Virtual Notes: Projected Note-Taking System Design

Yiran Lu
yl8558@rit.edu

Follow this and additional works at: https://scholarworks.rit.edu/theses

Recommended Citation

This Thesis is brought to you for free and open access by RIT Scholar Works. It has been accepted for inclusion in Theses by an authorized administrator of RIT Scholar Works. For more information, please contact ritscholarworks@rit.edu.
Virtual Notes
Projected Note-Taking System Design

Yiran Lu

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of Masters of Fine Arts in
Visual Communication Design

Rochester Institute of Technology
College of Imaging Arts and Sciences
School of Design
Rochester, NY

December 13, 2017
Thesis Title

Virtual Notes
Projected Note-Taking System Design

Committee Approval

Daniel Deluna
Chief Thesis Advisor

Signature of Chief Thesis Advisor

Date

Nancy Ciolek
Associate Thesis Advisor

Signature of Associate Thesis Advisor

Date

Chris Jackson
Associate Thesis Advisor

Signature of Associate Thesis Advisor

Date
<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>4</td>
</tr>
<tr>
<td>Thesis Statement</td>
<td>5</td>
</tr>
<tr>
<td>Review of Literature</td>
<td>6</td>
</tr>
<tr>
<td>Process</td>
<td>11</td>
</tr>
<tr>
<td>Ideation</td>
<td>12</td>
</tr>
<tr>
<td>Development</td>
<td>29</td>
</tr>
<tr>
<td>Project Deliverables</td>
<td>41</td>
</tr>
<tr>
<td>Interactive Prototype</td>
<td>42</td>
</tr>
<tr>
<td>Hardware Prototype</td>
<td>47</td>
</tr>
<tr>
<td>Demo Video</td>
<td>51</td>
</tr>
<tr>
<td>Evaluation and Conclusion</td>
<td>55</td>
</tr>
<tr>
<td>Evaluation Plan</td>
<td>56</td>
</tr>
<tr>
<td>Feedback and Conclusion</td>
<td>60</td>
</tr>
<tr>
<td>Appendix</td>
<td>62</td>
</tr>
<tr>
<td>Copy of Proposal</td>
<td>63</td>
</tr>
<tr>
<td>Survey</td>
<td>107</td>
</tr>
<tr>
<td>Persona Images</td>
<td>109</td>
</tr>
<tr>
<td>Bibliography</td>
<td>111</td>
</tr>
</tbody>
</table>
Abstract

Currently, traditional devices such as paper, notebooks and textbooks, and electronic devices such as computers and tablets, are the most common media people choose to take notes on. However, there is no device designed only for note-taking with full functionalities. The project Virtual Notes is designed for people to have a much better, effortless experience on taking notes. Implemented with projector, sensor and camera, Virtual Notes offers users a projected note-taking platform. With Virtual Notes, users can take notes on desks, paper or even textbooks without actually leaving a single mark.

The thesis project is undertaken independently and engaged in design research and methodologies, modeling, prototype iterations, and presentations. The project is broken into four main phases — a problem definition and research phase, an ideation / prototyping / modeling phase, a testing / critique iteration phrase, and lastly, a final development of prototype phase. The final deliverables comprise of a testable prototype and a creation of presentation materials.

Key terms: virtual reality, notes, projector system, IR camera, UI/UX, modeling, motion graphics, branding, industrial design
Thesis Statement

This project addresses the overall problem of the inconvenience caused by two different methods during the note-taking process. As for the traditional platform — paper, notebook or textbook, the notes are always not editable and messy if edited in several times, which takes users much more effort to recall the contents from the notes. Specifically, Some students found it preferable to take notes on the textbook for its convenience and effectiveness. As many students want to keep their textbooks clean, in consideration of collection or the condition that the textbooks are borrowed, the only way is using sticker notes, which is obviously messy and makes users easy to get lost.

The electronic platform — computers or tablets, also has lots of shortcomings. Take Evernote, the most commonly used iPad note-taking app for example. As it is restricted with iPad, the size of the note-taking area is limited. On the other hand, the cost of taking notes is much higher than traditional devices. Moreover, users can easily get distracted by other iPad apps or games when they are taking notes on the same device, which lowers the work efficiency. What is more, as the most important point, users cannot combine notes from Evernote with textbook content directly.

To solve the problems described above, the objectives of Virtual Notes functionality design are:

1. Make it possible and user-friendly to load, edit, save, upload and share different notes
2. Make it easy to write on any horizontal or vertical platform, including desk, textbook or wall
3. Make it possible to expand working area in a reasonable range
4. Keep the costs to the lowest
Design and Implementation of Low Cost Projection Based Interactive Surface
Somkuwar, Sujata, Ranjana Shendel, A. Tayal, and G.H. Raisoni
International Journal of Engineering Trends and Technology
February 2014

This article briefly introduced the technique of projection and the human interaction implemented on hand wearable system. It showed a brief work-flow of how the projector, sensor, camera, and micro-controller worked as a system.

GoodNotes App
Time Base Technology Limited
http://www.goodnotesapp.com

GoodNotes is an app is designed for iPad Pro user to take notes. It supports the Apple Pencil for pressure sensitive writing. Users can create different notebooks, just like one for each class or project – and then create individual pages within each notebook with various page styles. There’s also the ability to insert charts and images which comes in handy. GoodNotes also indexes the notes so users can quickly search them.

Livescribe Echo Smartpen
Livescribe, Inc.
https://www.livescribe.com/en-us/smartpen/echo

The Smartpen records everything the user write and hear. It can also replay the meetings or lectures simply by tapping on the notes and saves notes and audio recordings to user’s computer. It requires Echo Desktop software for Mac or Windows, designed notebook, ink cartridges & Smartpen cap (all the supplies have to be purchased before using the Smartpen)
Review of Literature

Technical Resources

A Virtual Keyboard Based on True-3D Optical Ranging
Du, Huan, Thierry Oggier, Felix Lustenberger, and Edoardo Charbon
Proceedings of the British Machine Vision Conference, vol. 1
January 2005

This paper comprehensively introduced the system architecture and working principles during the camera catching process of virtual projection keyboard.

Algorithms for Sensor Systems
Bar-Noy, A., and Magnús M. Halldórsson
Springer, 2013 edition
January 2013

This book introduced the fundamental theories and examples of wireless sensors, including the implementation and algorithms about Bluetooth.

Geometric Calibration of IR Camera Using Trinocular Vision
Yang, Rongqian, Wei Yang, Yazhu Chen, and Xiaoming Wu
Journal of Lightwave Technology
December 2011

This article introduced the methodology of how to calibrate IR camera to be geometrically accurate.
Review of Literature

Design Theory

**Acting with Technology: Activity Theory and Interaction Design**
Victor Kaptelinin and Bonnie A. Nardi
The MIT Press
August 2009

This book is about developing activity theory as an approach to the investigation of information technologies in the context of human practice. It also talked about how activity theory applied in the process of interaction design.

**How Bodies Matter: Five Themes for Interaction Design**
Klemmer, Scott R., Björn Hartmann, and Leila Takayama
In Conference on Designing Interactive Systems 2006

This paper drew on theories of embodiment - from psychology, sociology, and philosophy - synthesizing five themes that are particularly salient for interaction design: thinking through doing, performance, visibility, risk, and think practice. It also introduced aspects of human embodied engagement in the world with the goal of inspiring new interaction design approaches and evaluations that better integrate the physical and computational worlds.
Review of Literature

Design Methodology

Designing for interaction: *Creating innovative applications and devices*. 2nd ed
Saffer, Dan
New Riders
August 2009

Saffer provided a plain overview of the complexities of interaction design. He introduced methodologies of creating design strategies that make the design differentiated from the competition. The book also introduced how to use design research to uncover people’s behaviors, motivations, and goals in order to design for them. It also offered interviews and case studies from industry leaders on prototyping, designing in an Agile environment, service design, ubicomp, robots, and more.

The Design of Everyday Things
Donald A. Norman
Basic Books
November 5, 2013

In this entertaining and insightful analysis, cognitive scientist Donald A. Norman hails excellence of design as the most important key to regaining the competitive edge in influencing consumer behavior. Now fully expanded and updated, with a new introduction by the author, The Design of Everyday Things is a powerful primer on how—and why—some products satisfy customers while others only frustrate them.
Review of Literature

Design Methodology

Behance :: Online Portfolio
www.behance.net

This website showcases inspirational design examples, and lets users discover the latest work from top online portfolios by creative professionals across industries. It produces fresh inspirations and shows various design methodologies on different design fields, including interaction design, industrial design, branding and motion graphics.

Behance :: Product Design
http://www.industrialdesignserved.com

This website features top work in categories such as product design and industrial design.
Process
Ideation
Development
Ideation
Ideation Process

Project definition is the basis for future design and development. After the whole concept was clear, with the support of the information collected iteratively in the research process, different design methodologies were applied in the ideation process, such as brainstorming mind map and flowchart/wireframe sketching.

Design Concept

This project is focused on designing the interactive projected surface. The prototype device consists of a microprocessor, an IR camera, mini projector, a smart pen and flash memory. Signal and data are transmitted through Bluetooth and files can be uploaded via wifi or USB drives.

System Components

**Microprocessor**
Microprocessor works as a mini computer. It sends and receives signals and data from the projector, camera and pen.

**IR Camera**
The camera keeps capturing the projected interface and tells the microprocessor to display the updated interface.

**Mini Projector**
The mini projector projects the virtual interface on any surface. It gets information from the microprocessor.

**Flash Disk**
When the user wants to save, load or delete the note files, the microprocessor will read and write on the flash disk. Data from memory in the flash disk can upload to other devices through USB or wifi.
Ideation Process

System Components

**Smart Pen**
When users write with the smart pen on the projected interface, the sensor on the pen tells its position to the microprocessor.

In addition to the virtual interactive buttons on the projected interface, there are four physical buttons on the smart pen designed to integrate the whole functionalities:
- **Backward button**: click to undo any actions.
- **Forward button**: click to redo any actions.
- **Select button**: hold to keep in selection mode. In that mode, the user can select and move any objects or texts on the interface and also reposition or resize the interface.
- **Menu button**: click to hide or show the menu.

Figure 1: Ideation of Smart Pen
Ideation Process

System Components

**Integrated Projector**
The microprocessor, the camera, the projector and flash disk are assembled to be an integral whole, which named as "integrated projector". As is shown below, the integrated projector has an adjustable base to fit the height of any book that user wants to take notes on and the adhesive bottom makes it easy to adhere to any horizontal or vertical surface.

![Figure 2: Ideation of Integrated Projector](image)

**Figure 2: Ideation of Integrated Projector**
Building mind map is the first step of project definition process. The diagram shown below is the simplified mind map.

Figure 3: Concept Mind Map
Ideation Process

Organization Flowchart

This is a simplified organizational flowchart of Virtual Notes. Microprocessor works like a computer. It sends and receives signals and data from the projector, camera and pen. When users write on the projected interface, the sensor on the smart pen tells its position to the camera and then the camera capture the interface and let the projector display the new status of the interface. When the user wants to save, load or delete the note files, the microprocessor will read and write the memory. And data from memory is able to upload to other devices through USB or wifi.

Figure 4: Organizational Flowchart
Ideation Process

<table>
<thead>
<tr>
<th>User-End Process Flowchart</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part I</strong></td>
</tr>
<tr>
<td><strong>Setup and Adjustment</strong></td>
</tr>
<tr>
<td>Take the smart pen out of the device to switch on the integrated projector. Adhere the projector to the surface and then adjust the height of the base to fit the height of the textbook.</td>
</tr>
</tbody>
</table>

| **Part II**                |
| **Writing and Editing**    |
| Use the smart pen to take notes and interact with the menu panel. The panel includes four main parts: file management, edit, tool selection, and settings. There is also a tutorial for the new user. Specifically, in the file management section, users can sync the note to the desired device via Bluetooth/wifi/physical connection. |

| **Part III**               |
| **End**                   |
| Insert the smart pen back to the device to switch off. Detach the projector from the surface. |
Ideation Process

User-End Process Flowchart

Figure 5: User Flowchart
As the main part of the projected interface, the menu panel can be divided into four parts:

The first part is file panel, which includes six functions: open a new file, open an existing file, save the file, upload the file, delete the file and retrieve the file. The confirmation window will pop up once “delete” icon is tapped, and file direction window will appear on the interface once “open” icon is tapped.

The second part is edit panel. The user can go backward or forward of the action and also clear the document. The confirmation window will pop up before the “clear” function is activated.

The third part is tool panel. It consists of a color palette, which is able for the user to select colors and save the chosen color, and two resize bars to change the size of brush and text.

The last part is preferences panel. The user can adjust the brightness of the screen, select preferred theme color, and languages.
Figure 6: Wireframe - Menu Divided by Functions

The left part is the projected surface for note taking, and the right part is the menu panel. The menu panel is divided into six parts:

1. Status bar: displays time and power.
2. File panel: create a new file, open files, save the file or save as a copy and sync the file to user’s computer.
3. Edit panel: copy/paste items and clear the content.
5. Tool settings panel: set parameters of the selected tool.
6. System settings panel: adjust the brightness of the interface and select preferred languages.
Figure 7: Wireframe - File Panel
Ideation Process

Wireframe

Select tool & tool settings panel

Figure 8: Wireframe - Tools Panel 1
Ideation Process

Select tool & tool settings panel

Figure 9: Wireframe - Tools Panel 2
Figure 10: Wireframe - System Settings Panel
target audience
persona 1

Alvin Schneider

"Perfection is not attainable, but if we chase perfection we can catch excellence."

Age: 46
Gender: Male
Nationality: Germany
Work: Creative Director
Marital Status: Married, 2 kids
Location: Düsseldorf, Germany

Personality

<table>
<thead>
<tr>
<th>Ambitious</th>
<th>Creative</th>
<th>Good Sense of Humor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introvert</td>
<td>Extrovert</td>
<td></td>
</tr>
<tr>
<td>Analytical</td>
<td>Creative</td>
<td></td>
</tr>
<tr>
<td>Conservative</td>
<td>Liberal</td>
<td></td>
</tr>
<tr>
<td>Passive</td>
<td>Active</td>
<td></td>
</tr>
</tbody>
</table>

Motivations

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Fear</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Goals

- Take notes on any surface.
- Want an interactive note-taking tool.
- Notes can be shared and edited by every team member.
- Want to take notes on printed design.

Frustrations

- Post-it notes are easy to be gone after the meeting.
- Using pens to write comments on printed design could easily get messy.
- Sharing notes with others, which is almost the daily task, is not always convenient.
- Lots of products just have English version.

Figure 11: Target Audience Profile: Alvin Schneider
Ideation Process

Target Audience
Persona 2

Emma Zhang

“Believe you can and you’re halfway there.”

Age: 19
Gender: Female
Nationality: China
Work: College Student
Marital Status: Single
Location: Tokyo, Japan

Personality

- Direction: Extrovert
- Analytical: Creative
- Conservative: Liberal
- Passive: Active

Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social

Goals

- Take notes on books.
- Want a lower priced (compared with iPad) product to take notes.
- Get excellent grade in school.
- Want to keep my own books clean.

Frustrations

- Cannot take notes on borrowed books.
- Limited budget.
- Notes could easily get messy if revised in multiple times.
- Lot of products just have English version.

Figure 12: Target Audience Profile: Emma Zhang
Ideation Process

Target Audience
Persona 3

Jeremy Brown

“Change your thoughts and you change your world.”

Age: 22
Gender: Male
Nationality: United States
Work: College Student
Marital Status: Single
Location: Rochester, NY, U.S.A

Personality

<table>
<thead>
<tr>
<th>Introvert</th>
<th>Extrovert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical</td>
<td>Creative</td>
</tr>
<tr>
<td>Conservative</td>
<td>Liberal</td>
</tr>
<tr>
<td>Passive</td>
<td>Active</td>
</tr>
</tbody>
</table>

Motivations

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Fear</th>
<th>Achievement</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Social</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Goals

- Get excellent grade in school.
- Find a great job next year.
- Want a note-taking tool to replace his iPad.
- Want to have more fun in study work.

Frustrations

- Always fail to concentrate in class.
- Too addicted to games and the internet.
- Bad handwriting.
- Tried smartpen, but too expensive.

Figure 13: Target Audience Profile: Jeremy Brown
Development Process

In the previous stage, the functionalities and the whole structure of Virtual Notes had been figured out. Then in the development process, visual elements and the layout style were designed with the principle of “keep it simple”. The content was critiqued and refined iteratively before jumping into the interactive prototype design and implementation process.

Color Palette

White (#FFFFFF)
For borders, icons and text
Neat and simple
Distinctive on different surfaces

Green (#96FF96)
For regular icons and interactive instructions
Meanings of energy and safety

Red (#FF6464)
For the warning icon
Meaning of warning
Sans serifs are always preferable for their simplified letterforms, which make them easier to recognize. Montserrat and Helvetica, as two excellent sans serif fonts, are used in this project.

**Typeface for the prototype**
Font Name: Montserrat Light

```
ABCDEFGHIJK
abcdefghijk
0123456789
```

**Typeface for title in the demo video**
Font Name: Montserrat Bold

```
ABCDEFGHIJK
abcdefghijk
0123456789
```

**Typeface for descriptive text and slogan in the demo video**
Font Name: Helvetica Neue LT Std 47 Light Condensed

```
ABCDEFGHIJK
abcdefghijk
0123456789
```
Development Process

Icon Development

To show the icons in the interface clearly, which are designed in white color, all of them are set to black color in this document.

Figure 14: Icon Design Sketches

Figure 15: Icon Family
Development Process

Icon Development

**New**
Section: File
Function: Create a new file

**Open...**
Section: File
Function: Open an existing file

**Save**
Section: File
Function: Save current file
Development Process

Icon Development

File Saved
Section: File
Function:
Indicate that the current file has been saved

Save As...
Section: File
Function:
Save current file as a new file

Sync
Section: File
Function:
Sync and share current file
Development Process

Icon Development

Help
Section: File
Function:
Enter/exit help mode

Copy
Section: Edit
Function:
Copy selected object

Paste
Section: Edit
Function:
Paste copied object
Development Process

Icon Development

**Clear**
Section: Edit
Function:
Clear everything on current page

**Layer**
Section: Edit
Function:
View and edit layers

**Locked**
Section: Edit
Function:
Indicate that the interface has been locked. Tap to get it unlocked.
Development Process

Icon Development

**Unlocked**
Section: Edit
Function:
Indicate that the interface has been unlocked, which means it can be resized and repositioned. Tap to get it unlocked.

**Brush**
Section: Tool
Function:
Draw on current file

**Text**
Section: Tool
Function:
Type on current file
Development Process

Icon Development

**Eraser**
Section: Tool
Function:
erase any projected objects, color or text.

**Paint Bucket**
Section: Tool
Function:
Set background color of current file

**Shape**
Section: Tool
Function:
Select from 6 kind of shapes and draw the shape on current file
**Icon Development**

**Highlight**
Section: Tool
Function:
Highlight text on the physical resource (books, notes...)

**Language Toolkit**
Section: System Settings
Function:
Language settings (add or remove system languages)
Development Process

Layout Style

The layout style was designed to be neat and simple since the main function of this product is taking notes. On the other hand, white was selected as the dominant color in the color palette so that the interface could be distinctive on different surfaces of any color.

Figure 16: Interface on Surfaces in Different Colors
Project Deliverables
Interactive Prototype
Hardware Prototype
Demo Video
Interactive Prototype
The interactive prototype was built in software called Flinto, which allowed the designer to activate buttons on the screen and link to any pages with various transaction effects. The prototype could be displayed on any screen.

Figure 17: Pages Linked in Flinto
Sample Screen Shots

Default Status

Opening File

Saving File
Interactive Prototype

Sample Screen Shots

Help Status

Drawing

Editing texts
Interactive Prototype

Sample Screen Shots

Setting Background Color

Pasting Copied Objects

Editing Layers
Hardware Prototype
Figure 18: Hardware Models Sketches
Integrated Projector

As is shown below, the integrated projector has an adjustable base to match the height of any book that the user wants to take notes on. When the smart pen is taken out of the projector, with the core of the projector adjusted to a certain minimum height, the projector would be switched on. It also has an adhesive bottom to make it easy for the integrated projector to adhere to any horizontal or vertical surface.

Figure 19: Integrated Projector Model
Hardware Prototype

Smart Pen

The smart pen is designed in metallic gray color, which is consistent with the integrated projector. There is a directional led light to indicate the status of the smart pen. It will be flashing when the battery of the smart pen is low, and it will be off if the smart pen is out-of-battery. Among all the four buttons on the smart pen, the select button is highlighted since it takes a crucial part in various functions of Virtual Notes, such as object selection and object copy & paste.

Figure 20: Smart Pen Model
Demo Video
Demo Video

The demonstration video is designed to show the interaction activities in a dynamic form. There are two users in this video, which represents the target audiences, a student, and an employee. Different scenarios were showcased in the video. It also introduced the use of smart pen, which is not included in the interactive prototype.

Figure 21: User Scenarios

Jeremy is taking notes on his textbook in a lecture class.

He turns to the next page.

VNO detects this action so it automatically starts a new blank note area.

Alvin sticks VNO on the wall and opens the note file he wants to present to fellow designers.

He holds the select button on the pen and drags the edge of the surface to resize it, and then he repositions the enlarged surface.

He presents the notes and interact with the notes during the discussion.

Alvin is sharing the notes with his fellow designers.

The shared file gets synced to designers’s VNO and sent to the PC of people who doesn’t have VNO.

With authorization, designers can edit the notes and real-time sync the file.
Demo Video

Video Screen Shots

Resizing workspace

Projecting on the wall

Drawing a circle

Selecting devices for sharing

Typing

Hardware model
Evaluation and Conclusion
Evaluation Plan
Feedback and Conclusion
Evaluation Plan
Evaluation Plan

Evaluation critically examines whether the project works well with the user. By collecting and analyzing information in the surveys, which are from users in different age, culture or occupation, the effectiveness of the product could be enhanced much more precisely.

Audience

**40% of the audience: design students and designers**
They can give some suggestions on the aspects of aesthetic and design.

**60% of the audience: non-design people**
As Virtual Notes designed for college students and designers, it is also crucial to get feedback from people who don’t have any design background.

Test Cases

During the design process, testing whether all functionalities are covered and work well in the interactive prototype is crucial. Here are the functionalities that were tested:

1. Guide for new user
2. Note taking
3. Note editing
4. File operation
5. Preferences & Setting
6. Error prevention & recovery

As a complement of the prototype, whether the demo video has explained the whole story and whether the information is clear enough were also tested.
User Testing

The user testing process was designed in two forms: the face-to-face interview and the survey. In the first method, interviews got started right after the users were asked to finish different test cases mentioned above. It would be precise and obvious according to their response. In the other method, it was easy to get their personal information and their feedback towards the interactive prototype and the demo video in various aspects.

<table>
<thead>
<tr>
<th>Face-to-Face Interview Questions</th>
<th>1</th>
<th>How would you describe Virtual Notes in one sentence?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>How does Virtual Notes compare to physical notebooks and iPad?</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>On a rating scale from 1 to 10; how do you rate Virtual Notes?</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>What do you like most and least about Virtual Notes?</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Which feature (or features) of Virtual Notes are most and least important to you?</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Would you use Virtual Notes to take notes?</td>
</tr>
</tbody>
</table>
## Virtual Notes
Effectiveness Evaluation

<table>
<thead>
<tr>
<th>Age</th>
<th>18-23</th>
<th>24-29</th>
<th>30-35</th>
<th>36-41</th>
<th>42+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>Designer</td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactive Prototype</td>
<td>Ineffective</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Easy to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User control and freedom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Consistency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error prevention and recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icon Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction effectiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demo Video</td>
<td>Ineffective</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Clear Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appreciate Your Comments!


Feedback and Conclusion
Feedback

After collecting and analyzing feedback from all the face-to-face interviews and surveys, the author got a clearer vision of what was effective and what could be improved about the project. Here is some typical feedback:

1 “Really like the experience and visual style.”
   According to the face-to-face interviews, more than 80% of the users indicated that they wanted to have Virtual Notes as their note-taking tool. According to the data from the surveys, 100% of the users gave 5 points to the visual style.

2 “Some icons are kind of misleading.”
   One of the users indicated that the “open” icon reminded them of a share button.

3 “Would be better if people can take notes in the interactive prototype.”
   At the end of the interview, some of the users added that it would be better if the prototype is fully interactive.

4 “Would like to see more details in the demo video.”
   Some of the users indicated that though the demo video provided clear instructions of how Virtual Notes worked, it would be better if the “file” operations were introduced in the video.
Conclusion and Refinements

Virtual Notes is a new note-taking system. The functionalities are designed purely around the note-taking task with neat, minimal visual elements, which means people won’t get distracted while taking their notes.

However, it is not only a system design; it is a lifestyle — free and sharing. It breaks limitations of taking notes: the size, the place, the platform, and the environment. It also helps people make their books note-free. On the other hand, Virtual Notes let people sync notes and share notes with others more conveniently.

As a system design project, Virtual Notes should be continued after the thesis show. The next steps of this project will be focusing on these aspects:

1. Do more research about the icon design and refine icons in the prototype.

2. Shoot more scenarios and add more details in the demo video so that the users could get more information about the experience.

3. Developing the interactive prototype with coding and real-time simulation to make it fully interactive and let the user explore the tools on the screen.
Appendix
Copy of Proposal
Survey
Persona Images
Copy of Proposal
Virtual Notes

Thesis Proposal for
the Master of Fine Arts Degree

Submitted by: Yiran Lu

Rochester Institute of Technology
College of Imaging Arts and Sciences
School of Design
MFA Visual Communication Design
Thesis Committee Approval

Chief Thesis Advisor
Professor Daniel Deluna
MFA Visual Communication Design

______________________________  ____________________________
Signature of Chief Thesis Advisor  Date

Associate Thesis Advisor
Professor Chris Jackson
MFA Visual Communication Design

______________________________  ____________________________
Signature of Associate Thesis Advisor  Date

Associate Thesis Advisor
Professor Nancy Ciolek
MFA Visual Communication Design

______________________________  ____________________________
Signature of Associate Thesis Advisor  Date
# Table of Content

Abstract 1
Problem Statement 2
Review of Literature 3
  Related Projects 3
  Technical Resource 4
  Design Theory 4
  Design Methodology 5
Design Ideation 7
  Concept 7
  Design Components 7
  Branding System 9
  Content Organization 11
Methodological Design 26
  Process Overview 26
  Anticipated Software 26
  User Persona 27
  User Scenarios 30
Deliverables 32
Implementation Strategies 33
Dissemination 34
Evaluation Plan 35
Pragmatic Considerations 36
Timeline 37
Bibliography 38
Abstract

Nowadays, the traditional device such as paper, notebook or textbook and electrical device such as computer and tablet are two most common media people generally choose to take notes. However, there is no such a device designed only for the note-taking task and provide full functionalities. The project VNO, which is short for Virtual Notes, is focused on designing for people to have a much better, effortless experience on taking notes compared to the note-taking methods mentioned above. Implemented with projector, sensor, camera and software, VNO provides user a free-range, editable note-taking environment. With VNO, users can take notes on desks, paper or even textbooks without actually leaving a single mark.

The thesis project is undertaken independently and engaged in design research and methodologies, modeling, prototype iterations and presentations. The project is broken into four main phases — a problem definition and research phase, an ideation / prototyping, / modeling phase, a testing / critique iteration phrase, and lastly, a final development of prototype phase. The final deliverables comprise of a testable prototype and a creation of presentation materials.

*Key words: virtual reality, notes, projector system, IR camera, UI/UX, modeling, motion graphics, branding, industrial design*
Problem Statement

This project addresses the overall problem of the inconvenience caused by two different methods during the note-taking process. As for the physical device — paper, notebook or textbook, the notes are always not editable and messy if edited in several times, which takes user much more effort to recall the contents from the notes. Specifically, Some students found it preferable to take notes on textbook for its conveniency and effectiveness. As many students want to keep their textbook clean in the consideration of collection or in the condition that the textbooks are borrowed, the only way to keep the textbook clean is using sticker notes, which is obviously messy and easy to get lost. As for the electrical device — computer or tablet, there are also lots of shortcomings. Take Evernote, the most commonly used iPad note-taking app for example, as it is restricted with iPad, the size of the note-taking area is limited. On the other hand, the cost of taking notes is much higher than physical device. Moreover, people can easily get distracted by other iPad apps or games when taking notes on the same device, which lowers the work efficiency. What is more, as the most important point, user cannot combine notes from Evernote with textbook content directly.

To solve the problems described above, the objectives of VNO functionality design are:

1) make it possible and user-friendly to load, edit, save and upload different notes
2) make it easy to write on any horizontal or vertical platform, including desk, textbook or wall
3) make it possible to expand working area in a reasonable range
4) keep the costs to the lowest
Review of Literature

Related Projects


This article briefly introduced the technique of projection and the human interaction implemented on hand wearable system. It showed a brief workflow of how the projector, sensor, camera and micro-controller worked as a system.

Note-taking App "GoodNotes" for iPad

GoodNotes is an app designed for iPad Pro user to take notes. It supports the Apple Pencil for pressure sensitive writing. Users have the ability to create multiple notebooks – like one for each class or subject – and then create individual pages within each notebook with varying page styles. There’s also the ability to insert charts and images which definitely comes in handy. GoodNotes also indexes the notes so users can quickly search them.

Livescribe Echo Smartpen

The smartpen records everything the user write and hear. It can also replay the meetings or lectures simply by tapping on the notes and saves notes and audio recordings to user’s computer. It requires Echo Desktop software for Mac or Windows, designed notebook, ink cartridges & smartpen cap (all the supplies have to be purchased before using the smartpen)
Review of Literature

Technical Resource

Du, Huan, Thierry Oggier, Felix Lustenberger, and Edoardo Charbon. *A Virtual Keyboard Based on True-3D Optical Ranging.*

This paper comprehensively introduced the system architecture and working principles during the camera catching process of virtual projection keyboard.


This book introduced the fundamental theories and examples of wireless sensors, including the implementation and algorithms about bluetooth.


This article introduced the methodology of how to calibrate IR camera to be geometrically accurate.

Design Theory


This book is about developing activity theory as an approach to the investigation of information technologies in the context of human practice. It also talked about how activity theory applied in the process of interaction design.
Review of Literature

Design Theory

This paper drew on theories of embodiment - from psychology, sociology, and philosophy - synthesizing five themes that are particularly salient for interaction design: thinking through doing, performance, visibility, risk, and thick practice. It also introduced aspects of human embodied engagement in the world with the goal of inspiring new interaction design approaches and evaluations that better integrate the physical and computational worlds.

Design Methodology

Saffer provided a plain overview of the complexities of interaction design. He introduced methodologies of creating design strategies that make the design differentiated from the competition. The book also introduced how to use design research to uncover people's behaviors, motivations, and goals in order to design for them. It also offered interviews and case studies from industry leaders on prototyping, designing in an Agile environment, service design, ubicomp, robots, and more.


In this entertaining and insightful analysis, cognitive scientist Donald A. Norman hails excellence of design as the most important key to regaining the competitive edge in influencing consumer behavior. Now fully expanded and updated, with a new introduction by the author, The Design of Everyday Things is a powerful primer on how—and why—some products satisfy customers while others only frustrate them.
Review of Literature

www.behance.net
Online Portfolio

This website showcases great design examples and let users discover the latest work from top online portfolios by creative professionals across industries. It produces fresh inspirations and shows various design methodologies on different design fields, including interaction design, industrial design, branding and motion graphics.

http://www.industrialdesignserved.com

This website features top work in categories such as product design and industrial design.
Design Ideation

Concept
This project is focused on designing the interactive projected surface. The prototype device consists of microprocessor, an IR camera, mini projector, a smart pen and flash memory. Signal and data is transmitted through bluetooth and files can be uploaded via wifi or USB drives.

Design Components

Microprocessor
Microprocessor works as a mini computer. It send and receive signals and data from the projector, camera and pen.

IR Camera
The camera keeps capturing the projected interface and tell the microprocessor to display the updated interface.

Mini Projector
The mini projector projects the virtual interface on any surface. It gets information from the microprocessor.

Smart Pen
When users write with the smart pen on the projected interface, sensor on the pen tells its position to the microprocessor.

Flash Disk
When user want to save, load or delete the note files, the microprocessor will read and write on the flash disk. Data from the memory in the flash disk is able to upload to other device through USB or wifi.
“Integrated Projector”
For the design ideation of product, the microprocessor, the camera, the projector and flash disk are assembled together, which is named as "integrated projector". As is shown below, the integrated projector has an adjustable base to fit the height of any book that user wants to take notes on and the adhesive bottom makes it easy to adhere on any horizontal or vertical surface.
Design Ideation

Branding System

LOGO

Logo:

VNO = Virtual Notes

Virtual Notes + Mobile = M

Concept:
Design Ideation

Branding System

Typography

LOGO

Font Name: Moon Bold

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789

APP Default Font

Font Name: Montserrat Light

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789
Building mind map is the first step of project definition process. The diagram shown below is the simplified mind map.
This is a simplified organizational flowchart of Virtual Notes. Microprocessor works as a computer. It send and receive signals and data from the projector, camera and pen. When users write on the projected interface, sensor on the pen tells its position to the camera and then the camera capture the interface and let the projector display the new status of the interface. When user want to save, load or delete the note files, the microprocessor will read and write the memory. And data from the memory is able to upload to other device through USB or wifi.
Design Ideation

User-End Process Flowchart

Part I Setup and Adjustment
Take the smart pen out of the device to switch on the integrated projector. Adhere the projector to the surface and then adjust the height of the base to fit the height of the textbook.

Part II Writing and Editing
Use the smart pen to take notes and interact with the menu panel. The panel includes four main parts: file management, edit, tool selection and settings. There is also a tutorial for the new user. Specifically, in the file management section, user can sync the note to desired device via bluetooth/wifi/physical connection.

Part III End
Insert the smart pen back to the device to switch off. Detach the projector from the surface.
Design
Ideation

Content
Organization

User-End Process Flowchart

start

adjust device

take notes

file
new
open
save
save as
sync

tool
select

edit
copy
paste

settings
languages
size of screen
brightness
(size/brush/text)

pen
forward
backward
hide/show menu
select

menu

tools

settings

settings

size

(width/brush/text)

text

text font

format

end
Content Organization

Interface Wireframe

This is the wireframe of the menu panel. As is shown below, the menu has four parts.

The first part is file panel, which includes 6 functions: open a new file, open an existing file, save the file, upload the file, delete the file and retrieve the file. Confirmation window will pop up once “delete” icon is tapped and file direction window will appear on the interface once “open” icon is tapped.

The second part is edit panel. User can go backward or forward of the action and also clear the document. Confirmation window will pop up once “clear” icon is tapped.

The third part is tool panel. It consists of a color palette, which is able for user to select color and save the chose color, and two resize bars to change the size of brush and text.

The last part is preferences panel. User can adjust brightness of the screen, select preferred theme color and languages.
Content Organization

Smart Pen Wireframe

Backward button: click to undo any actions.

Forward button: click to redo any actions.

Menu button: click to hide or show the menu.

Select button: hold to keep in selection mode. In that mode, user can select and move any objects or texts on the interface and also reposition or resize the interface.
The left part is the projected surface for note taking and the right part is the menu panel. The menu panel is divided into six parts:

1. **status bar**: displays time and power.
2. **file panel**: create a new file, open files, save the file or save as a copy and sync the file to user’s computer.
3. **edit panel**: copy/paste items and clear the content.
4. **select tool panel**: select note-taking tools.
5. **tool settings panel**: set parameters of selected tool.
6. **system settings panel**: adjust brightness of the interface and select preferred languages.
Design
Ideation

Content Organization

Interface Wireframe

The file panel
Design
Ideation

Content Organization

Interface Wireframe

Select tool & tool settings panel
Design Ideation

Content Organization

Interface Wireframe

Select tool & tool settings panel
Design Ideation

Content Organization

Interface Wireframe

System settings panel
Design Ideation

Demo Video Storyboard

The demo video combines several scenarios into a short story.

1. Show logo and tagline
2. Introduce VNO and show 3D prototype
3. In a classroom, actor takes out his textbook and VNO
4. He takes the pen out to get started and then adjusts height of the base
5. Adjust size and brightness of the projected interface
6. Take notes and edit
7. He deletes a file and confirms to delete
8. He suddenly found he made a mistake
9. There’s a retrieve function and he feels lucky
10. Class’s over. He saves and uploads file to his PC and inserts the pen back
11. Someone knocks off VNO to the ground
12. Time stops. Introduce the structure and material of the device
Design
Ideation

Content
Organization

Demo Video Storyboard

1. Show logo and tagline
2. Introduce VNO and show 3D prototype
3. In a classroom, actor takes out his textbook and VNO

4. He takes the pen out to get started and then adjusts height of the base
5. Adjust size and brightness of the projected interface
6. Take notes and edit
### Design Ideation

#### Content Organization

<table>
<thead>
<tr>
<th>Time Code</th>
<th>Topic</th>
<th>Visual Element</th>
<th>Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00 - 0:05</td>
<td>Project Title</td>
<td>logo &amp; tagline</td>
<td>“VNO: a new era of note taking”</td>
</tr>
<tr>
<td>0:05 - 0:15</td>
<td>Ideation</td>
<td>3d prototype</td>
<td></td>
</tr>
<tr>
<td>0:15 - 0:30</td>
<td>Setup</td>
<td>in a classroom, actor sit down in front of a table and take out his textbook and VNO from his backpack, then take the pen out of the device to setup</td>
<td></td>
</tr>
<tr>
<td>0:30 - 0:35</td>
<td>Setup</td>
<td>actor opens the book and adjust height of the base &amp; position of the interface</td>
<td></td>
</tr>
<tr>
<td>0:35 - 0:40</td>
<td>Functionalities</td>
<td>change size &amp; brightness</td>
<td></td>
</tr>
<tr>
<td>0:40 - 0:45</td>
<td>Functionalities</td>
<td>start takings notes on book</td>
<td></td>
</tr>
<tr>
<td>0:45 - 1:10</td>
<td>Functionalities</td>
<td>edit note, type, add shapes, highlight notes, change color and size of brush</td>
<td></td>
</tr>
</tbody>
</table>
### Design Ideation

#### Content Organization

<table>
<thead>
<tr>
<th>Time Code</th>
<th>Topic</th>
<th>Visual Element</th>
<th>Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:10 - 1:20</td>
<td>Error Prevention</td>
<td>accidentally delete notes file and then retrieve</td>
<td></td>
</tr>
<tr>
<td>1:20 - 1:35</td>
<td>Functionalities</td>
<td>save note and upload to his PC, insert pen back</td>
<td></td>
</tr>
<tr>
<td>1:35 - 1:50</td>
<td>Error Prevention</td>
<td>accidentally drop VNO to floor, time stop, show product robustness, hit floor but still fine, actor smily gets it back</td>
<td></td>
</tr>
<tr>
<td>1:50 - 2:00</td>
<td>Functionalities</td>
<td>actor goes back home, open his PC and review the notes</td>
<td></td>
</tr>
<tr>
<td>2:00 - 2:30</td>
<td>Environment</td>
<td>use product on wall, desk, floor &amp; ground</td>
<td>“You can use VNO wherever you want”</td>
</tr>
<tr>
<td>2:30 - 2:35</td>
<td>Ending</td>
<td>logo</td>
<td>“VNO, your choice for notes”</td>
</tr>
<tr>
<td>2:35 - 2:40</td>
<td>Credit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Methodological Design

Process Overview
1. Project definition
2. Talk with advisors
3. Collect information & Research
4. Brainstorming & Sketching
5. Draft designs
6. Critique and refinement (iterative step)
7. Testing
8. Finalize the design
9. Finish thesis proposal and presentation

Anticipated Software

Photoshop
Prototype
Documentation

After Effects
Demo Video

Flinto
Layout
Prototype

Indesign
Documentation

Sketch
Wireframe
Layout
Methodological Design

User Personal

Alvin Schneider

"Perfection is not attainable, but if we chase perfection we can catch excellence."

Age: 46
Gender: Male
Nationality: Germany
Work: Creative Director
Marital Status: Married, 2 kids
Location: Düsseldorf, Germany

Personality

- Introvert
- Extrovert
- Analytical
- Creative
- Conservative
- Liberal
- Passive
- Active

Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social

Goals

- Take notes on any surface.
- Want an interactive note-taking tool.
- Notes can be shared and edited by every team members.
- Want to take notes on printed design.

Frustrations

- Post-it notes are easy to be gone after the meeting.
- Using pens to write comments on printed design could easily get messy.
- Sharing notes with others, which is almost the daily task, is not always convenient.
- Lots of products just have English version.
Methodological Design

User Persona2

Emma Zhang

"Believe you can and you're halfway there."

Age: 19
Gender: Female
Nationality: China
Work: College Student
Marital Status: Single
Location: Tokyo, Japan

Personality

- Introvert
- Extrovert
- Analytical
- Creative
- Conservative
- Liberal
- Passive
- Active

Motivations

- Incentive
- Fear
- Achievement
- Growth
- Power
- Social

Goals

- Take notes on books.
- Want a lower priced (compared with iPad) product to take notes.
- Get excellent grade in school.
- Want to keep my own books clean.

Frustrations

- Cannot take notes on borrowed books.
- Limited budget.
- Notes could easily get messy if revised in multiple times.
- Lot of products just have English version.
Methodological Design

User Persona 3

Jeremy Brown

"Change your thoughts and you change your world."

Age: 22
Gender: Male
Nationality: United States
Work: College Student
Marital Status: Single
Location: Rochester, NY, U.S.A

Personality

Introvert | Extrovert
Analytical | Creative
Conservative | Liberal
Passive | Active

Motivations

Incentive
Fear
Achievement
Growth
Power
Social

Goals

- Get excellent grade in school.
- Find a great job next year.
- Want a note-taking tool to replace his iPad.
- Want to have more fun in study work.

Frustrations

- Always fail to concentrate in class.
- Too addicted to games and the internet.
- Bad handwriting.
- Tried smartpen, but too expensive.
Methodological Design

**User Scenario 1**

Emma wants to review the content from his textbook after class. She turns on VNO and opens the page she wants to review. After a few seconds, VNO recognizes that there is a note file combined with that page, then the notes automatically appears on that page.

**User Scenario 2**

Jeremy is taking notes on his textbook in a lecture class. He turns to the next page. VNO detects this action so it automatically starts a new blank note area.
Methodological Design

User Scenario 3

Alvin stick VNO on the wall and opens the note file he wants to present to fellow designers.

He holds the select button on the pen and drags the edge of the surface to resize it, and then he repositions the enlarged surface.

He presents the notes and interact with the notes during the discussion.

User Scenario 4

Alvin is sharing the notes with his fellow designers.

The shared file gets synced to designers’s VNO and sent to the PC of people who doesn’t have VNO.

With authorization, designers can edit the notes and real-time sync the file.
Deliverables

Interactive Prototype

The interactive prototype is based on online webpages. It gives detailed descriptions of all functions of VNO by letting user to explore numbers of interaction cases. It also gives instructions on how to prevent errors that may happen during the using process.

Demo Video

The demo video can be divided into three parts according to the contents. The first part of the video will show the design concept and ideation. For the second part, functionalities and error prevention of the prototype will be shown in the video. For the last part, it shows different environmental conditions that VNO is compatible to be used. The duration of the demo video is about 2 minutes and 40 seconds.

Device Model

The 3D device model is built and rendered in Photoshop, including the integrated projector and the smart pen. The rendered image is shown in presented documents and the rendered model is used for the demo video.
Implementation Strategies

**Design Process**

Interactive Prototype

1. Concept
2. Flowchart
3. Wireframes
4. Layout
5. Prototype
6. Test and Revision

**Demo Video**

1. Storyboard
2. Script writing
3. Record in-use videos
4. Add prototype layout
5. Add device model
6. Combine and Render
7. Revision
Dissemination

The project will be disseminated on these platforms:

1. RIT MFA VCD Thesis Show

2. Behance
   www.behance.net

3. Personal Portfolio Website
   www.yiranlu.net
Evaluation Plan

Test Cases  During the design process, testing whether all functionalities are covered and works well is very important. Here is the functionalities that will be tested:

- Guide for new user
- Note taking
- Note editing
- File operation
- Preferences & Setting
- Error prevention & recovery

Usability Survey  Survey of the prototype usability will be conducted to students from RIT and people outside RIT. The survey will include the following criteria:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention and recovery
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help effectiveness
Pragmatic Considerations

As an interaction design project, the main budget of the project will be focused on the making of demo video and the prototype evaluation. Here is the budget plan:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acting</td>
<td>200</td>
</tr>
<tr>
<td>Video Recorder Rental</td>
<td>10</td>
</tr>
<tr>
<td>Print</td>
<td>20</td>
</tr>
<tr>
<td>Transportation</td>
<td>50</td>
</tr>
</tbody>
</table>
Timeline

2015
Aug
- Determine Topic
- Research

Sep
- Design
- Ideation

Oct
- Proposal
- Design
- Prototype

Nov
- Critique & Revision

Dec
2016
Jan
- Testing

2017
Jan
- Documentation

Feb

Mar

Apr

May
- Final Defense


7. www.behance.net

8. www.industrialdesignserved.com


Survey
### Virtual Notes

**Effectiveness Evaluation**

<table>
<thead>
<tr>
<th>Age</th>
<th>18-23</th>
<th>24-29</th>
<th>30-35</th>
<th>36-41</th>
<th>42+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>Designer</td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactive Prototype</td>
<td>Ineffective</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Easy to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User control and freedom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Consistency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error prevention and recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icon Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction effectiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demo Video</td>
<td>Ineffective</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Clear Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Appreciate Your Comments!**

J. User: "Great! I want to buy it if it's real."
### Survey

#### Virtual Notes Effectiveness Evaluation

<table>
<thead>
<tr>
<th>Age</th>
<th>18-23</th>
<th>24-29</th>
<th>30-35</th>
<th>36-41</th>
<th>42+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>Designer</td>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interactive Prototype</th>
<th>Ineffective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User control and freedom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Consistency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error prevention and recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icon Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction effectiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demo Video</th>
<th>Ineffective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Appreciate Your Comments!

- Would like to see more details in the video.

#### Virtual Notes Effectiveness Evaluation

<table>
<thead>
<tr>
<th>Age</th>
<th>18-23</th>
<th>24-29</th>
<th>30-35</th>
<th>36-41</th>
<th>42+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>Designer</td>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interactive Prototype</th>
<th>Ineffective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User control and freedom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Consistency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error prevention and recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icon Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction effectiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demo Video</th>
<th>Ineffective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Appreciate Your Comments!

- Cool effects, but reminds me of Sony Playstation.

- Very cool content.
Persona Images
Persona Images

All persona profile pictures are from free stock website: https://www.pexels.com/search/people/
Bibliography


Bibliography

7. www.behance.net

8. www.industrialdesignserved.com


11. http://www.goodnotesapp.com


15. https://www.pexels.com/search/people/