, it also includes a number of puzzles and moments of interaction. Basic scrolling is pictured in Figure 1; listed below are several potential puzzles I had planned to include and other uses of the swipe input.
Figure 1. Simple scrolling

Figure 2. Combination lock

Figure 3. Split screen scrolling

Figure 4. Erasing the text
Figure 5. Sorting narrative segments

a. Combination

The narrative contains clues to the code for a combination lock (Figure 2). The player is able to scroll back to look for any clues they missed, but is not able to continue until selecting the right combination. The player does not have to enter the combination again if they scroll up past the puzzle, once it has been entered correctly.

b. Split-screen

At times, the player is able to choose the direction the narrative takes by scrolling part of the screen (Figure 3). Both choices are scrollable until one or the other reaches a certain point, causing that choice to be "locked in." The player is still able to scroll up and "unlock" the choice, until one or the other choice reaches its end; the lock then becomes permanent, even if the player scrolls back up, and the narrative is affected accordingly.
c. Erasing

When swiping up, instead of scrolling the view, the movement instead "erases" the narrative, revealing more text beneath (Figure 4). The player must erase most of the screen before scrolling is enabled again. This is not a puzzle and is used to emphasize elements in the narrative.

d. Sorting

The player is able to put small segments of the narrative in order (Figure 5). The segments cannot be scrolled off the screen until they are in order, so that the player must solve the puzzle to continue.

3.2. Narrative

The theme of the game is time, and time travel. It is written either in the style of a memoir, as someone reminiscing on their travels, or direct second person. The player character is stuck in a time loop or reincarnation cycle, and the player must figure out why they are stuck and how to break them free. Portions of the game repeat to emphasize the feeling of being stuck in the cycle.

The game is structured with five "chapters." Each one gets repeated at least once, with new information each time, up to three or five times, until the player figures out what they need to proceed. The changes are fairly subtle, but not so much as to be missable, with changes in the initial chapters being more obvious. The choices made in each chapter are still meaningful, and affect the chapter if not the rest of the game. The end of each chapter is a chokepoint so that it does not branch more than is manageable; each chapter is complete in and of itself and does not change the following chapters in a significant way. Each chapter was planned to contain at least one split-screen choice, a combination lock puzzle at the end, and one of the other possible mechanics. The first chapter talks directly to the player, telling them how to interact with the
game, and introduces the character without giving everything away. The final chapter reveals what the player should have figured out by that point: how to break the cycle. The twist is that the player's traveling is what is keeping the cycle going, and by stopping traveling and proceeding in linear time, the cycle will be broken.

The mechanics were all meant to reflect the narrative in some way. The split-screen mechanic is used for basic this-or-that choices; sorting represents “getting thoughts in order” or figuring out the character’s timeline. Erasing is used for forgetting things, choosing to forget things, or starting over, and could go against the player’s will or the character’s will. The combination lock represents figuring things out and putting the pieces together, as well as simply unlocking parts of the narrative; it may be short words instead of numbers.

3.3. Playtesting

The goal of playtesting this game was twofold: determining if the “feel” of the game mechanics is good and appropriate for the game, and looking for narrative impact. Playtesters were asked to think aloud as they play, and the questions asked afterwards were qualitative rather than quantitative. The brunt of the playtesting came prior to the narrative’s completion, so initial playtesters were asked: Does scrolling feel good? Are the puzzles intuitive? Do they “fit” in the game? Do you get stuck anywhere? What did you like about the mechanics?

4. Iterations

4.1. First Iteration

While implementing the mechanics, I first tried to use “swipe detector” code which could pass input to various other objects. It proved to be simpler and more responsive to simulate a more natural scrolling motion by letting the player interact with objects directly via touch detection. I
also found that, rather than scrolling a chunk of text up to reveal another beneath, it felt more natural to scroll up and find the next element scrolling up after it. This way it feels “endless” rather than like flipping a page. Another major change was disabling scrolling back up to read previous elements. For elements where players can proceed with wrong choices, such as during a split-screen, the scene will simply restart at the end of the path, allowing them to start over.

![Flowchart of scenes](image)

*Figure 6. Flowchart of scenes*

The narrative was also completely restructured. There are now ten scenes that are independent from each other; nine of them each lead to three other scenes, as shown in Figure 6. The tenth, representing the character’s first life, can only be accessed after the player has thoroughly explored the rest of the narrative. Rather than the player interacting directly with another character, there are two characters; one who is reincarnating, and one, who the player is playing, who is time-traveling through the other’s lives. This is not immediately obvious; the player must figure this out through clues scattered throughout the scenes.
Each scene contains two of the mechanics listed below; the combination lock, and one of split-screen, sorting, or erasing. The latter mechanics are the “puzzles” the player must solve to complete the scene, while the combination lock will lead them to another scene. The player may visit the same scene several times; some hints may not make sense to the player without the context of other scenes, so that repeating is encouraged for full understanding. This is also meant to reinforce the feeling of being “stuck in a cycle” as both characters are; ultimately, the solution that “breaks the cycle” is exiting the game, thereby stopping the narrative in its tracks.

Playtesters liked the feeling of scrolling, but got hung up on a few of the puzzles. Some tried to scroll both sides of the split-screen at the same time; I assumed for the time being that this was because the placeholder text did not make it clear there was a choice to be made, and therefore this issue required further testing. Several found the sorting mechanic unclear; they tried to scroll the whole page rather than the individual elements. The improvements to this mechanic can be found in the “Sorting” section below. Finally, players interpreted the erasing mechanic as tapping individual words to make them disappear, likely due to them having a light gray background instead of white, making them appear to be buttons. I removed the backgrounds and the text beneath them, so that the passage initially appears to be a normal paragraph of text; when swiped, instead of scrolling, some of the text will disappear and leave nothing beneath. This encourages the player to keep swiping across the screen in the desired motion to remove all erasable text. Playtesters had no problems with the combination lock, and seemed to enjoy interacting with the game.
The change to this mechanic (Figure 7), beyond the effects of the across-the-board changes mentioned above, was that it affects the narrative through simple branching. Each choice has its own follow-up attached; choices still “lock in,” and once the choice has been scrolled off the screen, the path not chosen deletes itself. Scenes with this mechanic typically have two sets of choices, and therefore four endings; one leads to a combination lock, while the rest will prompt...
the scene to restart. A concern with this design is that, given that the arrows change color in other mechanics, players may assume the choice marked with the orange arrow is the incorrect choice.

*b. Combination*

Rather than numbers, the combination lock now uses letters to spell out short words (Figure 8). Upon entering a valid code word, one of three possible each time the lock is encountered (ex. TIME, FALL, or DONE), the player will “unlock” a corresponding part of the narrative. The player will not be able to continue until selecting a working combination; since there are multiple combinations, no choices are “locked in” upon replay. Each code word refers to a different scene, which will be loaded next; unlike other elements, the lock cannot be scrolled off the screen, but a blank screen can be scrolled over it, which prompts the next scene to load. The intention was that different scenes could be added on at the end to create one seamless experience, but due to technical constraints, it was not possible.

*c. Sorting*

I added color-changing arrows, similar to those used in the combination lock, to aid the player in realizing what they should do and whether they are sorting correctly (Figure 9). This was done in response to playtesters not realizing what they should do when presented with this element; there was also a bug in this mechanic that made the elements overlap when they first appeared on screen, but it functioned perfectly otherwise. This update fixed that bug as well. In some scenes, this mechanic is conceptualized not as “sorting” but as “repeating a pattern;” functionally, there are no other changes.
d. Erasing

Rather than erasing an entire block of text, this mechanic functions more like erasure poetry; swiping erases any words the player touches, except for a few that cannot be erased, which reveal something hidden in the narrative (Figure 10). The player must erase every word that can be erased to continue. As the meta design of the game implies that the characters are “trapped” in the narrative, this mechanic hints at their only means of escape.

4.2. Second Iteration

In the interest of time, I scoped the game down significantly. Rather than ten scenes, I made five, making sure to use each of the mechanics at least once. The player proceeds through them more or less chronologically backwards, starting at the other character’s tenth life and ending at their first, though the ones in the middle (fifth, seventh, and ninth) can be visited in almost any order, as seen in Figure 11.

![Figure 11. Modified flowchart of scenes](image)
Tenth life: NEXT

The tenth life (code word: NEXT) uses the sorting mechanic. It introduces the character and the “device” that lets the player travel from scene to scene. It also clues the player in that they are trying to solve a problem that affects both of these characters—and that the device is the key. It also hints at the character having died before, implying reincarnation as well as time travel. This scene leads to LONG (5) and REND (9).

Ninth life: REND

The ninth life (code word: REND) uses the split-screen mechanic. There are four possible endings to the scene, three of which cause the scene to simply repeat if the player reaches them. The character spends most of the scene helping the player out of a tree and reflecting on the “curse” that makes them keep meeting. Two of the false endings result in the player successfully getting out of the tree and hanging out with the character; one results in the player climbing back up to where they started to try again. The correct ending, however, results in the player leaving after only this brief interaction, which reflects how the solution to the “curse” is for the player to leave the game entirely. This scene leads to LONG (5), DONE (7), and NEXT (10).

Fifth life: LONG

The fifth life (code word: LONG) uses the split-screen mechanic. Like REND, there are four possible endings, three of which are false and narratively result in the player spending more time with the character, while the correct ending cuts their meeting short. In this scene, the character recognizes the player but does not immediately place them; when they do, they tell the player about a dream in which the player shows up at the wrong time and how this hurts them. Though they try to be positive about it, it seems that subconsciously they blame the player for their predicament; the correct ending is the one in which they do not recover. Again, this foreshadows
that the solution is for the player to stop playing. This scene leads to DONE (7), REND (9), and NEXT (10).

**Seventh life: DONE**

The seventh life (code word: DONE) uses the erasing mechanic. In this scene, the character despairs of ever breaking free of the cycle they are caught in; erasing reveals that they actually dread meeting the player again, and that they blame the player for their whole predicament. This scene leads back to LONG (5) and REND (9), but also to the final scene, RUIN (1).

**First life: RUIN**

The first life (code word: RUIN) uses all three puzzle mechanics: erasing, sorting, and split-screen. Unlike the rest, it does not have a combination lock, and therefore does not lead to any other scenes. In it, the character first meets the player and requests their help, as someone malicious appears to be following them--a medium told them it was not a person, but echoes of the lives they have not lived yet. The character eventually notices the player’s device and that the shadows following them seem to have something similar; they ask if they will meet again, to which the only possible answer is yes. This leads to the character rejecting the player; when erased, the passage directly reveals that the way for the player to leave is to literally stop playing. If the player continues to scroll, the scene will simply repeat endlessly. The only way to stop is to exit the game.

**5. Discussion**

I faced several problems in the creation of this project. The first was recreating the familiar scrolling motion in Unity; built-in scrolling controls were developed for UI only, so I had to code the mechanics totally from scratch. Fortunately, most of them built on each other; the split-screen
was simple to add after basic scrolling was complete, and sorting and the combination lock had some similarities as well. Erasing was mostly unrelated, but was also fairly simple to code.

Another problem was scope. Ten scenes proved to be too much to complete by the time the mechanics were done, as they not only had to be written, but built in Unity, which was time consuming. Even cutting it down to five scenes left little time for playtesting with the narrative. Fortunately, I was still able to complete some playtesting with placeholder text, so that various UI issues were solved before adding the narrative. This did speed up the testing process somewhat.

There are a few more changes I would like to make if I continue with this project:

1. Add a fade-out effect to the split-screen mechanic on the side that is not chosen, so that as the player scrolls it is clearer that they are being locked in to that choice.

2. Change the color of the orange arrow in the split-screen mechanic so as not to confuse players as to whether a choice is correct or incorrect; also, change the backgrounds of elements following the darker-background choice to match, for aesthetic reasons.

3. Give the tumblers of the combination lock mass and velocity, so that they can “spin” freely before snapping into place, because playtesters thought it would feel better.

4. Rework the narrative to be only about time travel or reincarnation and not both. The plot, insofar as there was one, ended up muddled and vague, and a sharper focus could have meshed better with the mechanics as well; with the combination lock conceived as a time travel device, for example, the combinations could be years or times of the day, instead of code words that were largely unrelated to the scenes they referred to.
That said, even considering its faults, I am satisfied with how the game turned out. While it was rushed in some ways, I feel it proves the concept was viable: that a game could be developed purely around the act of scrolling. Playtesters felt that it was innovative, but that interacting with it still felt natural to the format. The narrative could have been integrated further, but it still felt seamlessly part of the game.

Further development of this concept could find new scrolling-based mechanics as well. I had originally planned to include a sort of “air hockey” mechanic that would allow the player to flick words across the screen; I also considered a “pulley” mechanic that would pull elements in from offscreen. Additionally, I only dealt with vertical scrolling; horizontal scrolling and movement remain unexplored. Other narrative concepts relating to the mechanics could be interesting to pursue as well.

6. Conclusion

Endless scrolling is commonly found in smartphone apps, but usually for social media or web searches. The goal of this project was to bring the endless scroll into the realm of gaming by designing a narrative game entirely around the scrolling action. The success of this attempt was evaluated mostly through techniques used to assess the usability of user interfaces, as the game has no other environment or graphics to catch the player's attention. The hope was that the familiar action of scrolling would be immersive for the player, so that the unusual format of the game would not detract from the play experience. The game took inspiration from many sources, including one-button games, web art, Twine games, and webcomics, for both mechanics and narrative, and attempted to incorporate some of the problems with narrative in games--such as
repeating a level several times before moving on to the next part of the story--into the narrative itself.

The mechanics used in this game, besides basic scrolling, were: split-screen scrolling, indicating a branching choice in the narrative; sorting small text elements into the correct order; erasing parts of the narrative to reveal a hidden message; and a combination lock that leads to other scenes. The narrative was about time travel and reincarnation, and used the mechanics, particularly the "endless" scroll and repeating scenes, to emphasize the theme. Playtesters found that the act of scrolling felt good, and the mechanics were enjoyable; the narrative fell somewhat flat, but nevertheless integrated well with the mechanics.

Scope and my coding ability were major issues for this project, the latter of which caused delays that interfered with the former. However, the game works as a proof-of-concept, and there is plenty of room for further development. Additional mechanics could be added, and the existing ones tweaked for better usability and feel. The narrative could also be greatly improved. Overall, the project succeeded in creating a game based entirely around scrolling, with an endless theme to the narrative and mechanics that reflected that.
References


