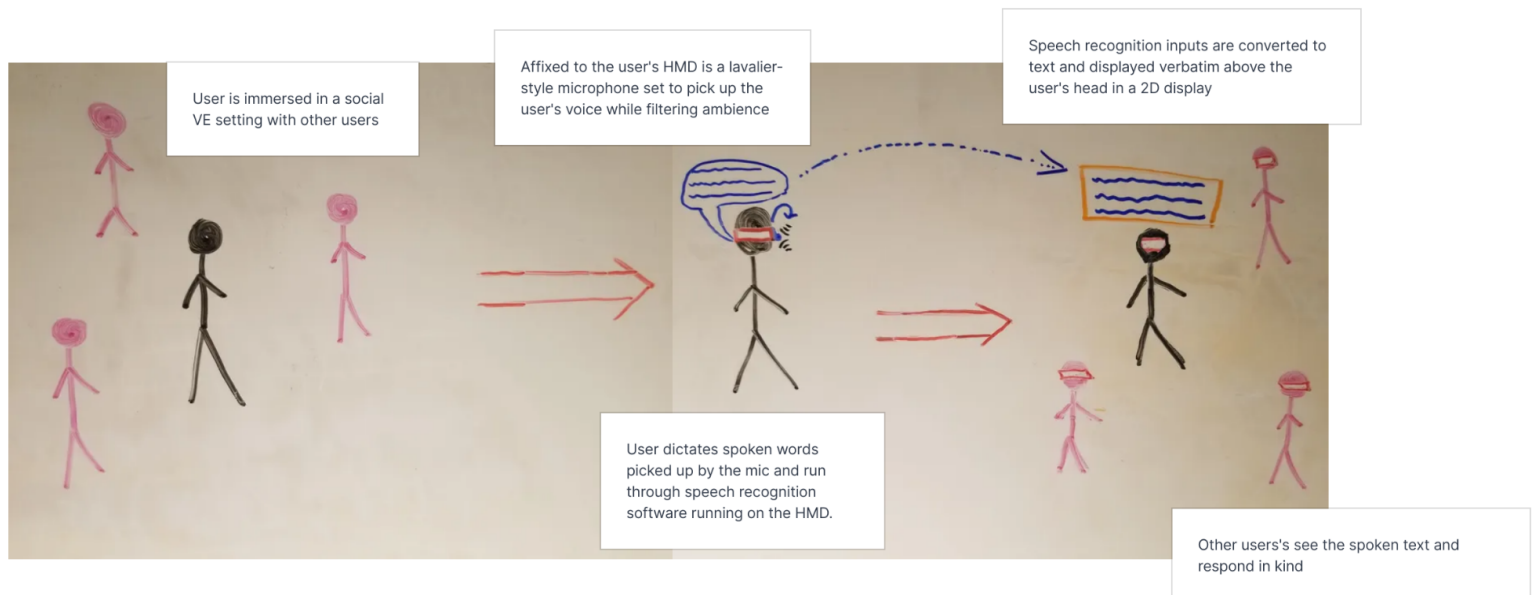
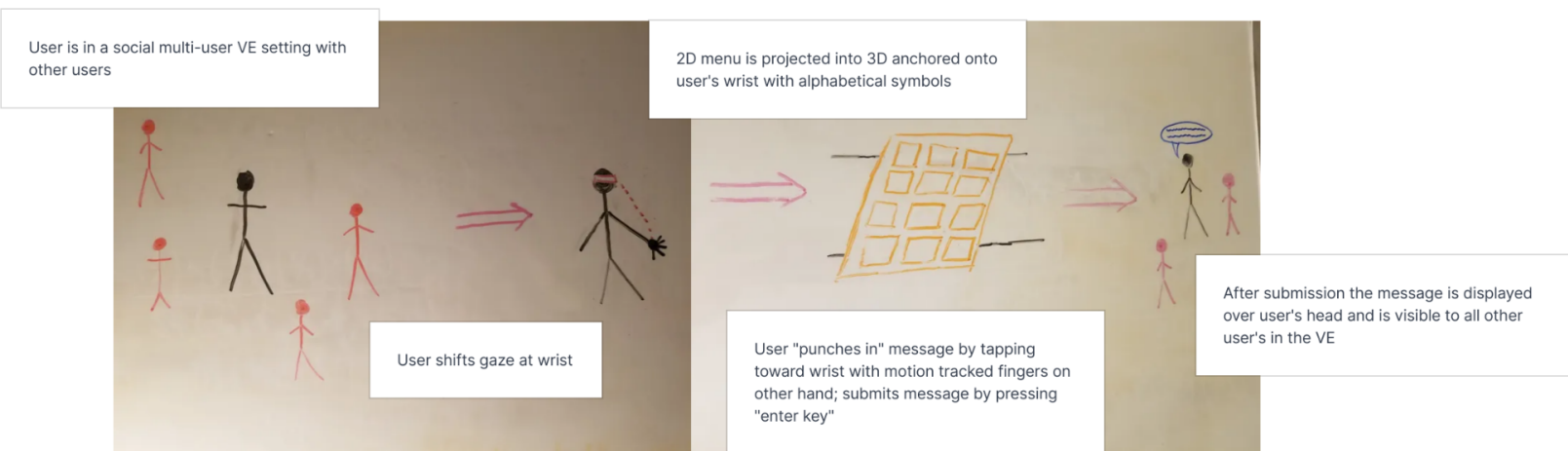


Design Exploration - Interaction Storyboards

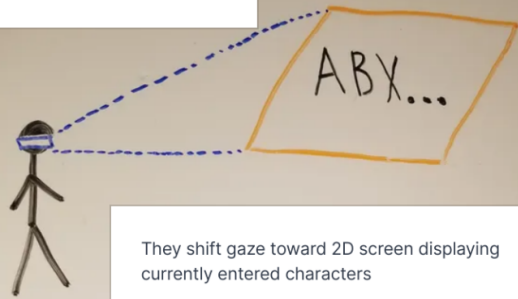
Add images of your design explorations below.

Each design exploration needs to be in the form of a storyboard that depicts the full interaction (you can think of it as a before state, an action or set of actions, and an after state).

An example of a simple interaction storyboard is [here](#). You can sketch on paper or use tools like [Milanote](#).

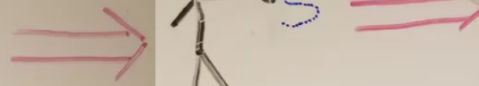


User seeks to enter an alphanumeric message in English

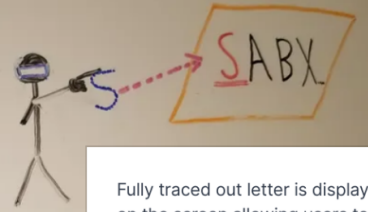


They shift gaze toward 2D screen displaying currently entered characters

User extends index finger and traces out a letter.



The HMD constructs the shape traced out by tracking the index finger and maps it to a character or number in the English language



Fully traced out letter is displayed on the screen allowing users to craft a sentence or phrase and display it




Heuristic Evaluation Guide





Perform a heuristic evaluation of the system you implemented.




Violation: How does your system violate the heuristic? Be specific.

Severity (high, medium, low): How much does this violation impact the user experience?

Recommendation: How can you fix this issue? If any of your design choices work better, mention it.

Heuristic	Violation	Severity	Recommendation
<p>1 Visibility of System Status</p> <p>Designs should keep users informed about what is going on, through appropriate, timely feedback.</p>  <p>Interactive mall maps have to show people where they currently are, to help them understand where to go next.</p>	<p>The visual aspects of the 3D interface are not responsive to selection in any way. Thus it becomes difficult to determine if a parameter slider has been selected and is ready to drag or not. This is a problem of system status because the user is unsure if they're currently engaging the system or just just moving their arms around.</p>	Medium	<p>Add outlines around UI elements when the user is hovering over a particular element with the raycast and change this color when the user actually selects (pinches) the element. For inspiration the Oculus menu system control menu does this very effectively.</p>
<p>2 Match between System and the Real World</p> <p>The design should speak the users' language. Use words, phrases, and concepts familiar to the user, rather than internal jargon.</p>  <p>Users can quickly understand which stovetop control maps to each heating element.</p>	<p>Traditional 2D interfaces usually contain descriptive information about the parameters, checkboxes, sliders, or other control knobs above the actual referenced element. The menu presented here has these positions reversed. This mismatch with conventional UI styles is confusing for the user.</p>	High	<p>Simply re-order the parameter sliders and checkbox by swapping their position with the descriptive text so that the element is below its description.</p>
<p>3 User Control and Freedom</p> <p>Users often perform actions by mistake. They need a clearly marked "emergency exit" to leave the unwanted action.</p>  <p>Just like physical spaces, digital spaces need quick "emergency" exits too.</p>	<p>There is no violation here because a crucial step is taken to ensure users can reset whatever changes they make in the app. By selecting <i>Reset</i> appearing as the last element of the interface users can reset their positions and dials to the original state.</p>	N/A	<p>No fix is needed because of the inclusion of <i>Reset</i>.</p>

<p>4 Consistency and Standards</p> <p>Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.</p>  <p>Check-in counters are usually located at the front of hotels, which meets expectations.</p>	<p>The user can elect to raise up bowling bumpers (as they are referred to) which prevent the bowling ball from leaving the lane. In our application there is a setting that allows the users to erect bowling bumpers but the parameter is called “Guard Rails”. This misnaming could be confusing and ambiguous for the user.</p>	<p>Small</p>	<p>Simply rename “Guard Rails” to their correct name of “Bowling Bumpers”.</p>
<p>5 Error Prevention</p> <p>Good error messages are important, but the best designs carefully prevent problems from occurring in the first place.</p>  <p>Guard rails on curvy mountain roads prevent drivers from falling off cliffs.</p>	<p>The vertical trajectory of the ball is controlled by the “Vertical Angle” slider but the actual height the ball travels isn’t clearly indicated depending on the perspective of the user wearing the AR glasses. The user might not realize that they are overshooting the height of the pins.</p>	<p>Medium</p>	<p>Implement a system that tracks the trajectory of the ball so that the user can see the precise height and curve of the bowling ball.</p>
<p>6 Recognition Rather Than Recall</p> <p>Minimize the user's memory load by making elements, actions, and options visible. Avoid making users remember information.</p>  <p>People are likely to correctly answer “Is Lisbon the capital of Portugal?”.</p>	<p>The only control aspect of this title revolves around the user's “pinch” motion with their index finger and thumb to select the various parameters and buttons of the interface. There isn’t any serious memorization required for this application that isn’t typical of XR applications in general.</p>	<p>N/A</p>	<p>None</p>
<p>7 Flexibility and Efficiency of Use</p> <p>Shortcuts — hidden from novice users — may speed up the interaction for the expert user.</p>  <p>Regular routes are listed on maps, but locals with more knowledge of the area can take shortcuts.</p>	<p>The inaccuracy of the tracking motion is largely a hardware-related issue but nevertheless can hamper the experience for novices and experts. Allowing the users to enter precise values for each parameter would ease the frustrating “select and drag” process for each slider.</p>	<p>Small</p>	<p>Implement a secondary option for specifying angle values with a button that displays a pop-up window allowing the user to enter via some symbolic input technique precise angle values.</p>

<p>8 Aesthetic and Minimalist Design</p> <p>Interfaces should not contain information which is irrelevant. Every extra unit of information in an interface <i>competes</i> with the relevant units of information.</p>  <p>A minimalist three-legged stool is still a place to sit.</p>	<p>At the top of the UI is a bit of text that says “Launchpad”. Initially I thought that this text was referring to a parameter slider that was located below it but later realized it was just a name for the UI. Aside from it being confusing there isn’t any useful information communicated with this.</p>	<p>Small</p>	<p>Remove the “Launchpad” text from the top section of the UI. Replace it with either the name of the application or in a stylized font to delineate it from the controls. Only include the “Launchpad” text if there are multiple menus so the user can distinguish between them.</p>
<p>9 Recognize, Diagnose, and Recover from Errors</p> <p>Error messages should be expressed in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution.</p>  <p>Wrong-way signs on the road remind drivers that they are heading in the wrong direction.</p>	<p>We encountered no system errors while testing the application. The user will not receive any system level problems unless as a result of an underlying system failure.</p>	<p>N/A</p>	<p>No fix required at the moment. Future system updates might introduce future errors, however.</p>
<p>10 Help and Documentation</p> <p>It’s best if the design <i>doesn’t need</i> any additional explanation. However, it may be necessary to provide documentation to help users complete their tasks.</p>  <p>Information kiosks at airports are easily recognizable and solve customers’ problems in context and immediately.</p>	<p>The application opens with no explanation on how to use the various features. The intuitive naming of the parameters remedies this to an extent but it isn’t immediately clear to the user how they are supposed to bowl. They would be forgiven for thinking that the physical element of mimicking a bowling swing would be a part of launching the ball but, as this is not the case, there should be an explanation for how to send the ball off.</p>	<p>High</p>	<p>Implement a tooltip-like system that onboards new users on what each parameter controls. By doing this, there will be an implicit understanding gained that this application is controlled via the “Launchpad” interface as opposed to actual physical motions.</p>