Team E: Stage 3 Creating

CPSC 481, FALL 2020

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TUTORIAL SECTION: T01
TEAM NUMBER: TEAM E

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1. Project Description

Our product, CARE, is an application for augmented reality (AR) glasses that would visually show a patient's relevant medical information to tending healthcare professionals. These healthcare professionals include doctors, nurses, EMTs, and any other healthcare worker who needs to see a patient's information quickly and hands-free. Users would interact with the system through specific hand movements such as swiping through X-rays as if interacting with a tablet or dragging a patient's name to the center of the screen to see a more detailed readout of their information. We expect our product to be used in various settings such as in hospitals, by paramedics responding to 911 calls, medical offices, and anywhere healthcare workers are needed. In a hospital setting, a doctor wearing the AR glasses would be able to quickly see a patient's information such as name, age, allergies, and reason for being in the hospital, while a paramedic could use the glasses to visualize the patient's vitals, condition, what first aid has been done already, and what first aid could possibly be done.

2. Updated User Tasks

Vertical User Tasks

These tasks are important to our project and have been prototyped vertically.

Task	Task Description
Display patient's vitals	Displaying in real-time a patient's current body temperature, pulse rate, respiration rate, and blood pressure.
Display patient's medical history	Pulling up a patient's medical history such as medication, allergies, previous surgeries, etc.
Check diagnostic test results	Viewing and interacting with recent and past diagnostic test results. Including diagnostic images and text information. E.g., X-rays, CT scans, Ultrasounds, Blood tests, etc.

Horizontal User Tasks

These tasks have been prototyped horizontally.

Task	Task Description
Add notes	Adding notes about a patient's progress, prognosis, treatment, etc.
To Do list	Creating to-do lists or treatment plans for specific patients.
Get visual notifications	Notifying that patients have asked for assistance through external systems and reminding workers of to-dos.

Commented [GG1]: we could probably fix the phrasing of this and say we interact with these results so we don't lose marks again

3. Storyboard

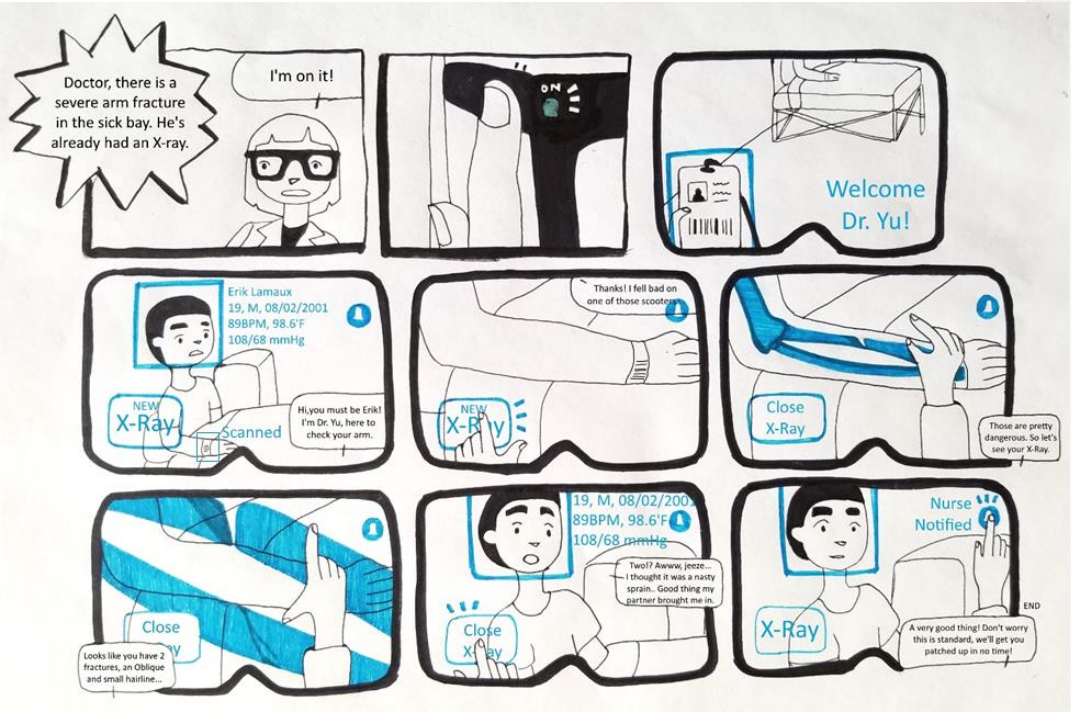

Figure 1: Storyboard based off our affinity diagram that focused on functionality (figure 7).

4. Cognitive Evaluation Discussion

For our lo-fi prototype we decided to use Balsamiq as prototyping software due to its accessibility and usefulness while remotely collaborating. In Balsamiq, we added in icons and arrows to imply hand gestures and show the AR's flow. It also allowed us to work collectively and share our ideas whereas a paper prototype would be either unsafe or have an uneven distribution of work. Each team member took different tasks and implemented them vertically or horizontally. Next, we spliced these tasks back together and walked each other through the tasks, along with a final walkthrough once the lo-fi prototype was completed.

During our cognitive evaluation we decided to add in a login screen and patient scan to show the actual flow, though in a different project we would have assumed that it was implied. However, in our situation the login screen and the patient scan utilize a lot of AR functionality in how it connects reality with technology. We chose to implement a scanning ability for identifying healthcare professional and patients as we believe that it provides a level of security to every individual. In addition, through our prototyping we realized that our original idea of scanning a patient's face to access information was less practical than thought out. This is due

to how there are many situations where facial scanning is less feasible such as with facial injuries. Scanning a patient's wrist band is unique to that individual and it is provided when they are admitted to the hospital.

While prototyping, the patient's medical history was shifted from having a separate righthand menu icon to accessing it through the top right corner ID card. We chose this because it intuitively makes sense to interact with a name for more information and it allows the UI to remain clean and minimalistic. While doing our walkthrough for the vitals task we decided to add three different views: one that took components of our depth view, one showed vitals on the side of the screen, and one that showed vitals in the middle of the screen middle. These views each have their own benefits in their detail and organization which is why we decided to include them.

During the prototyping for diagnostic test results, we added a feature that allowed users to add notations to the images. This gives practitioners a way to keep details about a certain test without having to write notes somewhere separate. With this function it allows users to be more organized and prevents users from having to keep relevant info separate.

The notes and to-do list tasks were kept identical with the original concepts as they worked intuitively during our evaluation. For notifications, instead of creating a notification sub-menu from the main cARe button, we realized it may be better to offer a toggle menu that can be accessed anytime on the left-hand side. It was also determined that an allowance of two notifications at a time would be cleanest, where the oldest notification would fade before the newest one until a new notification was added. The toggle function provides a way for users to access all notifications on the main screen instead of redirecting through sub menus.

During the task centered walkthrough for the 3D surgery, we realized that it would require enough features to become its own application and that in turn it was out of scope for our current design. Security was also found to be out of scope. We believe it was targeted more towards a security guard rather than a healthcare professional. Security was also rendered less effective by us previously removing facial recognition. For these reasons we decided to remove 3D surgery and security from our task list.

5. Reflection

Our ideation process consisted of collaborative whiteboarding sessions, idea sessions, and meetings where we had one group member draw out the ongoing group discussion on video. Overall, many things went quite well for our group including our naturally good collaboration, our consistent meetings and interactions, clear and concise prototyping communication, determination in meeting group appointed task deadlines, and our effective task delegation.

Though we did not complete this without issue, we did have difficulty in understanding affinity diagrams so much so that our group spent over 11 hours on them and multiple iterations/meetings to finally get confirmation that we created them correctly. Splitting up our prototyping ended up haunting us, as changes to individual tasks ended up affecting the entire prototype and required further group meetings to determine what to do. If we were to do this again, we would immediately try to understand affinity diagrams in depth and we would choose to collaborate more when it comes to the prototyping, so less time would be spent coalescing our individual prototypes together.

Appendix

Appendix A: Cognitive Walkthrough Documents

Table 1: Task Centered Design Walkthrough based off the Task Centered Design Walkthrough Template provided.

Task Step and Description	Does user have training or knowledge to do this step?	Is it believable that they would do it?	Are they motivated?	Comments
Login Screen Task The login task would have user's login by scanning their own medical worker ID.	Yes	Yes	Yes	This function is designed intuitively with instructions on the screen so it is likely a user can complete this. In addition, users must use this function if they wish to gain access into the system.
Scanning patient ID Gaining access to a patient's information will require users to go into the cARe icon and select the scan patient option. Once clicked, the screen displays a frame which has instructions to scan the patient's ID (which are their hospital wrist bands). Users can also choose to input the user ID using the HoloLens keyboard. Once inputted, all patient information will be displayed until a new patient is scanned or the user selects the clear function.	Yes	Yes	Yes	They would have similar knowledge because the system is like scanning and typing on a phone. We believe that they would use it and are motivated to do so because otherwise there would be no use for the system, and they would not be able to gain access to the patient's information through the system.
Viewing Patient Medical History Once a patient ID has been scanned, an ID card would be displayed in the top right-hand corner. In its smaller form it would display essential information such as name, date of birth, age, reason for staying, and date of admission. The user can then drag the ID card to the center of the screen where it would expand and show all information including the patient's medical history, such as previous visits, allergies, and other health problems. The user can the drag the ID card back into the corner to minimize the ID card.	Potentially	Yes	Yes	It is likely after one tutorial, that users would understand how to do it. This is because the swiping function is like organizing a tablet. The user would use this function as it is the only way to gain access to a patient's medical history.

Vitals task For this task, a user will need to click on the heart symbol on the right-hand side. Once clicked, the screen would display all vitals (heart rate, temperature, respiration, blood pressure, and blood oxygen level) anchored to the patient. The user with a hand swipe to move the displays to the left-hand side. The user can select the different vitals to view previous readings.	Potentially	Yes	Yes	The used may intuitively know that the heart sign is for vital, however the swiping motion would have to be taught at least once. In addition, they would use this function because it is the only way to view vitals.
Diagnostic Test Results This task allows users to check different test results and imaging such as blood tests, X-rays, and MRIs. The users would need to click the test result icon (which is the stethoscope). After a menu bar would appear on screen where they may select which test, they would like to view. After, they click a test it will open a secondary menu that would show all their tests, old and new. Only available tests are shown. Once they click on the desired test it would appear in the view. Users can have only one set of results displaying at a time. In the test images, the users may add circles indicating an area of concern. They can declare the level of concern by adding a yellow/moderate circle or a red/severe circle. It can also have a description attached to it. To do so they must drag and drop a circle and a keyboard will popup so the user can type their notes. User has the option to cancel typing the note. There will also be a back button on the left-hand side where users can click to exit the test result display.	Potentially	Yes	Potentially	It is possible after one tutorial that users would understand how to do it. This is because all functions are simple, however the addition of the circles are not completely intuitive until shown. User would use this function because it is the only way to gain access to any imaging and test results in the system.
Add Notes This task would allow users to add notes correlated to the patient currently being viewed. To use notes they must go into Notes (which is the pencil icon)	Yes	Yes	Yes	This function is like adding notes for many common UI's so it's likely users would have experience. It is similar to writing on a notepad, and users would

then select the notepad icon. In addition, there can be multiple notes and users can add notes too.				use this function when needing to write any sorts of notes.
To-Do List This task would allow users to add elements into a to-do list that is correlated to the patient currently being viewed. If a patient is not being viewed, the to-do list is associated to the user. To use the to-do list, they must go into Notes (which is the pencil icon) then select the check box icon. In addition, in to-do list there can be multiple tasks and the user may add more tasks by clicking the plus icon.	Yes	Yes	Yes	Yes, the user would have knowledge of using this task because it is similar to adding notes or making a checklist. It is easy for the user to tell which tasks have been completed, since filled in means done and empty box shows it's not finished yet. We believe they would use and are motivated to use it because it allows users to be organized and it is the only way to create a checklist in our system.
Visual Notifications On the top left-hand corner notifications will be displayed then gradually disappear. There is max two notifications on the screen at a time. Unless the user toggles the view notification switch on the top left corner which would then display all notifications with a similar layout as a phone notifications center. Both notifications are translucent.	Yes	Yes	Yes	Users would know how to use this because it is similar to a phone application layout and there is a title that indicates what the toggle switch does. As well as users would use this because it is the only way to get notifications in the system and view older ones.
3D Surgery This task allows users to simulate a surgery using AR technology, to gain access they would use the care menu and click 3D surgery.	No	Potentially	No	We believe that this function is difficult to use and therefore less likely to be used. Therefore, we believe it to be out of our scope.
Security This task allows users to verify if certain individuals have clearance to be in certain areas.	Potentially	Potentially	Potentially	This function would be nice to have however it is uncertain how many healthcare workers would have use for it. It would be more suited for a security guard, so we believe it to be out of our scope.

Appendix B: Affinity Diagram

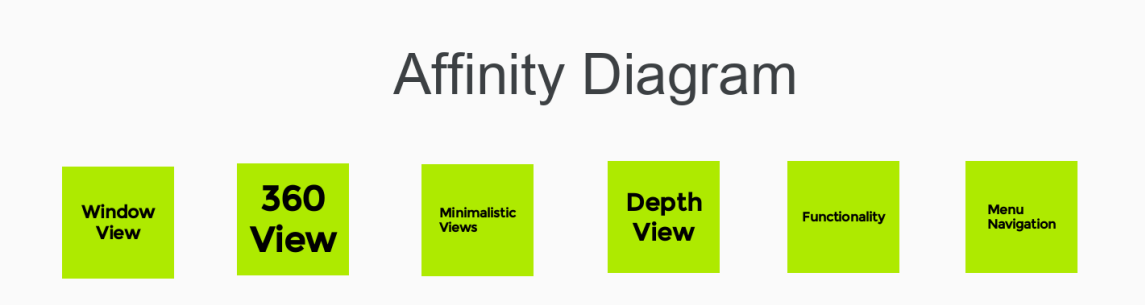

Figure 2: This is our Affinity Diagram Groups due to lack of spacing each group has its own slide. However, note that this is all one affinity diagram that would have been organized as seen above.

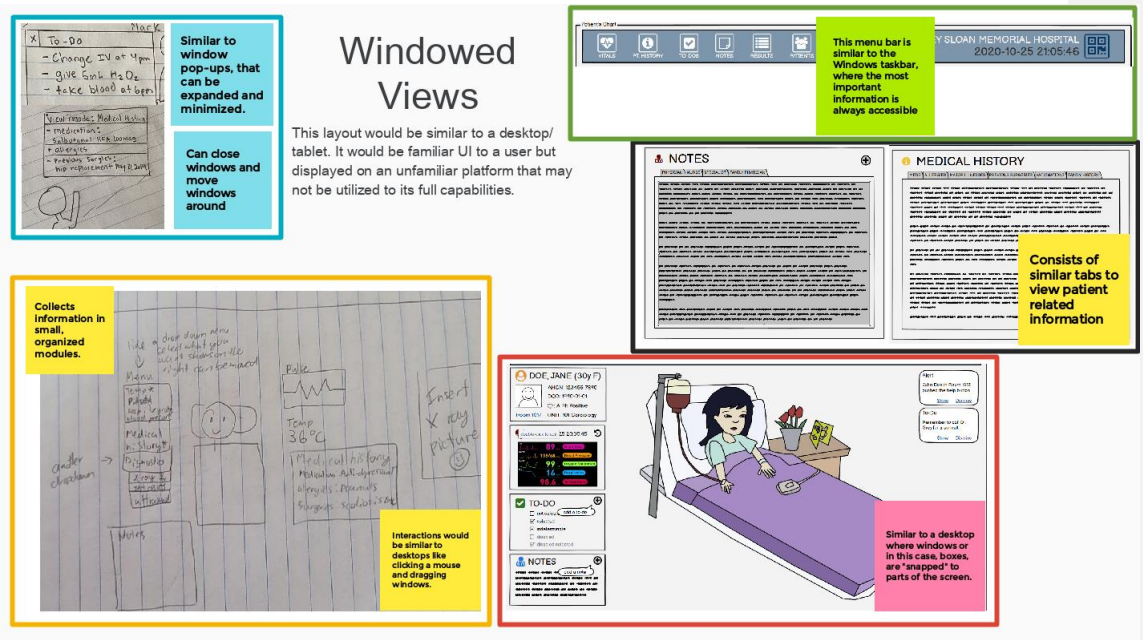

Figure 3: Windowed view. This grouping was created was in relation to the general look of our system and in turn affects all our requirements. Its weakness is that it is very blocky and not fully utilizing the AR system. Its strength is that it is intuitive since it mirrors the system of a computer. While it is feasible it lacks originality.

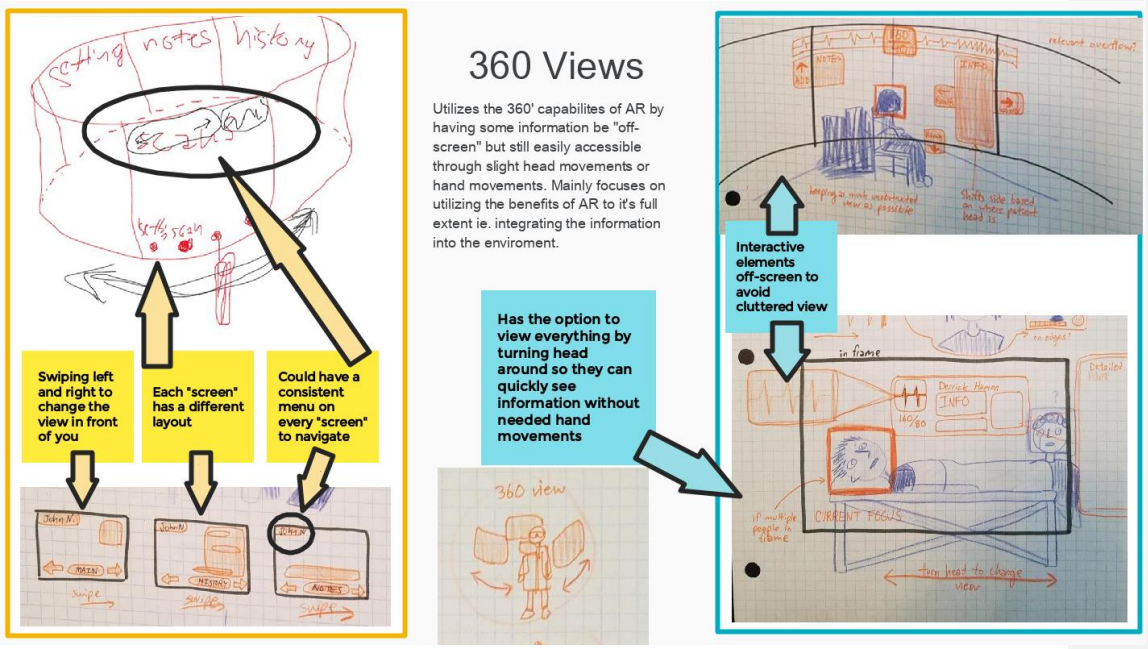

Figure 4: 360 Views. This grouping was created was in relation to the general look of our system and in turn affects all our requirements. Its weakness is that it may be difficult to use and get use to. Its strength is that it is futuristic and utilizes AR technology. The 360 view would very difficult yet feasible. In addition, it is an original group.

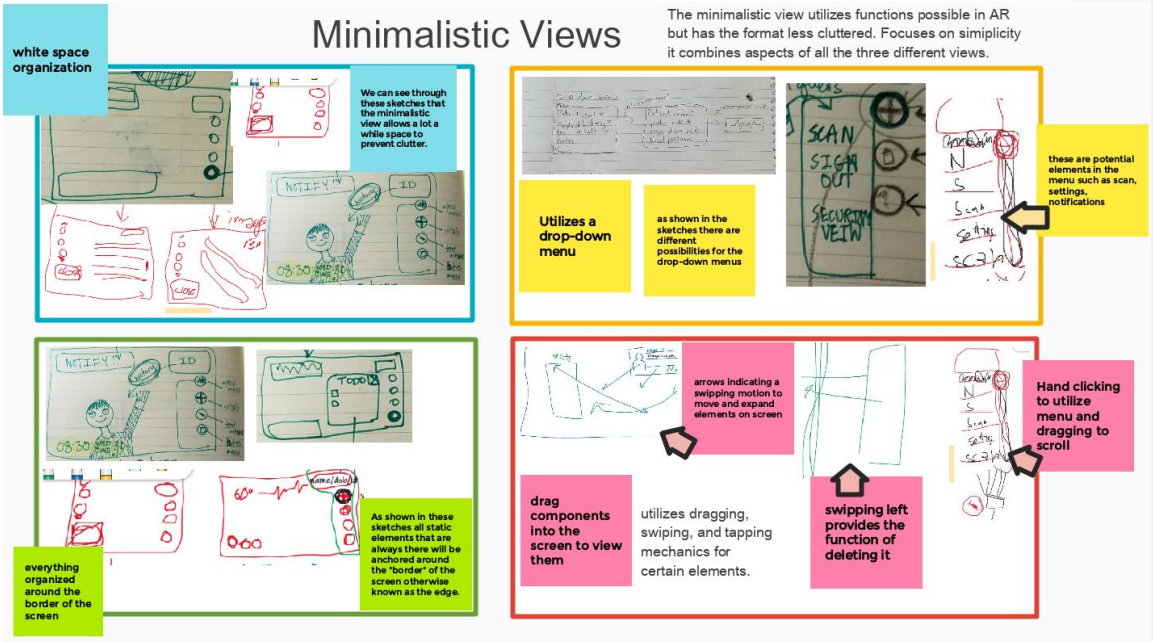

Figure 5: Minimalistic Views. This grouping was created was in relation to the general look of our system and in turn affects all our requirements. Its weakness is its limited screens therefore there are a lot sub menus so as a new user it could be difficult to navigate. Its strengths are that it is simple therefore it is organized and not cluttered so it is easy to look at for long periods of time. The minimalistic view is very feasible and somewhat original.

Minimalistic view is the first of our three most promising ideas. We chose this as a promising idea since it is both a very feasible and original idea for how our view will look. It focuses on allowing healthcare professionals to easily get information without compromising their vision outside of the UI.

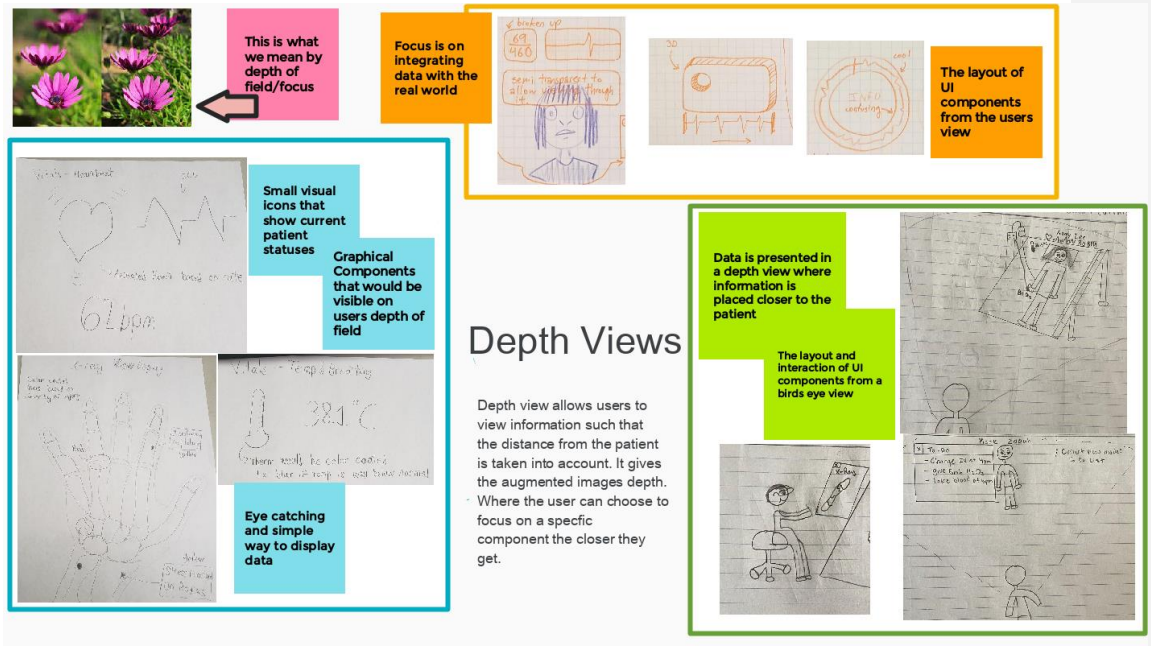

Figure 4: Depth Views. This grouping was created was in relation to the general look of our system and in turn affects all our requirements. Its weakness is that it is limited in the ability to display an abundance of information. In addition, the distance from any object must always be considered which could get quite tedious and confusing. Its strength is that it fully integrates information into the physical world therefore it uses AR technology. It could be feasible but is difficult to visualize, but it is quite original.

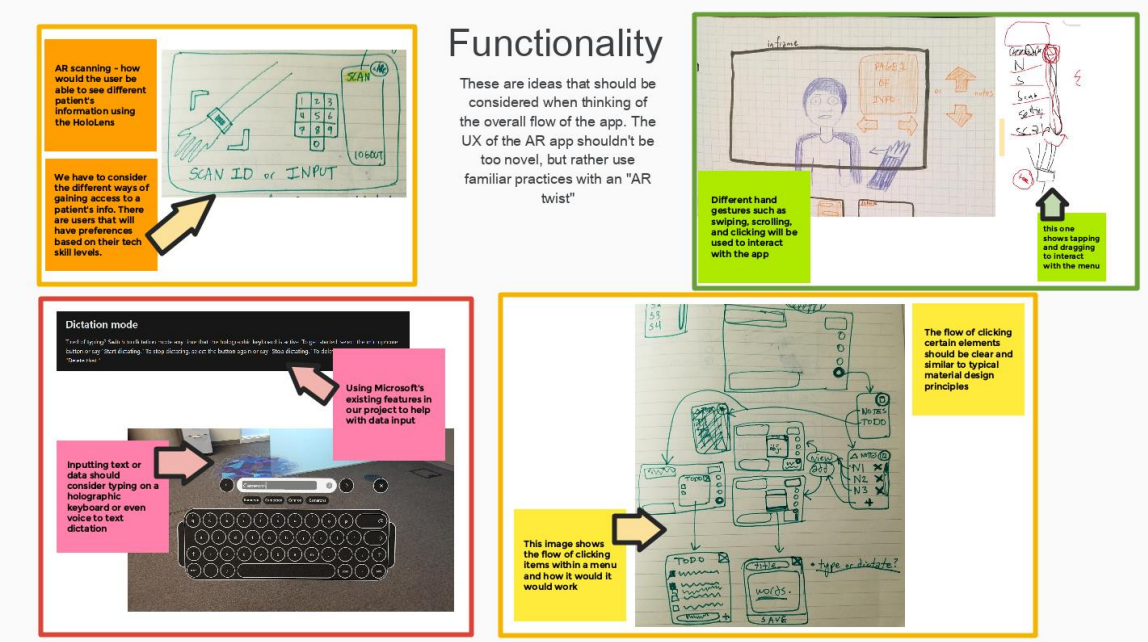

Figure 7: Functionality. This grouping was created was in relation to the user interactions with our system and it in turn affects how users complete our requirements. Its weakness the intuitiveness of hand gestures, another weakness is that if buttons were to be transparent it could disrupt the functionality visually. Its strength is that it utilizes AR capabilities, and it is fluid in that there is an easy transition from point A to B. Another strength is that it takes into consideration all different of level of tech ability of users for example: as we see in the orange group it uses AR functionality by scanning but also considers other users that aren't use to AR by adding a pin pad. It is very feasible since it likely a necessity for the system we chosen. It is very original.

Functionality is the second of our three most promising ideas. We chose this as a promising idea as it is critical for interacting in an AR system. Utilizing the ability to operate the system with gestural movements integrates AR into the everyday and allows the technology to flow freely.

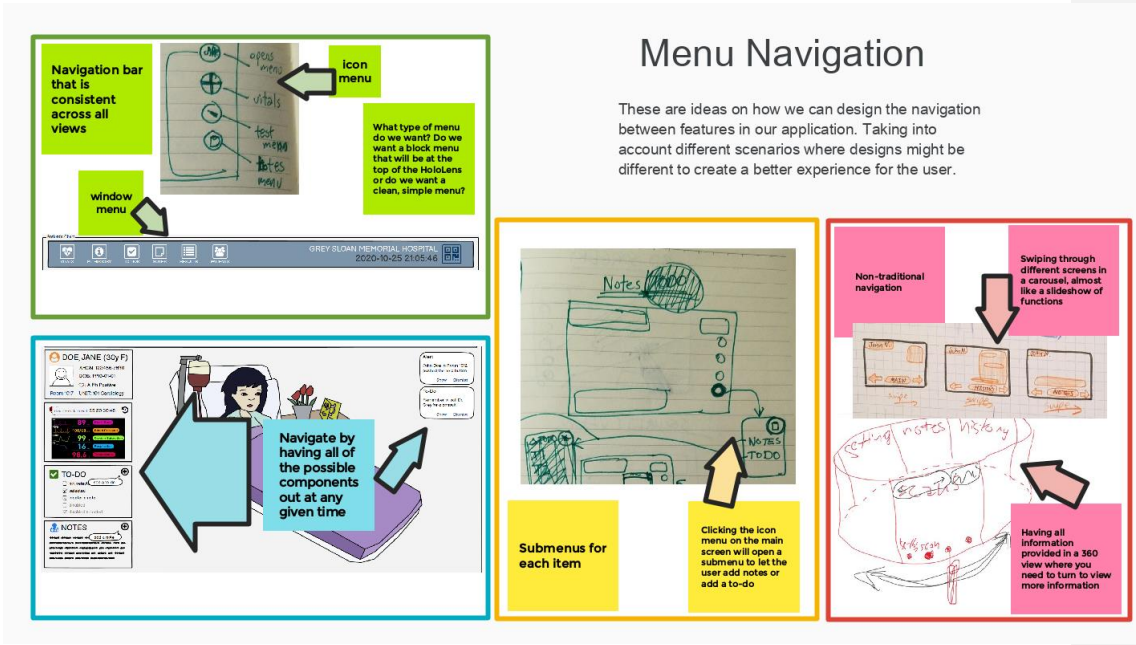

Figure 8: Menu Navigation. This grouping was created was in relation to the general navigation of our system and in turn affects how people interact with our requirements. Its weakness is that it contains subcategories so it can become tedious to constantly click. The strength is that it is a staple across various type of UI so it is extremely intuitive. It is very feasible since it a stable in all system but unless it is done uniquely it is not original.

Menu navigation is the third of our three most promising ideas. We chose this as a promising idea as it is critical for interacting in an AR system. Being able to navigate smoothly through the system is key to a positive user interaction and low frustration experience.

Appendix C: Sample of Team's Sketches

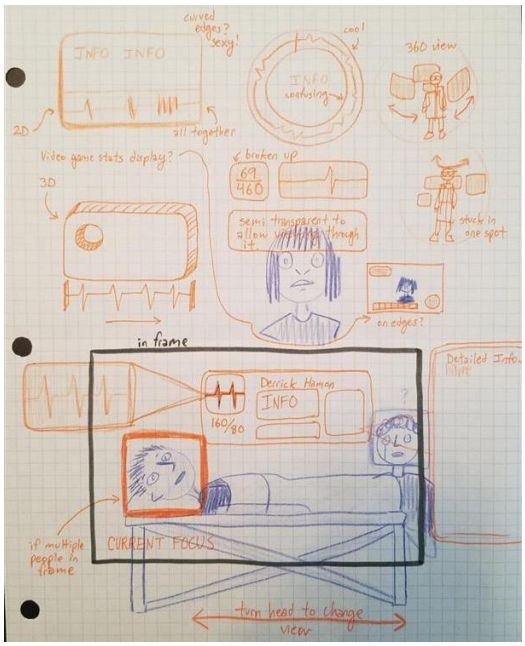

Figure 5: Sketch by Chevy O'Dell

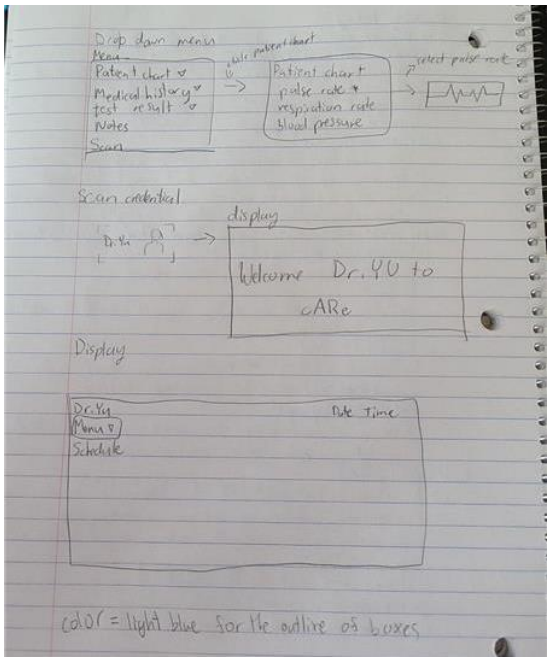

Figure 6: Sketch by Thien-Kim Nguyen

Figure 7: Sketch by Gaby Gonzaga

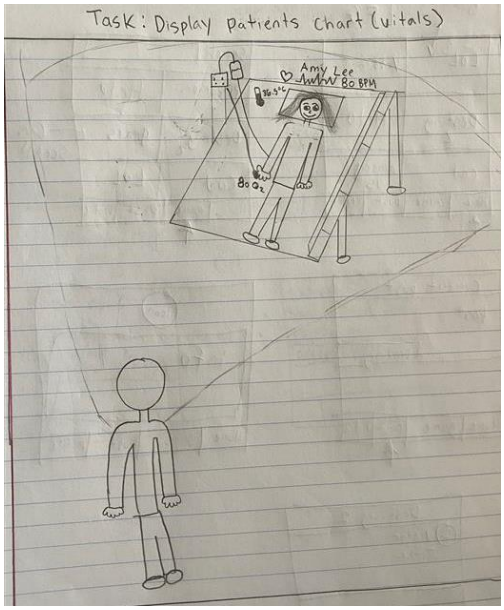

Figure 8: Sketch by Navjeet Hundal

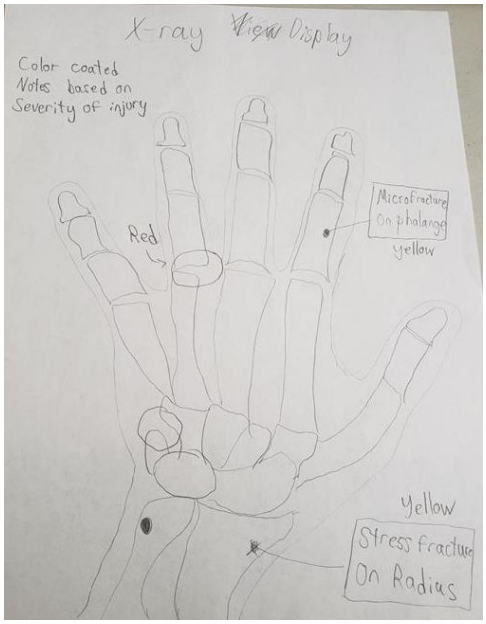

Figure 9: Sketch by Manny Rodriguez