

Product Requirements Document: 3D Mind Map

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1. Introduction & Vision

This document outlines the product requirements for a 3D Mind Mapping application. The vision is to create an immersive, intuitive, and visually engaging tool that allows users to organize, connect, and explore their ideas in a three-dimensional space. Unlike traditional 2D mind maps, this application will leverage 3D space to provide a more dynamic and spatially organized representation of complex thoughts and projects.

2. Core Features

2.1. Mind Map Entries ("Entry")

- **Geometry & Appearance:** Each **Entry** in the mind map will be represented as a 3D object.
 - **Shape:** A rectangular slate-shaped box.
 - **Dimensions:** [1, 1, 0.05] units in 3D space.
 - **Color:** A consistent shade of green (#4CAF50 or similar). A selected **Entry** will change to a lighter shade of green to indicate its state.
 - **Surface Texture:** A smooth, matte finish.
- **Content Display:**
 - **Summary View:** The surface of the box facing the positive z-axis will display a concise, single-line summary of the **Entry's** idea or topic. This text should be legible from a distance. The same text should appear on the opposite surface of the box, facing the negative z-axis. This ensures the Entry is readable from either direction.
- **Interaction:**
 - A single click or tap on an **Entry** selects it.
 - When an **Entry** is selected, a centered "Edit" button will appear near the bottom of its positive z-axis surface. Clicking this button opens the detailed view.

2.2. Detailed View & Editor

- **Overlay:** When the "Edit" button on a selected **Entry** is clicked, a 2D overlay will

appear on the screen, temporarily obscuring the 3D view.

- **WYSIWYG Editor:** This overlay will contain a "What You See Is What You Get" (WYSIWYG) editor.
 - **Functionality:** The editor will allow for rich text formatting, including bold, italics, underlining, bullet points, numbered lists, and hyperlinks.
 - **Content:** It will display the full, detailed text associated with the mind map **Entry**.
 - **Saving:** Changes will be saved automatically upon closing the editor.
 - **Closing:** The editor can be closed via an 'X' button or by pressing the 'Escape' key, returning the user to the 3D view.

2.3. Connections ("Connection")

- **Geometry & Appearance: Connections** between **Entries** will be visualized as cylindrical bars.
 - **Shape:** A round, cylindrical bar.
 - **Width (Diameter):** 0.01 units.
 - **Color:** The same shade of green as the **Entries**.
- **Connection Logic:**
 - **Origin/Destination:** The bar will connect from the center of either the positive or negative z-axis surface of each **Entry**. The specific surface used for connection will be determined by which surfaces are closest between the two connected **Entries**.
 - **Spacing:** The connecting bar will stop 0.5 units away from the surface of each **Entry** it connects to. This creates a visible gap, ensuring the **Entry** itself is not obscured.
- **Visual Effects:**
 - **Opacity:** When a **Connection** is partially or fully behind the camera's view (i.e., occluded by other objects or outside the direct field of view), its opacity will be reduced to **25%**. This helps maintain a sense of depth and reduces visual clutter.
- **Interaction: Connections** are not directly clickable or selectable. Their creation and removal are handled by interacting with the connected **Entries**.

3. User Interaction & Navigation

3.1. Camera Controls

- **Orbit:** Users can click and drag (or use a finger on touch devices) to orbit the camera around the central point of the mind map.
- **Pan:** Users can right-click and drag (or use a two-finger drag on touch devices) to pan the camera horizontally and vertically.

- **Zoom:** Users can use the mouse scroll wheel (or a pinch gesture on touch devices) to zoom in and out.

3.2. UI Elements & Layout

- **No Grid:** The 3D view will not include any visible grid lines or planes.
- **Help Overlay:** A persistent, semi-transparent help overlay will be displayed in the lower-left corner of the screen, listing all available camera and interaction controls. This box will have a heading of “3D Mind Map controls”.
- **Origin Indicator:** At the top of the help overlay, immediately below the heading, are 2 lines of dynamic text that indicate the camera’s current position, relative to the origin [0, 0, 0].
 - The first line starts with a dynamically-updating 2D arrow, like the hour hand of a clock, that points from the camera’s current position to the plane of the z axis, anchored at [x, y, 0]. This is followed by a dynamically-updating number of units to this plane, followed by the static text “ units to center (on z axis)”.
 - The second line starts with a dynamically-updating 2D arrow, like the hour hand of a clock, that points from the camera’s current position to the plane of the y axis, anchored at [x, 0, z]. This is followed by a dynamically-updating number of units to this plane, followed by the static text “ units to center (on y axis)”.

3.3. Add New Entry

- A clearly visible "Add Entry" button will be present in the UI. Clicking it will create a new Entry.
- If an Entry is selected, and the camera is at least 3 units away from the selected Entry, then the new entry will appear half-way between the selected entry and the camera. If not, then the new entry will appear 3 units directly in front of the camera position.
- The new entry should be selected.

3.4. Creating and Removing Connections

- The process for both creating and removing a **Connection** is a toggle action. The user first selects an **Entry** with a single click.
- While one **Entry** is selected, the user holds the Control key and clicks a second, different **Entry**.
- **If no Connection exists:** A new **Connection** is created. A small 2D overlay appears at the bottom of the screen with the message: "Connection Added. Click to remove". Clicking the text "Click to remove" will delete the newly created **Connection**.
- **If a Connection already exists:** The existing **Connection** is removed. A small 2D overlay appears at the bottom of the screen with the message: "Connection

removed. Click to undo". Clicking the text "Click to undo" will recreate the **Connection**.

- Both feedback overlays are persistent but will disappear immediately if the user moves or rotates the camera, or clicks on any **Entry**.

I will add a point to the "Move Entries" section to indicate that the temporary visual entries (ghosts) should not be stored.

Here's the updated text:

3.6. Move Entries

- Once an **Entry** is selected, A message at the top of the Entry will indicate that the user can move it by clicking and dragging.
- If the user clicks and drags or shift-clicks and drags a selected Entry, then it can be moved, as per the rules below. An Entry cannot be moved by clicking and dragging an unselected Entry. It must be selected first, and then clicked and dragged or shift-clicked and dragged.
- Regular clicking and dragging will move it around the plane that is perpendicular to a hypothetical line formed by the Entry and the current camera orientation. During this action, the cursor should change to a 4-way arrow to indicate that the user is performing a 2-axis move action.
- Holding down shift while dragging up or down will move it farther from and closer to the camera, respectively, along a hypothetical line formed by the Entry and the current camera orientation. During this action, the cursor should change to a 2-way arrow pointing up and down, to indicate that the user should move their mouse along this axis to move the Entry farther or closer.
- In both cases, navigation should occur at one-third the speed of normal camera navigation, since repositioning an Entry needs to be more precise than navigating the camera.
- Camera controls should be disabled while an Entry is being moved. This ensures that the new position of the Entry will be clear to the user.
- While the Entry is being moved, it should continue to appear at its original location, but at 75% opacity. The new position of the Entry should also appear as a temporary copy of the Entry, at 25% opacity, continuously updating its position while the user is dragging. Once the user releases the mouse button, the Entry should move to the new location, and revert to 100% opacity, and the temporary copy of the Entry should be discarded. **The state of these**

temporary visual entries should not be stored; they exist solely in the UI to assist the user with visualizing the new position. If the Entry move is completed successfully, the position of the Entry should be updated and stored. If the Entry move is cancelled, the temporary copy should disappear from the UI, and the Entry's state should not change.

- If the Esc key is pressed while moving an Entry but before releasing the mouse button, then the move action is cancelled, and the temporary copy of the Entry is discarded, and the Entry remains at its original location, and it reverts to 100% opacity.
- **Connections** will dynamically update to follow the moved **Entry**, after it has been moved. The Connection should not update dynamically while the Entry is being moved. After a successful move, the connections that involve that Entry should be updated to reflect its new location.

3.7. Delete Entries

- A "Delete" option will be available when an **Entry** is selected. Deleting an **Entry** will also remove all **Connections** attached to it.

4. Technical Considerations

- **Platform:** Web-based application, accessible through modern browsers.
- **Technology Stack:**
 - **Frontend Framework:** React.
 - **3D Rendering:** Three.js, managed through React Three Fiber with helpers from React Three Drei.
 - **UI Components:** shadcn/ui for UI elements (2D overlays, buttons, etc.).
 - **Styling:** Tailwind CSS v3 (for compatibility with shadcn/ui).
 - **WYSIWYG Editor:** A library such as Quill.js, Tiptap, or Slate.js.
 - **Database & Backend:** Supabase for database, authentication, and backend services.
- **Performance:** The application must maintain a smooth frame rate (60 FPS) even with a moderately complex mind map (e.g., 50+ **Entries** and **Connections**).

5. Future Enhancements (Post-V1)

- **Customization:** Allow users to change the color and shape of **Entries** and **Connections**.
- **Collaboration:** Real-time, multi-user editing of a single mind map.
- **Export Options:** Ability to export the mind map as an image (2D) or a 3D model file (.obj, .glb).
- **Search Functionality:** A search bar to quickly find and focus on specific **Entries**.

- **VR/AR Support:** Explore the possibility of viewing and interacting with the mind map in virtual or augmented reality.