

Design Evolution Section

Modification #1: Replaced the ‘Long-Press’ Mechanism to Access Settings with a Visible Settings Icon

Before Modification: To access the settings menu, users had to long press on the OK/SELECT button on their TV remote for 5 seconds. This necessitated that the user memorize the action, and hence was a cognitive load.

After Modification: A small gear icon (⚙️) is permanently visible in the bottom-center of the mirror display. Users navigate to this icon using the remote's arrow keys and press OK/SELECT to enter settings.

Rationale: This change was proposed by both participants that underwent the paper prototype testing. The change addresses Nielsen's "Recognition Rather Than Recall" heuristic. Users now do not need to remember the hidden commands. This is especially important during their half-awake morning routines when their cognitive resources are already limited. The visual settings icon provides an affordance, in that users can recognize the gear icon as relating to settings because of their prior experience with interfaces that do that (gear icons are universally regarded as meaning "settings" in many interfaces). This change further aligns with aesthetic minimalism as the icon is kept small and unobtrusive while still being discoverable.

Modification #2: Enlarging the Text and Increasing the Contrast for All Display Elements

Before Modification: Text sizes were not uniform, and the contrast levels were also moderate. This made it difficult for users to read the information on the display at typical mirror-use distances. Further, the test users expressed their willingness to be able to view the details on the mirror from a distance.

After Modification:

- Time display: Increased to 48px+ with high contrast white (#FFFFFF)
- Weather information: Enlarged to 36px for temperatures and icons
- Calendar events: Set to 24px minimum for event descriptions
- All text uses pure white or near-white (#F0F0F0) against black (#000000) background
- Added semi-transparent backgrounds (rgba(0,0,0,0.3)) behind widgets for additional contrast

Rationale:

This modification addresses glanceability and aesthetic minimalism. During rushed morning routines, users need to read and understand information within seconds without stopping their activities. Larger text with high contrast enables peripheral vision reading and also reduces cognitive load. Further, this change improves accessibility across diverse age groups and people of varying vision capabilities. This change aligns our usability goal of familiarity by making information immediately recognizable without necessitating focused attention or squinting.

Modification #3: Reorganized Default UI Element Positions to Screen Corners

Before Modification: Informational UI elements were placed on non-corners of the screen. During paper prototype testing, users expressed that they wished the UI elements were on the screen corners so that they would have more space on the mirror for their reflections.

After Modification:

- Time & Date: Top-left corner
- Weather: Top-right corner
- Calendar/TODOs: Bottom-left area (list format)
- Settings icon: Bottom-center
- "Last updated" indicator: Bottom-right corner
- Center area: Completely clear (including edges) for maximal reflection.

Rationale: This change directly addresses our usability goal of “Use the Mirror as a Mirror” and Nielsen’s “Aesthetic and Minimalist Design” heuristic. The mirror needs to function excellently as a mirror first, with information display being a valuable secondary feature. By moving the information to the periphery, users can check their appearance while absorbing information simultaneously- using their peripheral vision. The default layout creates a natural visual hierarchy, in that corners are scanned last in typical viewing patterns, making information available without demanding attention.

Modification #4: Simplified Brightness Adjustment Control

Before Modification: If users wanted to adjust the brightness of the display, they had to navigate through multiple menu layers (opening the settings menu and then the brightness settings). This was noted to be cumbersome as user's would likely want to alter the brightness multiple times a day due to varying lightning conditions.

After Modification:

- Dedicated the volume buttons on the remote as brightness adjustment buttons.

- Each button click increases/decreases the brightness by 10%.
- Allows user to decrease the brightness to 0, effectively turning off the screen and maximizing mirror space to the full extent.

Rationale: This change addresses Nielsen's "User Control and Freedom" and "Flexibility and Efficiency of Use" heuristics. Users need quick access to brightness controls as lightning conditions change multiple times a day. Further, users should be able to "turn off" the screen by reducing the brightness to 0. This change also supports error prevention as easy brightness adjustments prevent eye-strain that could discourage users from using the mirror. This change provides users with immediate, reversible control that lets users have agency over their environment without needing to open the settings menu and navigate through it.

Modification #5: Removed "City Name" from the Weather Widget

Before Modification: Weather widget displayed the city name (e.g., "Montreal") alongside temperature and weather conditions.

After Modification: Weather widget shows only:

- Current weather icon (晴 雨 晴雨)
- High/low temperatures (H:25° L:18°)
- Chance of rain percentage (60% rain)

Rationale: This was a change suggested by both participants during the lo-fi prototype testing. It reinforces aesthetic minimalism by eliminating redundant information. This is as users already know their location, so displaying it provides zero value while consuming screen space and adding visual clutter. This aligns with the principles of calm technology: Every pixel should serve a clear purpose. Further, removing the city name reduces cognitive processing time during quick glances, supporting our usability goal of extracting information within 3 seconds. This also matches the real world practicality of checking the weather, as users care about what to where, not where they are. This change aspects users' attention and intelligence.

Modification #6: Added Ability to Move UI Elements to Wherever Users Wish

Before Modification: Users had no way to organize the UI elements to their liking. The UI elements were set-in-stone in their position, and were only hidable (by being disabled) but not movable.

After Modification: We have added a settings option called “Re-arrange Screen” that allows the user to individually select UI elements and place them wherever they wish on the screen. The system ensures that UI elements cannot go off screen.

Rationale: This modification directly addresses Nielsen’s “User Control and Freedom” and “Flexibility and Efficiency of Use” heuristics. Different users have different preferences for where information should appear based on their mirror placements/ any obstructing objects that may obstruct part of the mirror. Further, each user has a different height, dominant eye, or left/right-hand preferences. By allowing customization, we respect individual differences and allow the user to optimize the layout for their specific use case. The constraint preventing off-screen placement demonstrates error prevention, as it ensures that users don’t accidentally make information inaccessible. This modification transforms the mirror from a “one-size-fits-all” device so a personalized calm technology tool that adapts to the user rather than forcing the user to adapt to it.

Modification #7: Removed the Term “Widgets”

Before Modification: The settings menu used the term “Widgets” to refer to the informational display elements (Time & Date, Weather, Calendar TODOs).

After Modification:

- The term “Display Elements” is used instead

Rationale: During our paper prototype testing, users expressed that they did not understand what the term “widget” meant. The term “widget” is technical jargon that may confuse non-technical users. Many users (particularly older adults or those less familiar with digital interfaces) may not understand the term “widget” thus it contributes to cognitive load. By using plain language- “Display Elements”- we speak the user’s language with concepts that they already understand from everyday life. This change addresses Nielsen’s “Match Between System and Real World” heuristic, and improves overall familiarity. It also ensures that the settings are immediately understandable without needing to consult documentation- supporting our goal of zero-documentation daily use.