Note: Our project follows a different path and thus we don't have a design for a project yet, instead this document will be updated as a design is created and instead be focused around our design process and potential designs. For more information please contact Rachel Shannon

4.3 Proposed Design

4.3.1 Overview

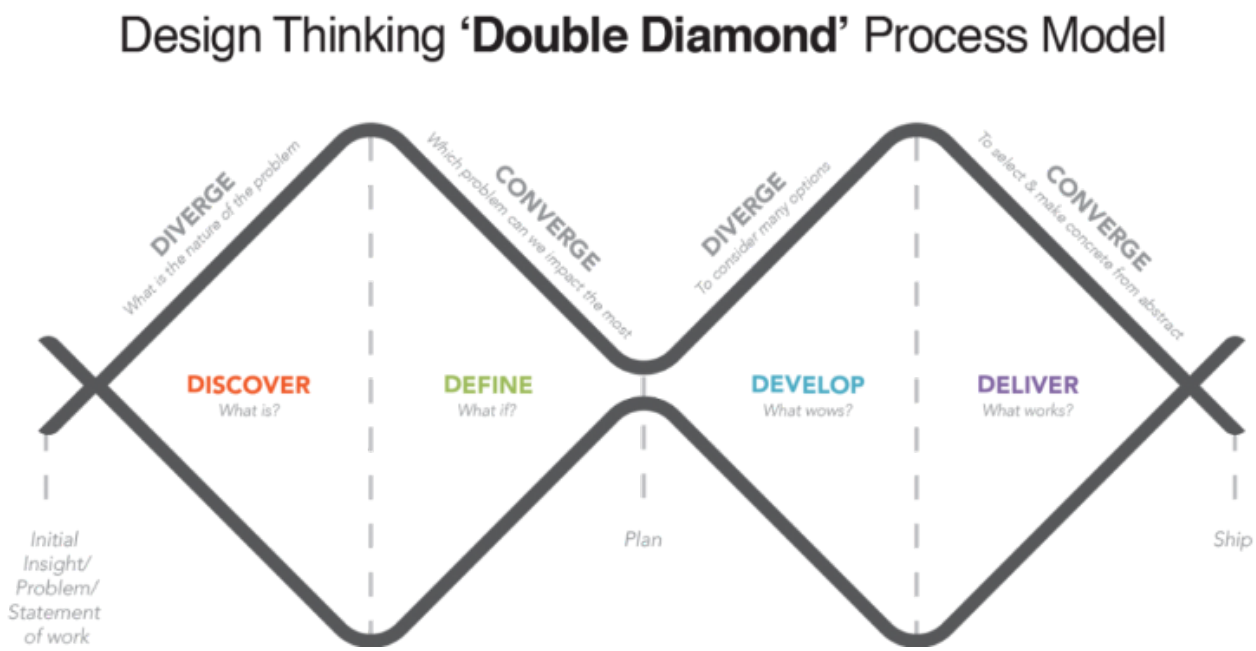
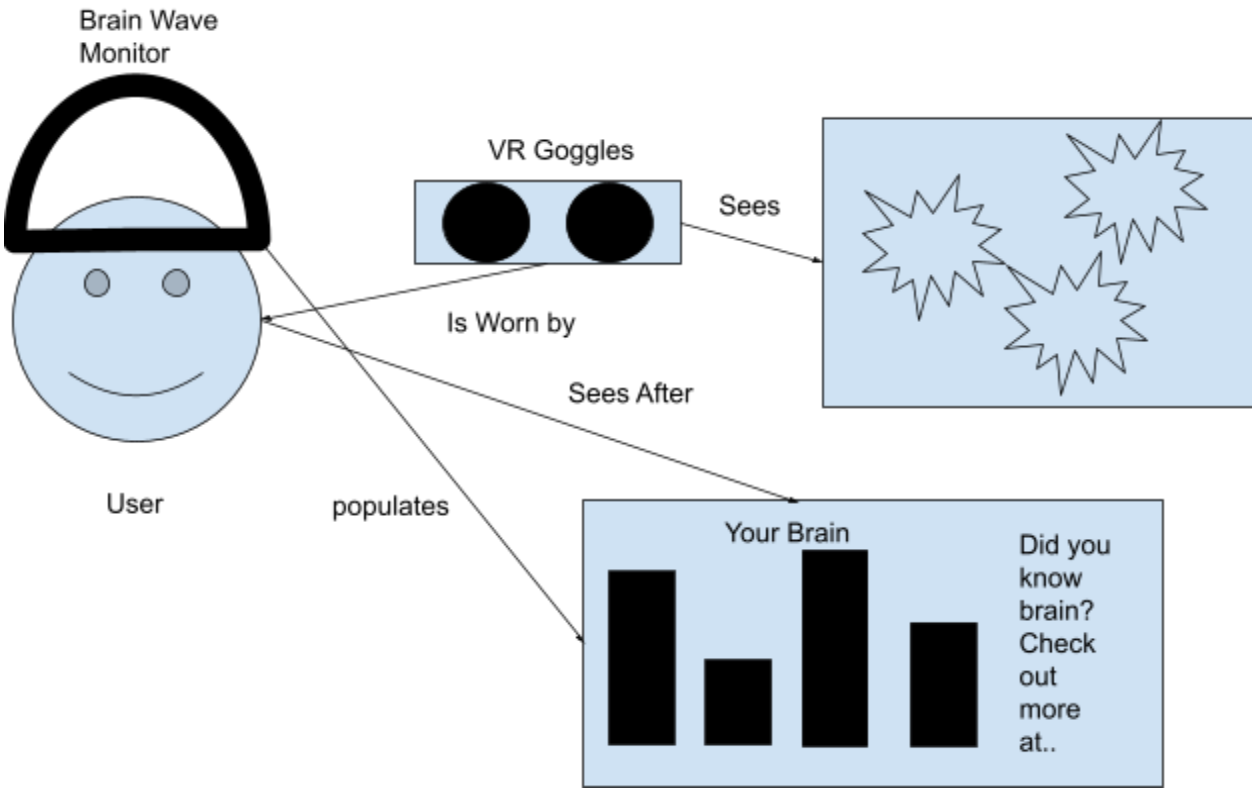


Image From https://www.redspark.io/double-diamond-o-que-e-e-como-usar/

Our design is currently following the double-diamond process. We are creating an interactive art exhibit to help gain interest in reverse engineering the brain to help improve AI. One possible design is running an escape room in VR and monitoring the user while they participate. Once the user has finished the exhibit, they will be presented with information about how their brain reacted to different moments in the simulation.



4.3.2 Detailed Design and Visual(s)

Provide a detailed, technical description of your design, aided by visualizations. This description should be understandable to peer engineers. In other words, it should be clearly written and sufficiently detailed such that another senior design team can look through it and implement it.

The description should include a high-level overview written for peer engineers. This should list all sub-systems or components, their role in the whole system, and how they will be integrated or interconnected. A visual should accompany this description. Typically, a detailed block diagram will suffice, but other visual forms can be acceptable.

The description should also include more specific descriptions of subsystems and components (e.g., their internal operations). Once again, a good rule of thumb is: could another engineer with similar expertise build the component/sub-system based on your description? Use visualizations to support your descriptions. Different visual types may be relevant to different types of projects, components, or subsystems. You may include, but are not limited to: block diagrams, circuit diagrams, sketches/pictures of physical components and their operation, wireframes, etc.

(Once again, this is just one project idea we have thought of but have not settled on. When we finish our process of creating/choosing project ideas, then we will start designing and defining our project details and intend to update this document then.) Above is a sketch of a project idea where a virtual reality headset would be placed on the user's head, along with a brain wave monitor. The VR headset would display images and sounds to the user. After the VR application has run, the user will be able to see their brain wave results and/or a comparison of their actions versus previous players' actions.

4.3.3 Functionality

Describe how your design is intended to operate in its user and/or real-world context. What would a user do? How would the device/system/etc. respond? This description can be supplemented by a visual, such as a timeline, storyboard, or sketch.

A user would wear the VR headset to see the game and use either a controller or keyboard and mouse setup to interact with the virtual environment. They would also need to wear a headband or similar item to measure brain activity. Some of the information/results will be found via psychology and statistics.

4.3.4 Areas of Concern and Development

How well does/will the current design satisfy requirements and meet user needs?

A virtual reality game that analyzes brain activity would effectively introduce the topic of reverse engineering the brain in a way that's engaging and interactive. It could have varying levels of difficulty depending on the age group of the user or the desired challenge. Additionally, a VR headset would allow users of a variety of abilities to participate.

Based on your current design, what are your primary concerns for delivering a product/system that addresses requirements and meets user and client needs?

One concern for this potential project is the financial cost. The equipment itself could be expensive to purchase and would need to be cared for appropriately to prevent any damage. Maintenance could be challenging depending on the expertise of whoever is responsible for the physical site of the exhibit. With a large number of users, the risk of accidents increases. In addition, only having one headset or setup would restrict the number of people we can reach at a time. if we can only have one person through every ten minutes (a generic estimate), we may struggle to reach people stopping by on campus.

What are your immediate plans for developing the solution to address those concerns? What questions do you have for clients, TAs, and faculty advisers?

To address these and other concerns, we plan to continue brainstorming solutions and speaking with experts. One interview with a professor with experience in mixed realities and education suggested a walkthrough-focused exhibit rather than a stop-and-go one. We have also visited interactive exhibits on campus and plan to continue exploring options in the local area.

4.4 Technology Considerations

For our proposed design above, we would be using a few different devices. To measure brain activity, we would use Muse 2, a multi-sensor headband. Although Muse 2 has open-source code for us to use, a big takeaway is that the user cannot move their head or blink--the data could be jumbled and inaccurate to what they are seeing using the HoloLens.. The HoloLens is another device we would use--an AR headset designed by Microsoft. It is free for us to use and follows a person's eyes well. However, the field of view is quite narrow. Also, due to its nature as an augmented reality (not virtual reality) headset, the level of immersion would be notably less.

We have also considered using an Oculus Quest 2 instead for greater immersion, so the potential damages are less expensive; however, we would have to buy this as there are none available to us (as opposed to the HoloLens).

4.5 Design Analysis

Discuss what you have done so far, i.e., what have you built, implemented, or tested? Did your proposed design from 4.3 work? Why or why not? Based on what has worked or not worked (e.g., what you have or haven't been able to build, what functioned as expected or not), what plans do you have for future design and implementation work? For example, are there implications for the overall feasibility of your design or have you just experienced build issues?

As stated at the top of the assignment, we are still in the process of creating ideas, choosing between them, and designing a project. Therefore, we do not have a truthful response to this question since we haven't actually built, implemented, or tested anything yet. So far, we have compiled primary and secondary research on our topic, then deep-dived into AI research, and have only briefly touched on project ideas thus far.