Accessible Avatar Customizer for Social VR: BodyStorming Approach

INFR 4460U: Special Topics in Game Dev: Emerging Technologies

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***Abstract*—This paper explores the design of avatars in Social Virtual Reality (VR) that is accessible to individuals with physical disabilities as well as those who use assistive devices. Over 2 million Canadian gamers have disabilities (Wiens, 2020), emphasizing the importance of accessibility in avatar design. Our goal is to provide basic customization features for disabled individuals and persons of color while allowing for modifiable content to meet specific unaddressed needs. To accomplish this, we conducted a physical paper prototype and a body storm in Mozilla Hubs. Through testing, we identified key elements that significantly improve the overall experience for our target user.**

***Index Terms*—Accessibility, VR, Avatar, Customization**

I. Introduction

The advancement of VR technology has resulted in the need of more accessible social VR avatars that cater to a broader range of users, particularly marginalized communities. The proper representation of these users is critical to promote inclusion and participation in VR spaces. However, designing for VR comes with unique challenges and limitations. As a team with no prior experience in this area, we conducted a body storm test to gather feedback and insights. This would ensure that we accurately catered to the needs of our target users, those with physical disabilities and persons of color.

This report presents a list of critical elements necessary for accessible avatars, based on our design thinking stage of development. By organizing and ranking these elements by importance, we can prioritize the user's experience while staying within the scope of the bodystorm test. The bodystorm test will also identify gaps in our limited VR knowledge and inspire us to find ways to improve the user experience. Our design had to consider not only simple customization options to allow for accessibility but also laying the groundwork for future modifiability. This can be achieved through the use of self-identification, accessories, and importing specific body parts. We hope by enabling anyone to create accurately represented VR avatars, that we can help make VR accessible for everyone, regardless of appearance. Moreover, we aim to contribute to the growing knowledge on accessible VR design and provide suggestions for future research and development.

II. Methods

When conducting our bodystorm, we employed a two-fold approach: A physical paper prototype and a digital prototype within Mozilla Hubs. To ensure that the products met the needs and values of our primary target audience, we developed a persona and designed a use case diagram to map out interactions within the system. For the physical bodystorm, we printed out each frame of the prototyped design within Figma and simulated the systems using Wizard of Oz Interactions, taking notes of the tester's thoughts and behaviors. We then conducted digital testing in Mozilla Hubs, where we created a simple VR environment to simulate interactions within our product. In addition, it is important to note that our testing process included considerations for individuals with physical and visual impairments, focusing on the customization rather than the accessibility features in the program. While we can't expand the scope to consider how certain users will access the software to its fullest extent, we implemented basic accessibility considerations to best suit their needs.

III. Results and discussion

The results of our bodystorm testing revealed some key areas where our paper prototype fell short in providing a satisfactory user experience. One issue we encountered was the lack of a UI area to view the user's avatar and see real-time changes. User feedback highlighted the negative impact of this omitted feature on the overall experience. Our digital testing in Mozilla hubs incorporated a mirror to address this issue. Feedback also indicated a lack of clarity and depth in some of our customization options and menus, such as the difference between the "body measurement" and "weight and height" nodes. Due to our limited scope, we cannot include advanced accessibility features like text-to-speech or color-blind features, which may exclude certain target users from using our software. However, moving forward, we plan to address any accessibility issues to the fullest extent to create a comprehensive product that better fulfills the needs of our target audience. With this product, we hope to improve accessibility in the VR community with further development, research, and tools.

IV. Appendices

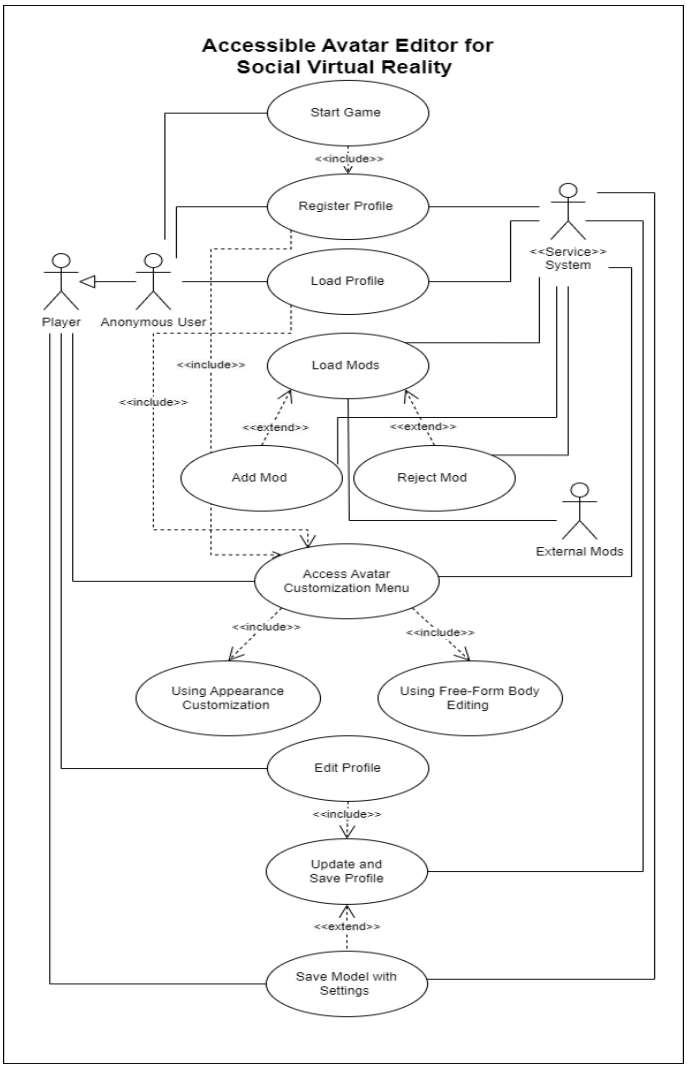

Fig. 1. Use case

A. Notes test 1:

1) Actor: Situation:

- Wants to create an avatar for themselves to use in a formal business setting for a meeting while still adhering to their appearance
- Will be discussing their personal experience and needs the avatar to represent how they view themselves

Scenarios:

- The person has already used the software before and has created an avatar. However, they need to edit their avatar to reflect the new setting (Change clothes and hair) and edit their profile information.
- The person is completely new to the software and while familiar with vr has not seen the software before. Will want to customize the avatar more extensively and sculpt the body to more realistically represent themselves.

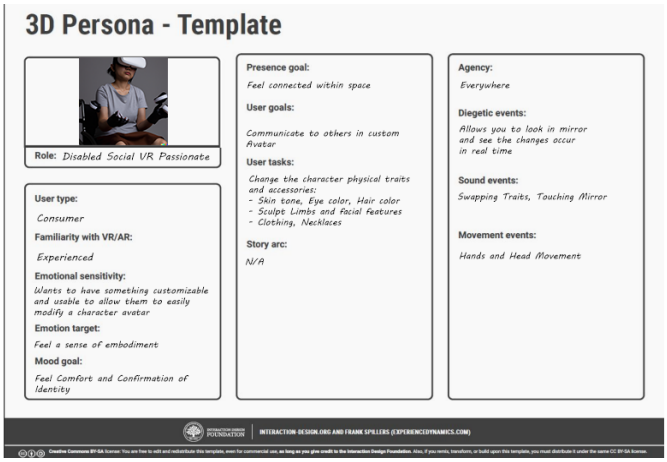

Fig. 2. Persona

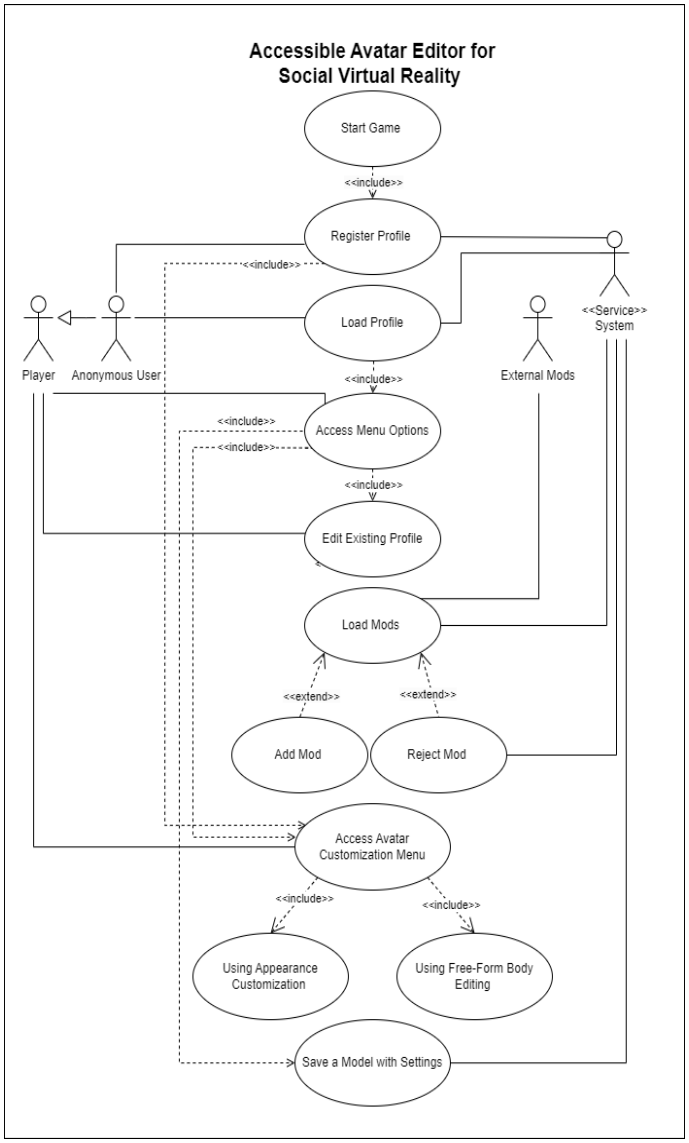

Fig. 3. Revised Use case

Possible Issues:

- Limited Elements for clothing and accessories requires importing custom assets that may not work
- May want to save different versions of the same avatar depending on the setting
- Want the option to toggle pronouns, the use of an assistive device or other visual features
- May struggle with the experience of learning the software, even if they are familiar with it as it requires some knowledge of how the modifications occurs

Possible Solutions:

- Include a wide range of elements that include a way to only import textures to allow for a unique necklace representing a community
- Saving individual profiles can be done through the new access options menu
- Using different profiles will allow them to switch the model between two different states
- Helpful question icon that will explain in text what the features is besides the feature that can be toggled on and off

2) Notes about prototype: : Unclear wording of some UI elements:

- What changes will be undone?
- "Body Measurements" and "weight and height" nodes seem like the same thing and aren't grouped clearly

Redundant UI elements:

- Redundant undo button in sculptor when there is already an undo command
- Extra menus just to save profiles and models individually instead of a "save all progress"
- Scroll bar when there is nothing to scroll

Missing elements:

- Measurements to give a sense of scale for body measurement modification.
- No distinction between upper and lower body clothes.
- No hearing aid representation.
- No differentiation between which side the accessory is on.
- No birthmark or tattoos.
- Selecting multiple accessories as they are currently mutually exclusive.
- Back button in a lot of places.

3) Observer;:

- Immediately strayed from the path and explored every other option that doesn't lead to progression just to see what it did.
- Spent next to no time on the profile editor as they selected their pronouns and gender and made a very simple description of themselves.
- Spent little time on the skin tone but spent a lot of time on facial features.
- Noted that they would have spent a lot of time on clothing but didn't because of how limited the outfits were.
- Inquired about assistive devices in depth but ultimately didn't choose any.
- Spent a decent amount of time on fashion accessories such as glasses and wristwatches and completely glossed over religious accessories.
- Stayed generally average for body measurements and set height on the higher end.
- Spend a lot of time on face sculptor but ultimately undid most decisions.
- Brushed past body sculptor.
- Explored options for limb editor but did not make any final choices.

B. Notes test 2:

1) Actor: : Situation:

- Wants to create an avatar for themselves to use in a informal setting with friends
- Wants to have a more relaxed and visually creative version of themselves

Scenarios:

- The person has already used the software before and has created an avatar. However, they want to change their clothes to reflect a new trend that has been occurring online. In addition, they want to have custom clothing with their original character on it
- The person is completely new to the software and while familiar with vr has not seen the software before. They want to spend as much as needed, customizing everything with their avatar including body proportion and customization with limbs

Possible Issues:

- Issues with the clothing not fitting on their current character body and clipping in the skin
- Want to be able to save presets for colors to use for different seasons (spooky eye colors for Halloween)
- May struggle with controlling the ui through vr with miniscule changes in color being hard to achieve

Possible Solution:

- Defining a new property to clothing which allow them to scale to the size of the user
- Create a new section to the profile which includes the current color presets in the software
- Ability to use the software on the desktop and control the changes with a mouse. Also the ability to type in color codes instead of having to find the color.

2) Notes about prototype: :

- Assumed undo in profile would do something different than what happened - Suggested removing undo.
- Noted that Skin tone should be first then facial features.
- Noticed continuity errors in menu.
- Unsure on how to deselect from the custom color: Wants it to be select where you can pick up and put something down to control the custom color. Wants to adjust individual presets rather than an overall
- Clothing based on region of body to organize.

- Was led to believe that you can only select one accessory.
- Suggested add a checkmark for things that are applied and highlight current selection
- Instead of reset to default, say reset to default type for the accessory type.
- Have numbers associated with weight and height for reference
- Undo button beside slider to show which action rather than off to the side
- For thank you message: Instead of restart, go back to the beginning. Thank you -¿ edit section-¿ start again. Exit button in middle for prominence

3) Observer::

- Have not done before option
- Added name in virtual keyboard
- Blazed through profile
- Was confused about insert text here and undo interaction
- Immediately went for the custom color editor over the presets
- Skipped over assistive devices straight onto accessories Free form:
- Small eyes and head
- Near max height
- Didn't engage too much with body and face sculptors and used it to play around a bit.
- Wanted quit option after finishing

C. Takeaways

- The functionality for Mozilla Hubs feels contrary to the actual experience using the software and as such was not suitable for this project without further development.
- The paper prototype was an effective use for our software but limited how we viewed the usability based on only focusing on UI. Allowing for a view of the user using the wizard of oz would allow for a better representation of the software. This would include a paper prototype where we slide different versions of the face, body etc in front of the mirror.
- The key issue with our project currently was scope and the optimization of the ui
- By doing this process, we have a much clearer idea of the limitation of our software and what we actually have in mind for the final product
- This also presented the issue of: What if the target user can't even use the software? And forced us to resolve that issue and understand what needs to happen

Bodystorming breakdown video: https://youtu.be/eTJ_2cq-1TM

VR prototype: https://hubs.mozilla.com/scenes/DXVrHe7

D. Contribution of Work:

Jonathan Narine:

- Completed the paper prototype
- Conducted testing for the bodystorming
- Edited and wrote for all sections of the report
- Wrote the key takeaways
- Created the Use case and Persona

Ehren Chan:

- Created Virtual Prototype on Mozilla Hubs
- Conducted testing for bodystorming
- Wrote first draft for all sections of the Report