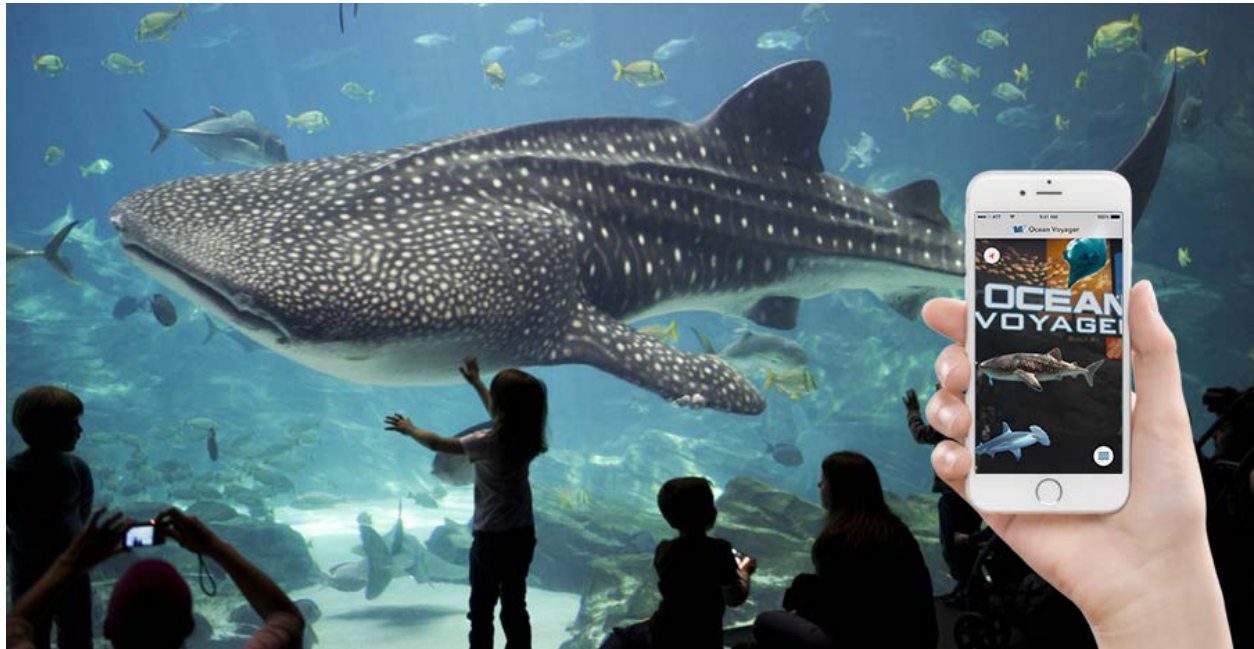


# AquaRium

An Augmented Reality Tour App designed for Georgia Aquarium



by

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**Digital Media Master's Project Design Document**

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# 1. Abstract

AquaRium is a master's thesis project of M.S Digital Media at Georgia Tech. It integrates Augmented Reality to redesign Georgia Aquarium tour experience with a mobile app. Based on the existing digital contents from Georgia Aquarium, AquaRium features user-centered interaction to facilitate the aquarium tour experience, incorporating the functions of navigation, providing knowledge about aquatic life as well as sharing and other social features.



## 2.Introduction

### Digital Media in Exhibit Design

As modern people are increasingly engaged in digital world through advanced technologies like smart phones, tablets or other electronic devices, more and more information are carried and spread through digital media. Not only can time-sensitive information like news be spread instantly, but also a variety of knowledge can be searched and shared online. Turning to digital media rather than TV or newspaper for getting news has become the main choice for younger generation according to reports on journalism in 2016<sup>1</sup>. Beyond news, Wikipedia, search engine, and social media are primary sources for many to gain information and knowledge for their convenience and wide accessibility.

On top of that, digital media can be even more powerful in terms of engaging people with unconventional experience design. In exhibit design, digital media has its irreplaceable strengths to integrate digital elements into physical place and enrich the senses of visitors, create immersive experience, and provide deeper understanding and creative interaction with the contents. Among “The 20 Most Influential Exhibit Designs this Century” between 2000-2016 selected by exhibit design experts in SEGDC community<sup>2</sup>, exhibits like *Science Storms* at Chicago Museum of Science and Industry, *Interactive Exhibits* at Detroit Institute of Arts, *Gallery One* at Cleveland Museum of Art have integrated various interactive installations, mobile applications, and immersive multimedia to create unique experiences to bring contents alive and interactive. As advanced technology like AR, VR, Internet of Things are merging into our digital world, there is broad innovation opportunity for digital media in exhibit design.

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<sup>1</sup> “*The Modern News Consumer*”, by Amy Mitchell et al., Pew Research Center  
<http://www.journalism.org/2016/07/07/pathways-to-news/>

<sup>2</sup> “*The 20 Most Influential Exhibit Designs this Century*” by The Society for Experiential Graphic Design  
<https://segd.org/20-most-influential-exhibit-designs-century>

## Augmented Reality in the Real-World Use Case

Augmented Reality (AR) is a technology that provides augmented digital elements, such as sound, videos or GPS data, on top of the live view of the real world. It helps to enhance the user's current perception of reality by providing complimentary elements in real time and in semantic context with the environment. AR can be implemented in wearable technologies such as Google Glass and HoloLens, or general electronic devices like mobile phones and game consoles.

Not until the release of AR mobile game "Pokemon Go" in 2016 did most people start to pay attention to AR technology. However, AR has been implemented in various real-world use cases more than we realize. For example, football game live broadcasting on TV with a virtual yellow line<sup>3</sup> to show the distance for making first down is a breakthrough of AR application. Also, many games like Nintendo 3ds include mature AR features to create innovative gaming experiences. Until recently, more and more AR mobile apps are coming out for advertisement, providing information and services for specific locations like tourist attractions guide, or serving educational purposes, such as image tracking to visualize textbooks and animate static images.

## Strengths of AR in Interaction and Experience Design

AR has a lot of strengths in interaction and experience design, and for exhibit design particularly. In exhibits and tours, content design and storytelling play the main roles to communicate the concepts and engage visitors. However, the huge difference of interests, ages, and cultural background between visitors makes it difficult to fulfill everyone's need. Instead of trying to fit in all the information, AR can provide personalized contents based on users' selection and manipulation,

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<sup>3</sup> "How the NFL's magic yellow line works" <https://youtu.be/1Oqm6eO6deU>

add on digital materials to enrich the exhibit, allow innovative interaction on digital media, and make the contents more widely accessible beyond the exhibit itself. The application of AR to digital media can help to create immersive and insightful experiences for the exhibit and tour design.

Thus, it is a very tempting challenge to apply AR to exhibit design and create more immersive tour experience. With this broad view in mind, this project, AquaRium, has tried to bring an immersive digital experience for aquarium tour with AR technology.

# 3. Problem and Solution

## Problem

When visitors asked volunteers about an unknown question of marine animals, they will suggest the visitors to download and look up the Georgia Aquarium app. However, it is difficult to find the desired target because the animal catalog categorized by galleries doesn't provide easy search. The app doesn't fully satisfy visitors' need to readily acquire desired information.

## Georgia Aquarium App

The current aquarium app only provides static map for navigation, top-down catalog for marine animals searching, and text contents for animal information.



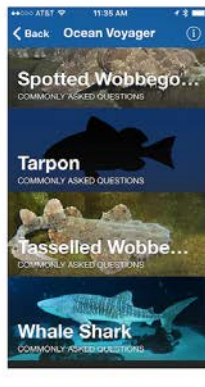
### Static Map

- Difficult to tell the direction
- Hard to tell the location of a particular fish



### Fish Catalog

- Tedious to go through the whole top-down menu each time
- Hard to identify the target given different size of the fish
- Frequent missing of fish images



### Fish Information

- Contents are too text-based
- Lack of personalized feature, e.g. bookmark

## Design Challenge

“How can we optimize the tour experience by integrating existing digital and physical resources?”

By investigating existing resources of Georgia Aquarium's web and app, researching digital interaction examples for famous exhibits and museums, comparing other aquarium-related mobile apps, and getting insights from aquarium visitors, AquaRium project has gone through a thorough design journey from research, ideation, iterative design to prototyping, and finally brought the design to test with the visitors in Georgia Aquarium.

## Solution



### Augmented Reality

- Playful AR fish floating around, served as fish catalog and personal fish collection
- Image tracking to recognize current location

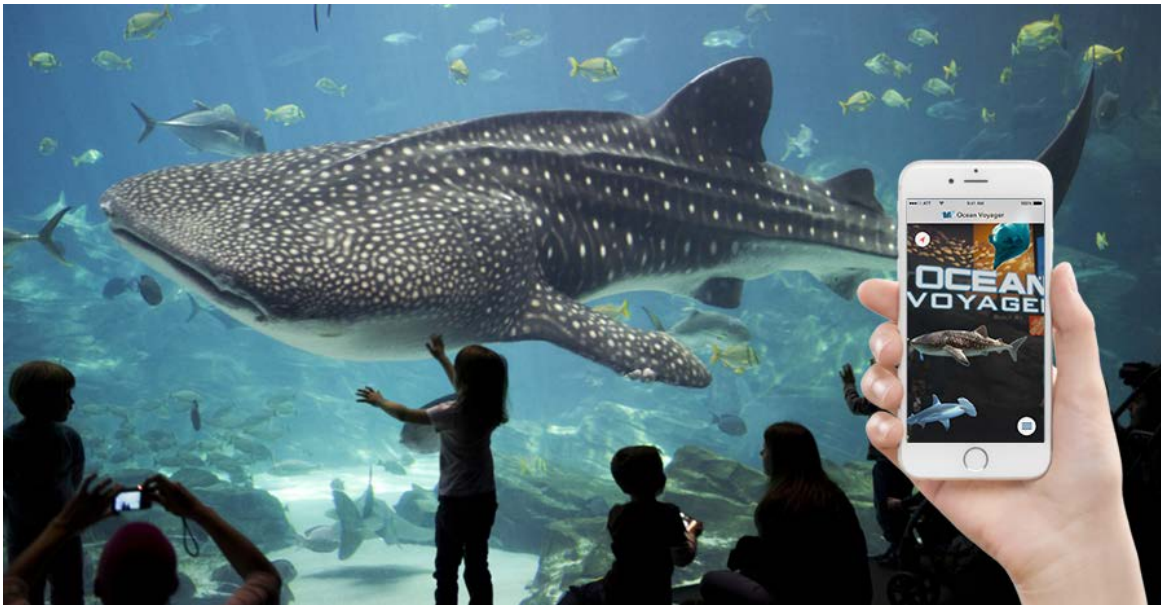


### Content Design

- Visualizing fish features, e.g. size, diet habit, range
- Filters for searching based on interests
- Bookmarks and AR fish view in personal fish tank



# AquaRium App Design

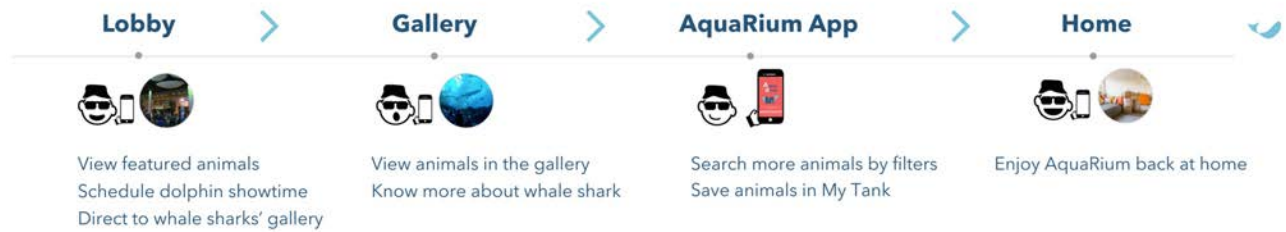


**AR Menu**  **Fish Finder**  **Fish Cam**  **My Tank**

The AquaRium app is designed to be a companion app for the aquarium tour with complete information structure to provide aquarium general information, navigation, marine life knowledge, personal collection and social features. In order to demonstrate the app design under each use case to fulfill the user need, a thorough user journey from the aquarium lobby, gallery to post tour experience is shown below along with the app screens.

The final design is delivered as an interactive prototype on mobile phone accompanied by a product demo video and has been tested with aquarium visitors.

## User Journey



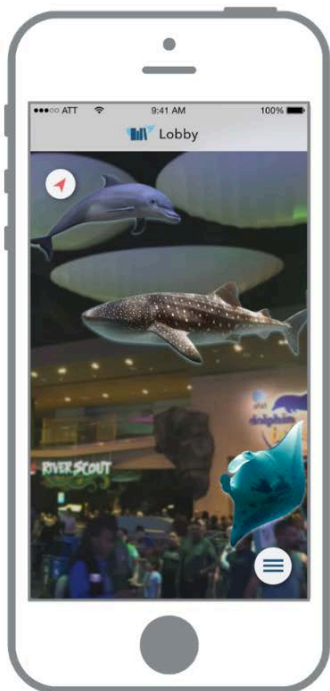
## Demo Video



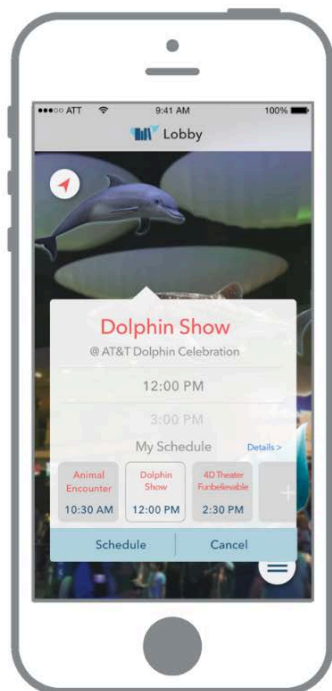
<https://www.youtube.com/watch?v=HqNLGsrIQ00>

## Lobby

- Explore the featured animals, schedule show time and get direction



View featured animals



Schedule dolphin showtime

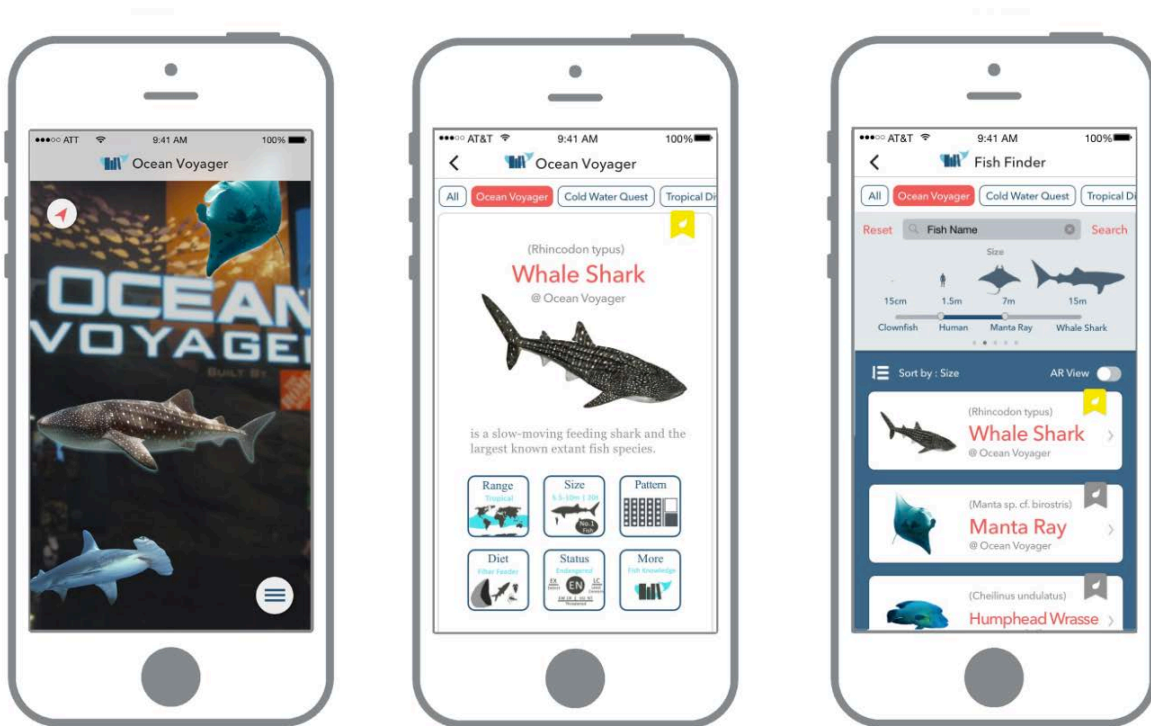


Direct to whale sharks' gallery

- When a visitor arrives at the lobby, featured animals of Georgia Aquarium, such as dolphin, manta ray and whale shark, will float around as AR fish menu on the screen. The visitor can move the phone to find other fish on screen and directly access information like show time and direction by clicking the AR animated fish.
- The visitor can schedule the dolphin show time on the app, view his schedule and get the alert later.
- When he taps on the whale shark, brief introduction and the option to direct to whale shark's location are provided.

## Gallery “Ocean Voyager”

- Explore gallery animals, get more information about individual species, bookmark favorite fish, and search for more animals by filters in Fish Finder



View animals in the gallery

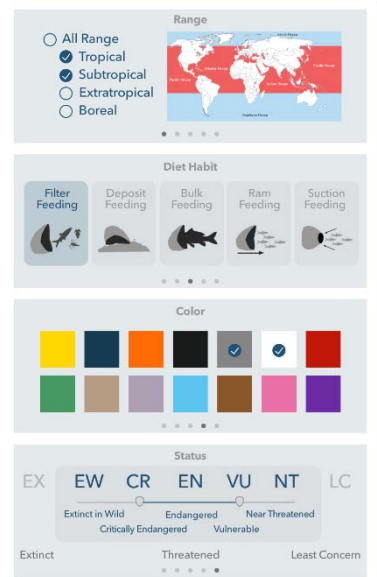
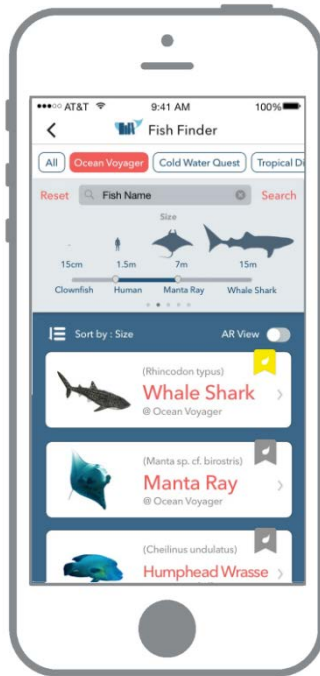
Know more about whale shark

Search more animals by filters

- When the visitor directs himself to Ocean Voyager gallery to see whale shark, by detecting his physical location, the app changes AR fish menu to the gallery animals, such as manta ray and sea turtle.
- When tapping on the AR whale shark, he can see details of the fish with images and iconized information, including the fish’s range, size, color pattern, diet habit, conservation status and more. He can bookmark his favorite fish on the top right.
- The feature “Fish Finder” provides easy search of aquarium animals by filters. The visitor can set filters by location, fish size, habitat range, diet habit, color and conservation status. By this, the visitor can explore more animals based on similar characteristics and his own interests.

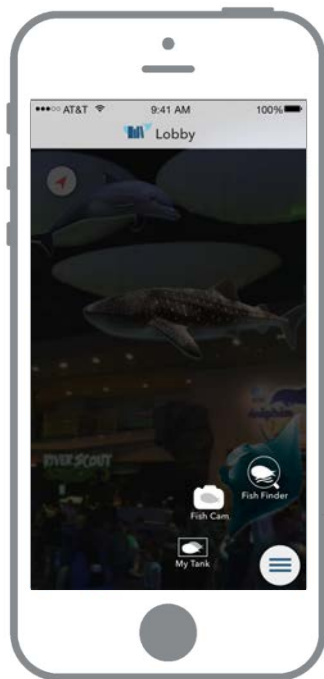


Fish Finder



### AquaRium App

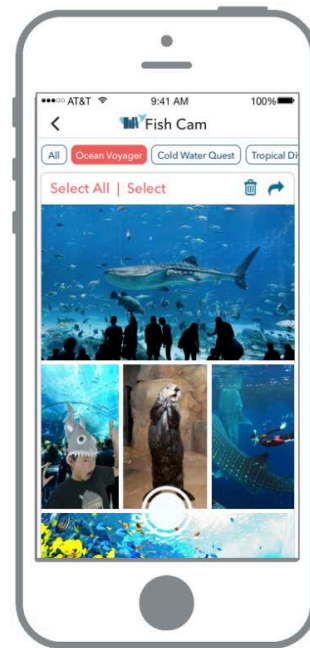
- Play with Fish Cam to take aquarium pictures and share, and view bookmarked fish in My Tank with both list view and AR view
- a) With a few aquarium-specific social features in Fish Cam, like fish head AR filter, the visitor can take playful pictures and share their aquarium fun on social media.



Fish Cam

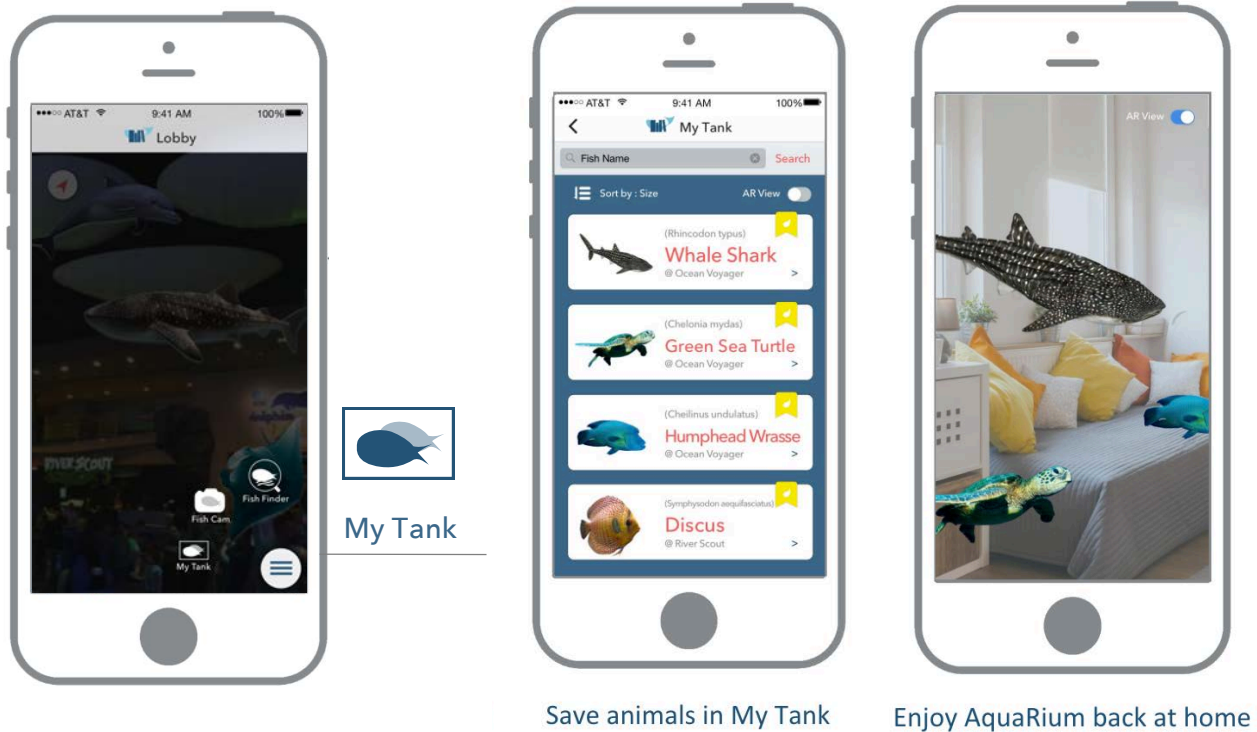


Take photos with playful filters



Manage images from Fish Cam

b) In My Tank, the visitor can view all fish he has bookmarked and access their details by tapping on the item. When choosing AR view, he can see AR fish floating around on the screen, which forms a customized virtual aquarium.



## Home

- Bring AR fish collection home and share the experience beyond the aquarium

## 4. Research

### Digital Interaction Design for Exhibits Examples

My initial idea started with creating innovative tour experience on digital platform. I hope to expand the tour experience to a wider scale in digital world, with innovative content creation through various forms of digital media, including but not limited to interactive web/app design, tangible design, interactive visual arts, AR, VR, and digital media production.

I researched existing examples of digital experience for exhibits that I've been to, among which the most impressive and innovative design include Museum of Science and Industry in Chicago, College Football Hall of Fame in Atlanta, Musical Instrument Museum in Phoenix, and San Francisco Museum of Modern Arts.

Even though the digital tools varied, the technology chosen helps to facilitate visitors while interacting with the contents of the museum and fits in the context. For example, the Musical Instruments Museum in Phoenix applied simple audio guide which automatically switches sound tracks as the visitor walks toward different sections. This technology is not particularly complicated but helps to smooth the tour experience in an audio-heavy scenario.

- **Museum of Science and Industry, Chicago / 2016 April**



The exhibitions are very carefully designed and gave children and adults alike immersive experiences. It brings educational and entertaining experience through digital simulation of natural phenomenon on touch screens, like making tsunami and tornado.

- **College Football Hall of Fame, Atlanta / 2016 June**



A personal tag using beacon technology saves personalized information (school, name, videos and photos taken) throughout the whole tour. The tag is detected when people approach any digital screen, where personalized information will be shown based on the visitor's interests.

- **Musical Instruments Museum, Phoenix / 2016 January**



The most interesting part of the visit is that with an audio guide, visitors don't need to press buttons to switch sound tracks, while the audio will automatically change when visitors stand close to a certain screen where the video is playing.

- **San Francisco Museum of Modern Arts / 2016 August**



Unlike typical "go to an artwork and press the button" tour guide, SFMoMA audio tour app provides a continuous audio guide introducing the path, art works and galleries based on visitor's location and direction with various tour options for different needs and focus.



## User Research with Aquarium Visitors and Volunteers

After gaining good insights from a variety of digital experience design for different tours and exhibits, I was then advised by my advisor Dr. Janet Murray to focus on one specific exhibit and figure out the gap between the current and my ideal design.

"Design is always done in the specific instance. It's good to have a platform that is generalizable but first it has to clearly do something in particular."

- Dr. Janet Murray

I have struggled to find a proper exhibit to design for. There are culture-related topics which I have familiarity and advantages to design for, like digital exhibit for National Palace Museum in Taiwan or Chinese Kunqu Opera; I have also considered local topics such as Sweet Auburn historical site, Center for Puppetry Arts, or continuing my previous information web design for US National Park to build sharing platform for national parks travel experience.

After surveying and carefully analyzing the scalability and design opportunity of the topic, I chose to move forward with Georgia Aquarium tour experience design since it is easily approachable at local area and the design opportunity for tour experience is notable, verified by visitors and volunteers I talked to.

### Interviewing and Observing

The user research included primary interview and secondary data collection. I first talked to visitors and volunteers, and observed their interaction at the aquarium. I also personally volunteered at the aquarium for a few months, which helped me greatly to observe the situation closely and have empathy to both visitors and aquarium staffs.

I collected insights mainly through interviewing volunteers and being a volunteer myself because the position they stand bridges the visitors and the aquarium, and their close interaction with visitors provides crucial insights on how visitors are experiencing the tour.

- **Being a volunteer**

Volunteers are the first contact to interact with visitors. There are roles like greeters at the lobby to hand out maps with daily program, gallery volunteers to introduce specific animals to visitors, and more. They are constantly trained to keep up with the newest information about aquarium and animals knowledge, and thus can give professional information and guidance for visitors. However, there are still difficulty to ensure the consistency of the information they could provide to each visitor, given the huge number of visitors and large amount of professional information.

Some insights from volunteers include questions about navigation, featured animals to see, scheduling and animal-specific questions. Even with a printed map and an existing aquarium app, visitors found it difficult to retrieve information at first sight and thus frequently turned to volunteers for answers. For example, visitors with a map in hand at the lobby would still ask volunteers questions like “Where is the whale shark?”, “What are the featured animals and which should I go first?”, “What time is the dolphin show and when I should get there?”. When in the lobby being asked about animal-specific questions, the volunteers sometimes ask visitors to download the app for more information if interested, but among those who follow to download, they found it difficult to search for specific animals because of the way its catalog is structured.

#### **Situation for Volunteer**



Wan-Ning Lee  
Volunteer since 2015

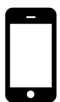
When a visitor asked about an unknown question or species to the guide volunteer, the volunteer will ask the visitor to download and look up the aquarium app.

- **Providing digital resources for consistency, flexibility, and personalization**

The interaction between visitors and aquarium staffs are positive and desirable by both for the overall tour experience, for that human-to-human interaction is still most valuable and irreplaceable. However, there are needs for providing information digitally or on hand to give visitors more flexibility and control in the tour. The existing resources like map and app were designed to provide general information and personalized experience for visitors. By observing visitors touring in the aquarium, current resources provided didn't serve the need completely.

Particularly in the "Ocean Voyager" gallery, where the most popular animals like Manta Ray, Sea Turtle and Whale Shark are located with spectacular undersea tunnel and viewing window, visitors found many animals they are curious about but couldn't find the information right away. Problems like the top-down catalog on the app doesn't have the search function, the physical signage in the gallery are located separately, the fish images on app or signage are not always comparable with the fish they see in the gallery because of size, angle and variations, or the text-heavy information on signage and app is hard to follow, will refrain visitors from enjoying the tour while being able to acquire knowledge they are curious about.

#### **Difficulty for Visitors**



Georgia Aquarium  
Mobile App

It is difficult to find the desired target because the top-down menu categorized by galleries doesn't provide easy search. The app has not fully satisfied visitors with its design.

#### **Insight Summary**

Having collected the user insights from both interviewing and observing visitors and volunteers at the aquarium, I summarized the key insights as followed.

- Despite the help from volunteers, there are general information and animal knowledge that are designed to be provided digitally.
- Digital artifacts can provide consistent, more flexible and personalized experiences for visitors, and bridge the gap between physical and digital resources.
- Visitors found the existing app difficult to use to fulfill their need in searching and getting animal knowledge.

Based on the problem identified, I continued to investigate the Georgia Aquarium App as well as other aquarium-related Apps.

# Competitor Analysis & Existing Aquarium Resources

Since my goal is to combine physical and digital resources to enhance tour experience, I investigated Georgia Aquarium's existing app and other aquarium-related apps. I then analyzed and listed down a competitive analysis to figure possible design areas and structure my ideal design scale. Some creative features like Virtual Aquarium and Personalized Postcard were inspiring for my later brainstorming.

## Investigate Georgia Aquarium's App and other related apps

- Georgia Aquarium App



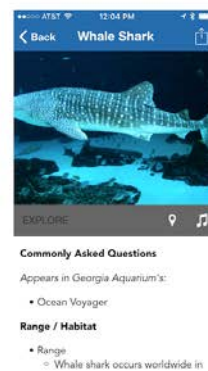
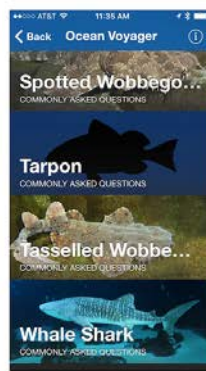
### Static Map

- Difficult to tell the direction
- Hard to tell the location of a particular fish



### Fish Catalog

- Tedious to go through the whole top-down menu each time
- Hard to identify the target given different size of the fish
- Frequent missing of fish images



### Fish Information

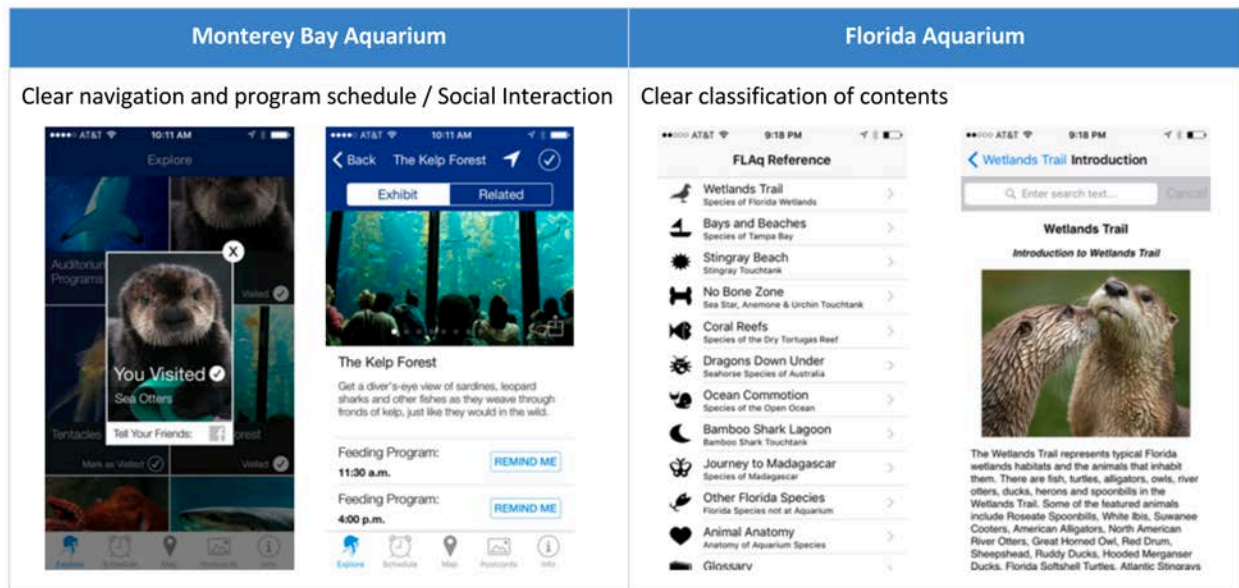
- Contents are too text-based
- Lack of personalized feature, e.g. bookmark

GAA App provides navigation through a static map, which has direct links to gallery introduction and icons for featured animals in each gallery. However, the icons and texts on the screen are too small to recognize.

Under Galleries & Exhibits, the top-down fish catalog is hard to navigate, for that some images are missing and most people want to look up fish they don't know the name. Inside individual fish information page, contents are too text-heavy and lack of personalized features to save and share.

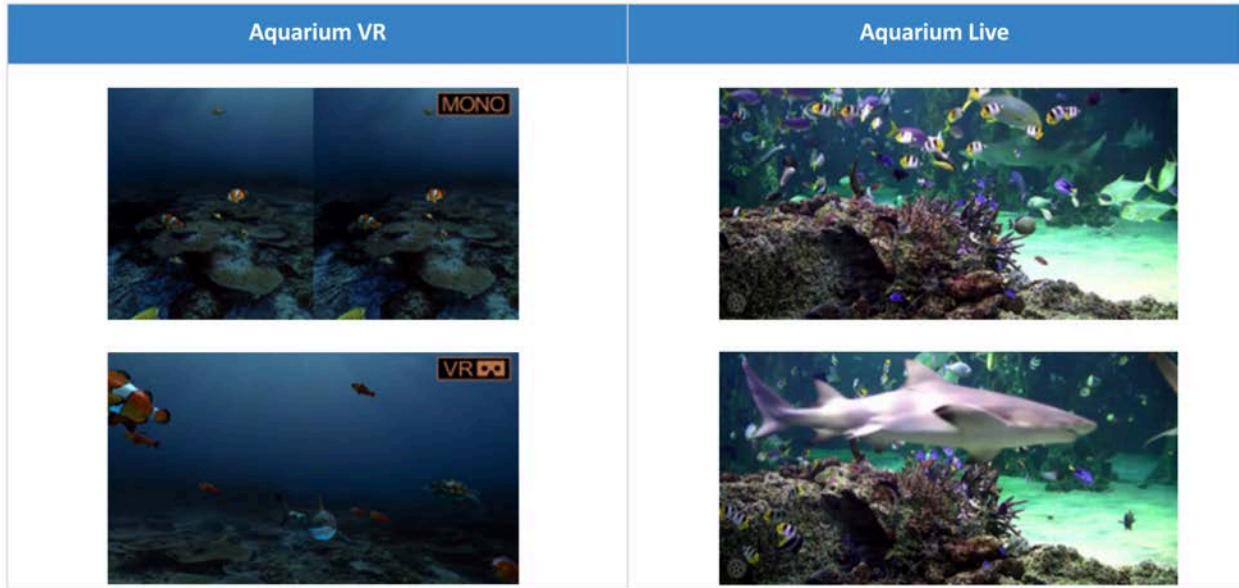
- Other Aquarium Tour Apps

Other popular aquarium apps include Monterey Bay Aquarium and Florida Aquarium apps. Monterey Bay Aquarium app has clear navigation and program scheduling features, and provides personalization through marking the animals as visited and sharing to social media. On the other hand, without much design on in-aquarium information, Florida Aquarium provides clear and interesting classification of animals' details. Both apps have some strengths to learn from.



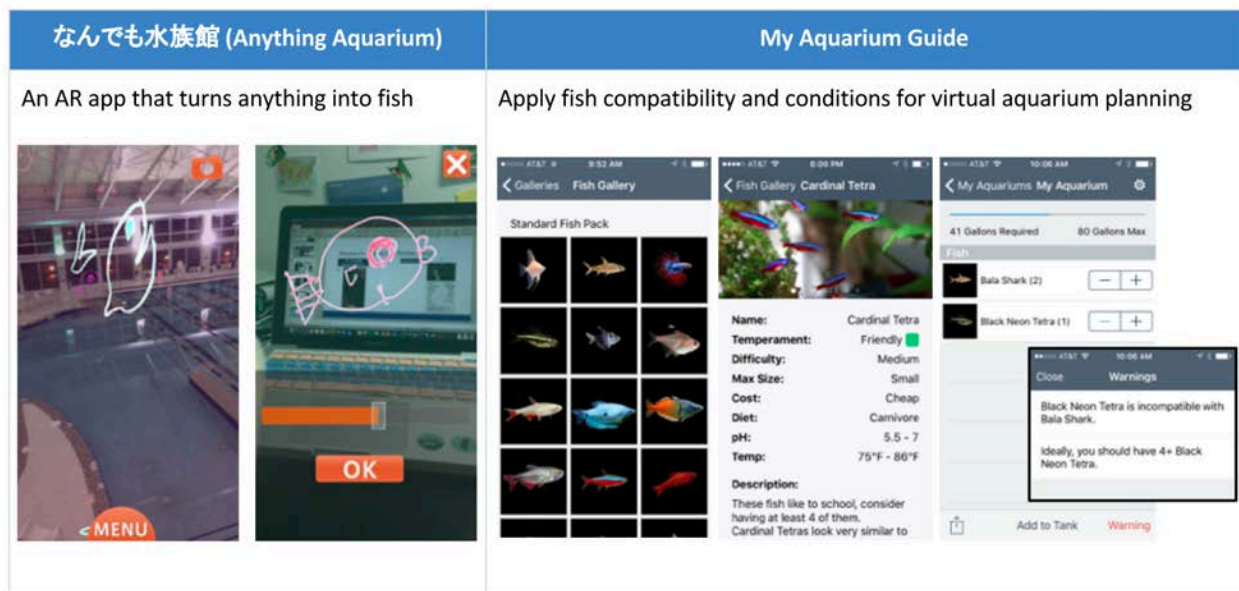
- Virtual Aquarium Apps

Some apps integrate virtual reality and 3D models to present undersea world digitally.



- Aquarium Gaming and Guiding App

There are some interesting ideas like making your surrounding environment an aquarium. The app “Anything Aquarium” turns your drawing into AR fish and animates them to float around. “My Aquarium Guide” provides professional suggestions on fish compatibility and conditions for planning a personal fish tank. The way they present information is very visually attractive and clear.



## Competitor Analysis

After researching various aquarium-related apps and gaining valuable design inspiration from their features, I conducted competitor analysis across multiple apps and categorized features into important design areas, including Information / Library, Map / Navigation, Interaction / Personalization, Augmented Reality, Virtual Reality / 3D Animation.

	GA Aquarium	Monterey Bay Aquarium	Florida Aquarium	My Aquarium Guide	Aquarium VR/ Aquarium Live	Anything Aquarium
Information/ Library	Pictures Audio		Clear Classification	Compatibility		
Map/ Navigation	v	v				
Interaction/ Personalization		Postcard/ Check-in				
Augmented Reality						v
Virtual Reality/ 3D Animation					v	

Aquarium Guide App

Aquarium Game & Assistant App

Since navigation, library hierarchy, and personalization are three essential fields to improve on in Georgia Aquarium app, the way I classified and analyzed other apps help to identify design opportunity and alternative design options.

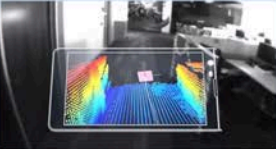


For example, under information / library, instead of providing information with picture, text and audio the way GAA app has, other ways to classify categories like Florida aquarium app or highlight characteristics in My Aquarium Guide app can be considered. Also, most current aquarium tour apps don't have AR/VR features, while in game apps these are common and mature technology. Thus, there is opportunity to integrate some innovation into the existing aquarium tour apps.



## Augmented Reality Technology and Tools

Throughout the whole project timeline, I conducted research and design interchangeably. Some parts I verified some ideas through research while others I gained inspiration and developed ideas from research insights. Since there are always constraints on time, resources or technical development, it is necessary to adjust project scale and features to be focused on through the iterative process.

### AR Headset & Tablet

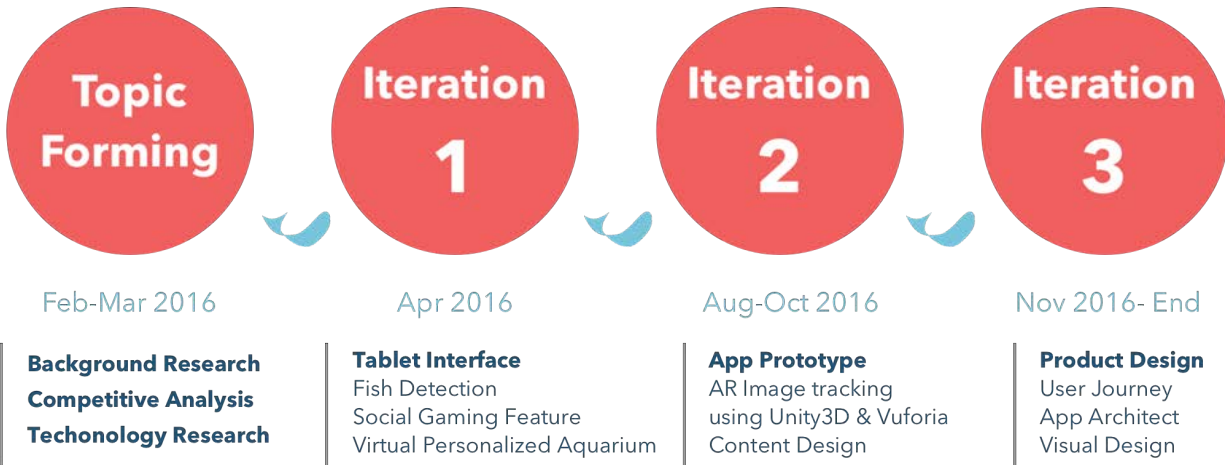
Project Tango	HoloLens	Intel RealSense
<ul style="list-style-type: none"><li>- Enable mobile devices to detect positions</li><li>- Indoor navigation</li></ul> 	<ul style="list-style-type: none"><li>- AR smart glasses</li><li>- Blend hologram into real world</li></ul> 	<ul style="list-style-type: none"><li>- 3D camera</li><li>- F200: Face, gesture</li><li>- <b>R200</b>: AR, object scanning</li></ul> 

Among them, the most essential part is the AR technology. Since I decided to utilize AR in my design in early stage, I put a lot of efforts to research available technology for prototyping. By interviewing an award-winning AR game designer, Chun-I Lee, I got to know more about different AR tools and the strengths of each. While Project Tango and Intel RealSense are best for scanning the environment, and can create real mixed reality experience interacting with the surroundings, HoloLens provides overlay of information and hologram in front of eyes that can create a more real feeling of the digital objects.

## Unity3D Vuforia

However, given the AR part in my design is only partial for image tracking, I decided to use normal mobile phone as a medium, on which I run Unity3D's Vuforia library for mobile AR experience. The concerns included that the tablet is too bulky for carrying through a 3-hours aquarium tour and not widely accessible for all visitors. Also, even just for a conceptual redesign, to design for a public tour experience, it is desirable to use a medium that can provide advanced features without costing greatly for its device.

## 5.Design Process



### Iteration 1: Mockup on iPad

- 3 Main Features, AR Fish Detection

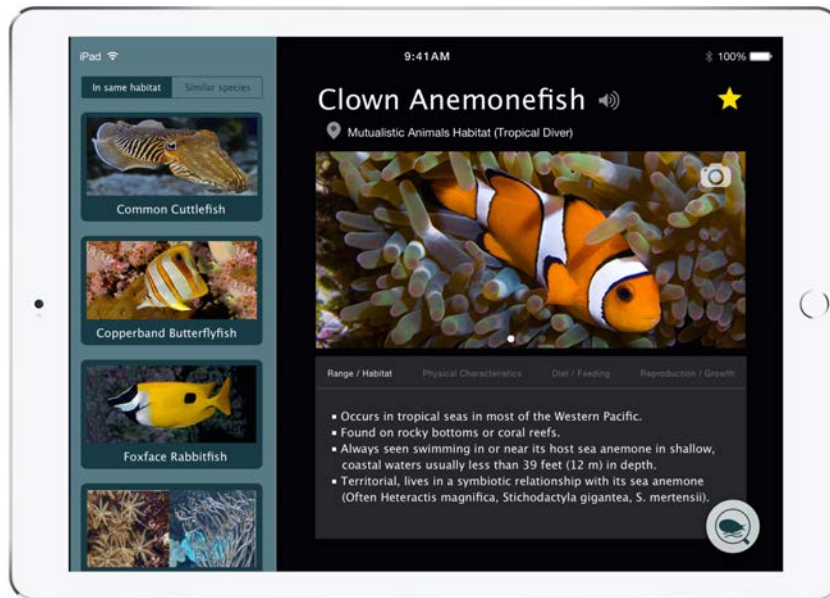
For the first iteration, I used a quick mockup on iPad to flesh out what features to include. Three main features I concluded after analyzing existing apps are Fish Detection with AR, Social Gaming Feature, and Virtual Personalized Aquarium.

#### Fish Detection with AR

My initial idea to detect fish using AR fulfills the need to find information for a certain animal. However, considering the AR technical constraints of dark vision inside aquarium and fish as moving objects being hard to track, I decided to provide both real fish and sticker recognition.



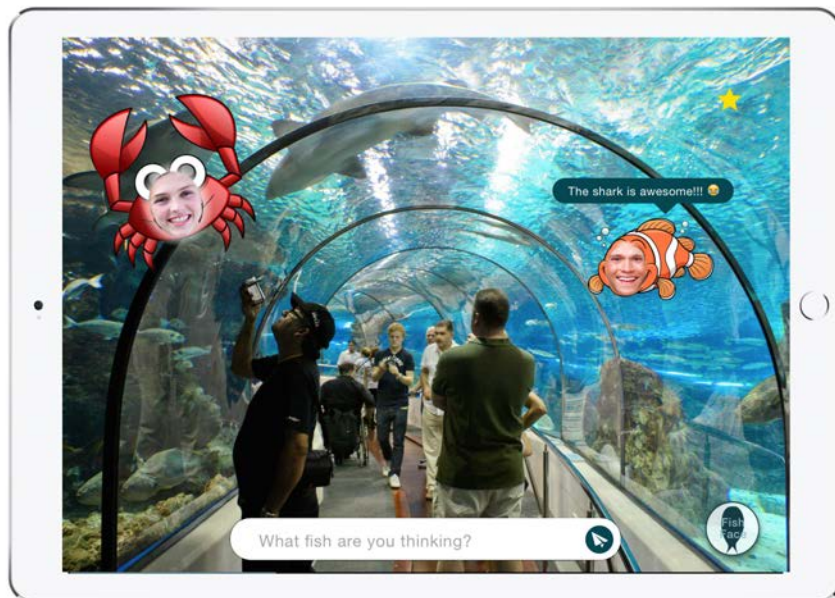
AR object recognition from identifying real fish and stickers



Fish details with lists of species in same habitat and with similar characteristics

## Social Gaming Feature

Also, with the motivation to engage visitors during the tour, I designed gaming feature of swap face with fish and ability to digitally interact with other visitors, which allows visitors to engage with their favorite fish and express their experience as well as feeling to other fish lovers.



## Virtual Personalized Aquarium

The other important observation from surveying related apps was that personalization plays a crucial role for users to keep their desired information and thus stay motivated to interact with the app. I include VR personal fish tank as the third main feature for both entertaining and bookmarking purpose.



## User Feedback

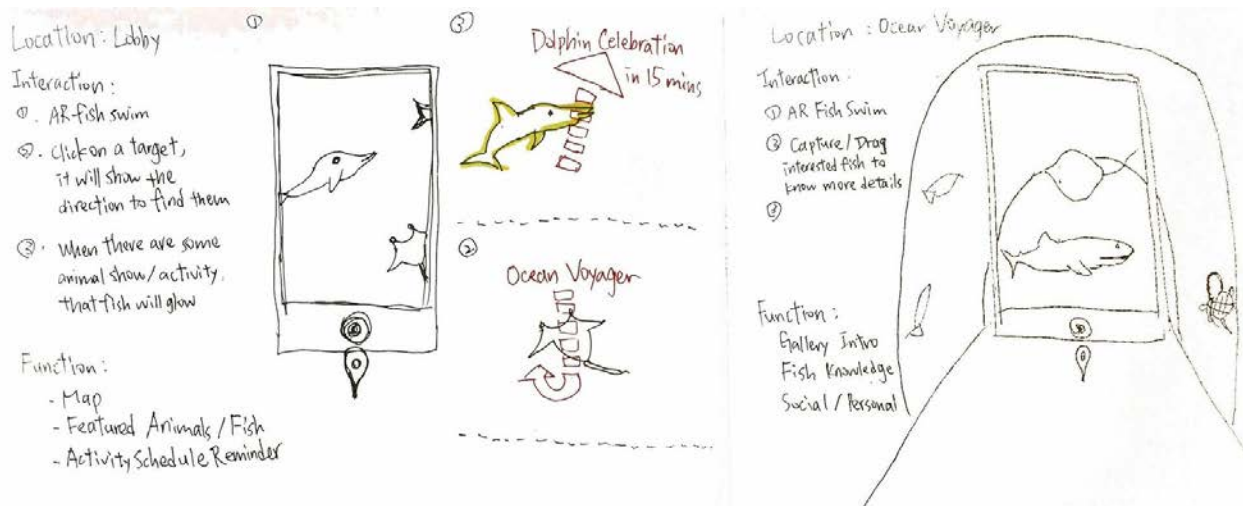
The result of the initial iteration solves the original problem, that is, provide easy approach to marine animals' knowledge and engage visitors with digital artifact in the trip. However, in order to accommodate complicated contents, I chose iPad as a design tool, which turned out to be too bulky for visitors to hold all the time and also distracting; Game feature is hard to explain and doesn't really serve the goal to inspire visitors learn more about fish, so does the virtual personal aquarium.

All the elements are desirable to be included, but right now they seem to be all separate and unrelated to facilitate the experience as a whole.

## Iteration 2: Interaction Design & AR Prototype

- Unique AR Interaction, Prototype with Unity3D

In this iteration, I came up with innovative AR interaction on mobile phone and prototyped to test the idea with users. I designed an interactive menu with fish floating 360-degree in AR view on the screen to allows easy access to the featured animals and their location. This design provides a similar experience on the screen as in the aquarium – watching fish floating around while keeping heads up finding things out of curiosity. All the visitors need to do is to look around on the phone and click on fish they are interested.



2nd iteration sketch

### AR interactive menu prototype

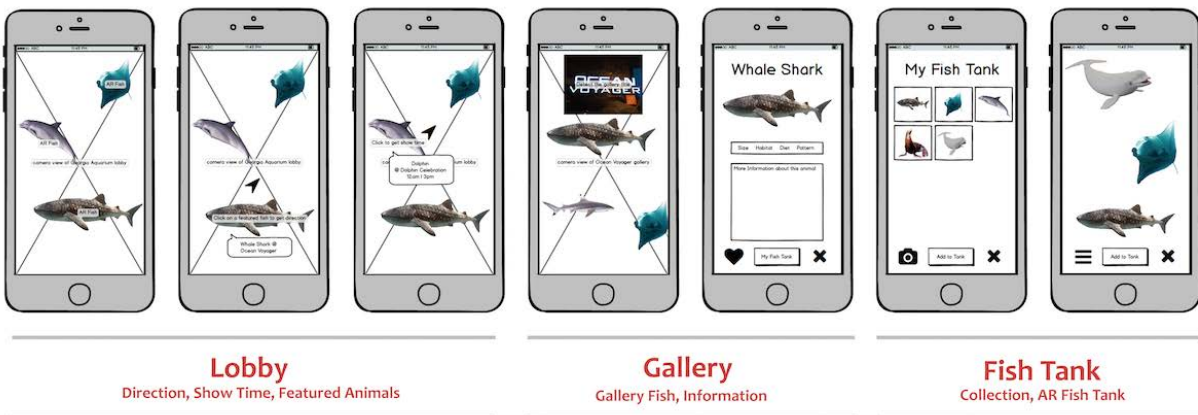


The prototype was built using Unity3D and Vuforia on the mobile phone, which were chosen after I considered various kinds of AR technology (Project Tango, Hololens, Intel RealSense) for its accessibility and viability to develop. Having the chance to test the prototype with Georgia Tech GVU demo day guests, I attained considerably positive feedback for the creativity and quality of the design.

## Design mockup for user experience

The 2nd iteration makes improvement on a smoother user experience that matches the aquarium environment. Users were satisfied with the solution being able to easily find desired fish information, and were attracted to engage in the fresh interaction of AR technology.

### Design Mockup



A walkthrough from lobby, gallery to personal tank

However, there were concerns about too many fish on the screen would be difficult to find for a desired target. More ways to organize and approach contents should be designed.



# User Testing 1: GUV Demo Day

2016 October / 11 visitors - DM Faculty, HCI Students, DM Students, Guests

## Good Features for further development

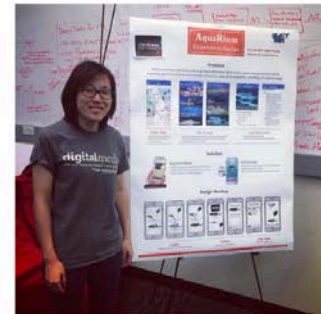
- Take fish home idea is great: bring the experience back to friends
- Social sharing feature

## Design Comment

- Creative & useful redesign for tour experience
- Very interesting to see animated AR fish on phone
- Can have more gamified features
- Propose to georgia aquarium

## Possible Concern

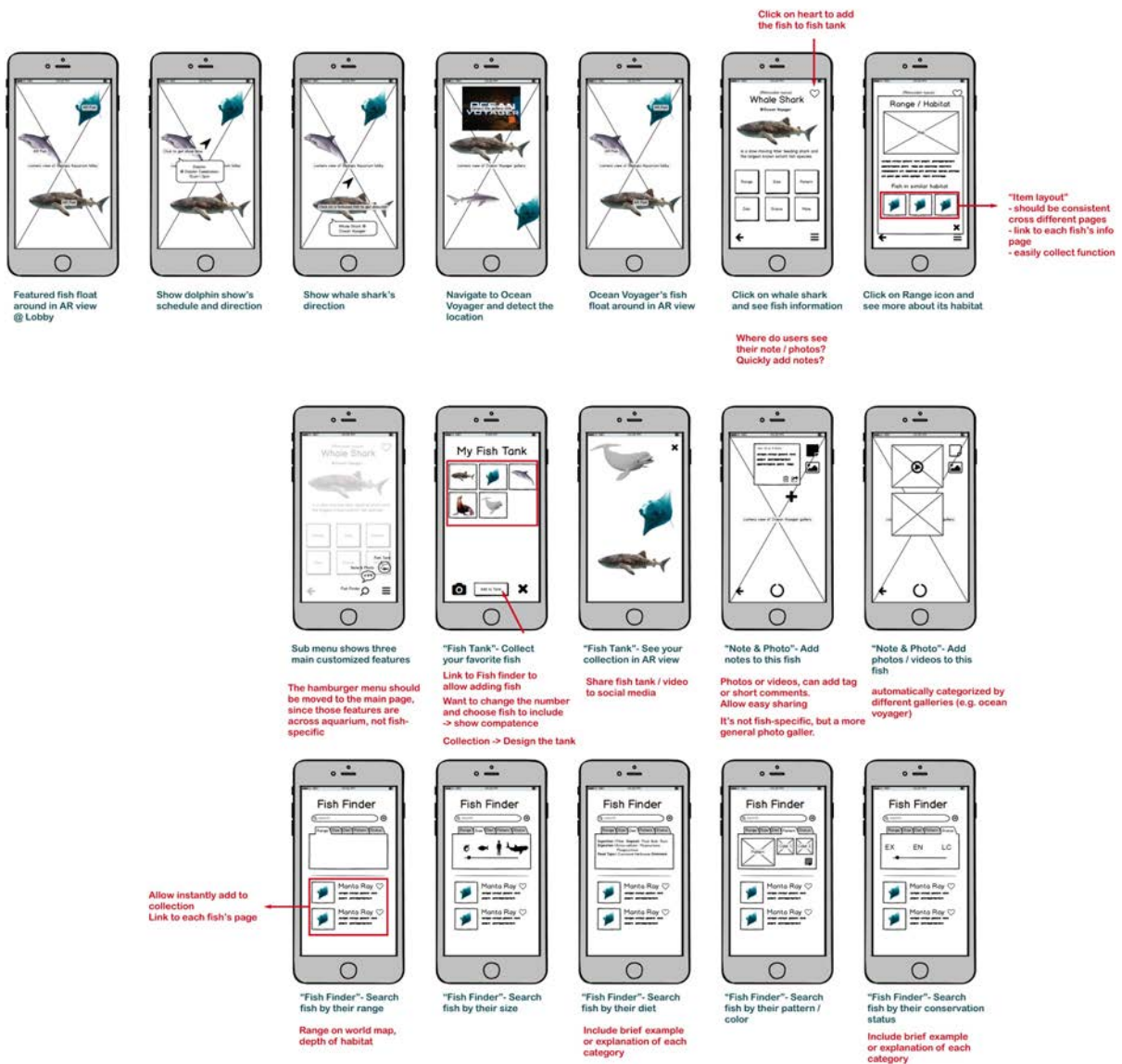
- People want to look at fish, not phone. How do you assist the tour considering this fact? -> create a similar experience on the phone (looking at floating animated fish that's very similar to real fish tank) to engage users
- What's the final deliverable? How many fish will you present? -> Get a clear walkthrough / story



# Iteration 3: Thorough User Experience

- Content Design, User Flow, Interactive Prototype

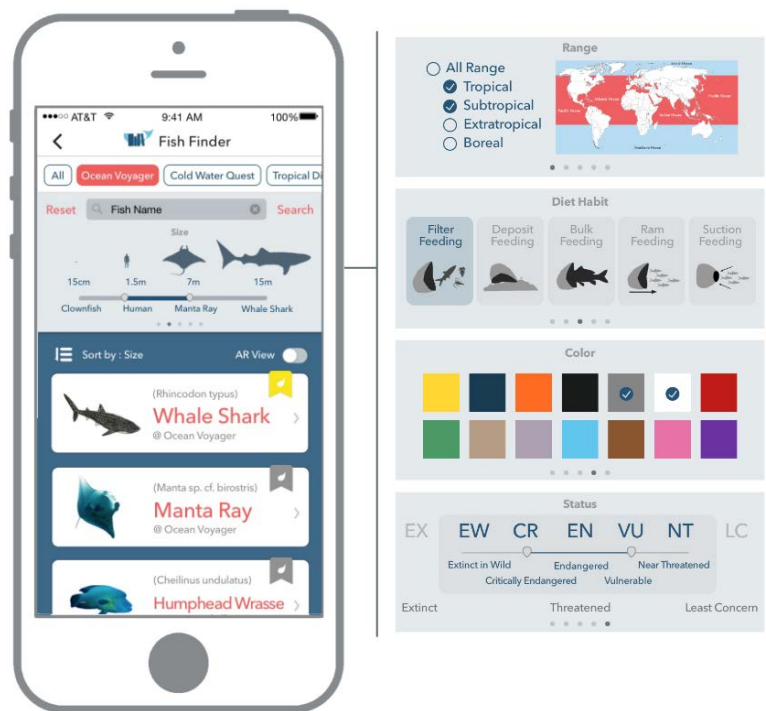
The goal of final iteration focused on content design to approach information more flexibly and to complete the overall user flow. In order to bring a thorough user experience, I sketched out the app wireframe to refine the user flow, the consistency of visual and interaction.



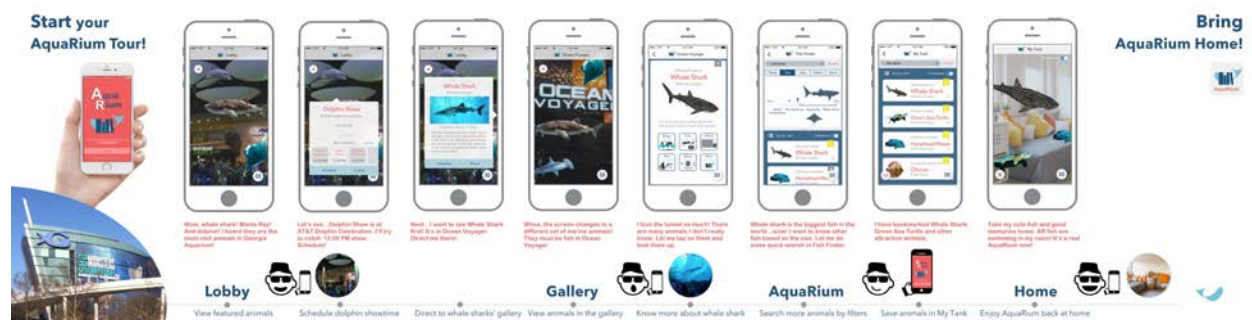
Wireframe for overall user experience

## Content, Visual and Experience Design

From lobby, gallery, interaction on app, to post tour experience, the app shows a consistent visual and interaction style. The initial three main features from Iteration 1 have been further developed after researching professional marine life knowledge and Georgia Aquarium. Much design efforts were put in Fish Finder, where the filters fish based on gallery, range, size, color, etc. are provided with easy setting.



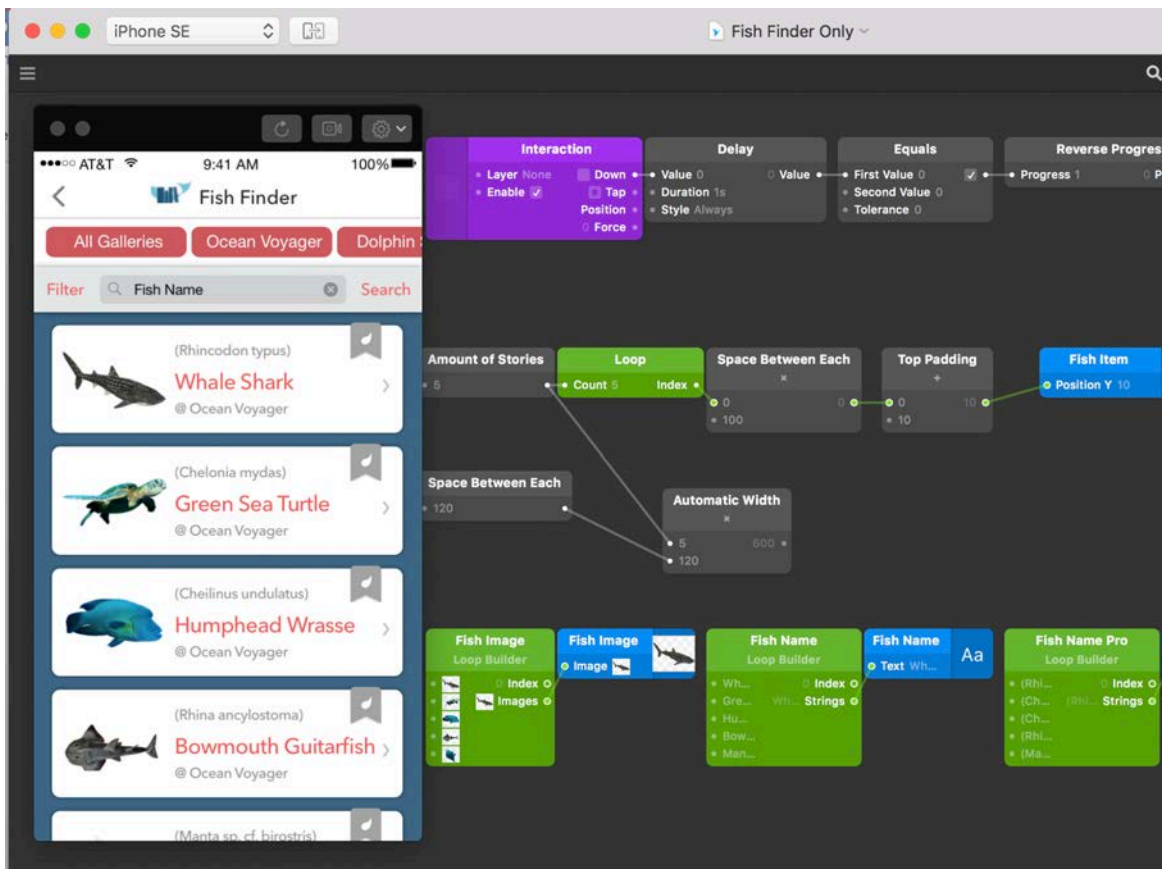
Searching filters in Fish Finder



Overall User Journey with Key Screens

## Interactive Prototype with Origami

In order to fully communicate the AR design in my prototype, which most users have few experience with, I tried different prototyping tools, including Principle, FramerJS, etc. and finally built with Origami for its ability to access mobile phone's camera and sensors.



Prototyping in Origami

## User Feedback

I brought my interactive prototype to test with visitors in Georgia Aquarium. The AR fish menu to find dolphin show time and direction was impressive for them. The Fish Finder filter also let them explore different attributes of fish they didn't

know before. Users were most delighted to see their fish collection floating around in AR view.

However, users met some difficulty interacting with the prototype not knowing which parts are functional. The visual design prompted them to interact, such as a slider, but it was not fully interactive due to limitation of time and design efforts. Thus, in addition to just propose the development part as an actionable future plan, I made a demo video to show the overall experience with the AquaRium app and got positive feedback from viewers across cities.



VR Game Designer

Great video, and neat to see how you combine encyclopedia-like features with scheduling and pokemon-go collecting to support many different ways of interacting with the aquarium in AR!



UX Designer

The demo video looks pretty neat! It looks like a creative and useful redesign for aquarium tour experience. It's definitely attractive for kids. There is opportunity for sound design too.

# User Testing 2: Onsite testing at Georgia Aquarium

7 Users, 4 on-site at Georgia Aquarium

## LOBBY

1. Look up the dolphin show time and schedule
2. Navigate to where Whale shark is
3. Check the current location

## FISH FINDER

1. Setting up filter in Fish Finder / Select the gallery tag Ocean Voyage
2. Bookmark interested fish
3. Look up whale shark's information and its Range

## FISH CAM

1. Take a funny photo using Fish Cam
2. View the photos taken in gallery

## MY TANK

1. View your own collection (My Tank) in list and AR view



User testing at Georgia Aquarium, Feb 16, 2017

## Result

- All users could quickly figure out the functionality of Fish Cam and My Tank.
- At Fish Finder, most users wanted to adjust the filter setting even though they were just static mockup. All users understood the interaction with filters and bookmark immediately.
- Most users (5/7) could easily find the AR animated fish as menu for show time and direction.
- Two users not being able to find information at lobby from AR fish menu didn't realize they could be tapped.

- Overall, with a little hint of the system to interact with AR fish, all users finished the tasks successfully.

## **Feedback**

- For those users who didn't know about the Georgia Aquarium App, they found this app easy and interesting to interact with.
- For users who had seen the official Georgia Aquarium App, they viewed this as a considerable improvement for getting information and assisting tour experience.
- One user thought it can be a really attractive design for kids, and mentioned the possibility to add animals' sound feedback from tapping.

## 6. Conclusion

As part of the ongoing effort to explore AR interaction and experience design for exhibits, AquaRium has successfully brought a creative AR interaction idea to integrate digital information into the aquarium tour experience. The AR 3D animated menu not only provides a playful and visual experience for selecting items and navigation, but also creates immersive digital experience to fit in the aquarium context, which helps to bridge the digital world with the physical environment and bring the tour experience beyond the physical border.

Besides AR interaction design of the project, content design also plays an important role to help improve the easiness of accessing information and personalization. With technical constraints not being able to accurately recognize moving animals, filters are very important alternatives to provide access to the information. By simplifying the process of search, using attributes like habitat, size, color, feeding habit, and conservation status helps to link relations between different pieces of knowledges and enhances educational purpose with easy and encouraging manipulation on the screen.

As an AR tour app designed for Georgia Aquarium, AquaRium aims at enhancing the digital experience and bridging the gap between digital world and the reality. By exploring the possibility of AR in interaction and experience design for the aquarium, the project has successfully brought an enriched aquarium tour experience with unique interaction design.



## 7. Acknowledgement

This project is made possible through the help from different people and parties, including my committee, professors and fellow students in Digital Media program, guests from GVU Demo Day, Georgia Aquarium Volunteer Program, and people who gave me supports during my research, design, user testing and video filming.

I am particularly thankful for my great advisor Dr. Janet Murray for always pushing me to think deeper along the design process, giving me valuable and positive feedback instead of instruction, and keeping my project on a proper scale and on time to be able to deliver meaningful results. I also benefited greatly from Dr. Jay Bolter's course "Mixed Reality Design" for tour design and Augmented Reality design concept, and taking part in Dr. Nassim Jafarinaimi's "Visual Design and Culture" field trip to Sweet Auburn and the final demo for content and experience design. Through GVU demo day and conversation with DM faculty, students and alumni, I obtained constructive suggestions and inspiring ideas that helped me focus and be creative.

I also want to express great appreciation to Georgia Aquarium and its volunteer program. By having the opportunity to learn more about aquatic life, the operation of behind the scene of aquarium and immersing myself in aquarium every week, I could bring my design closer to the true user needs and learned whole lot of life long experience during the process.

Last but not the least, I want to thank my family and all friends who helped and inspired me throughout my design journey. Without your support, I couldn't have finished the project as it is.

## 8. Resources

### Competitor Analysis- Aquarium Related App

[“Monterey Bay Aquarium”](#)

[“Florida Aquarium”](#)

[“なんでも水族館 \(Aquarium Everywhere\)”](#)

[“My Aquarium Guide”](#)

[“Aquarium VR”](#)

[“Aquarium Live”](#)

### Design Resources

[Unity3D AR Library Vuforia](#)

[Georgia Aquarium Galleries Catalog](#)

[Origami Prototyping Tool](#)

### User Testing

Start User Testing <https://usabilityhour.com/start-user-testing/>

User Testing <https://www.usertesting.com/>

### Final Design

[AquaRium Demo Video](#)

[AquaRium Project Website](#)

### Related Articles

[“The Modern News Consumer”](#), by Amy Mitchell et al., Pew Research Center

[“The 20 Most Influential Exhibit Designs this Century”](#) by The Society for

Experiential Graphic Design

[“How the NFL's magic yellow line works”](#)

# 9. Appendix

## GVU Demo Poster / Oct 26, 2016

# AquaRium

## Experience Design



Tica Lin, M.S. Digital Media  
Advisor: Dr. Janet Murray

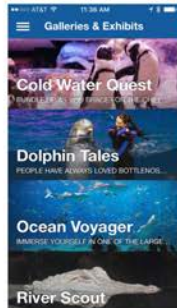
### Problem

Visitors to Georgia Aquarium want to get more information about certain marine animals, but the existing aquarium app doesn't provide user-friendly interaction, especially in navigation, searching and content design.



#### Static Map

- Difficult to tell the direction
- Hard to tell the location of a particular fish



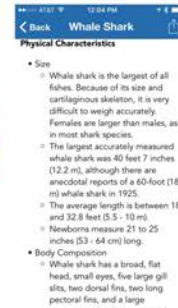
#### Fish Catalog

- Tedious to go through the whole top-down menu each time
- Hard to identify the target given different size of the fish
- Frequent missing of fish images



#### Fish Information

- Contents are too text-based
- Lack of personalized feature, e.g. bookmark



### Solution



Try it with the demo phone!

#### Augmented Reality

- Image tracking to recognize current location
- Playful AR fish floating around, served as fish catalog and personal fish collection



#### Content Design

- Visualize common features, e.g. Range, Size, etc., and make it easier to read
- Allow users to collect fish in personal fish tank

### Design Mockup



#### Lobby

Direction, Show Time, Featured Animals



#### Gallery

Gallery Fish, Information



#### Fish Tank

Collection, AR Fish Tank



# User Testing Script / Georgia Aquarium, Feb 16, 2017

## Introduction

This is the AquaRium app. In the main page, you will see popular fish in Georgia Aquarium, which can show you what's special here and give you easy access to the information like show time, direction and lead you there.

The main objective for this app is to provide information in a user-friendly and playful way, you can find fish easily and have personal collection, and have options to see them in Augmented Reality view.

I will test my design prototype with you. I'll ask you to finish certain tasks, like navigating to a specific page. Since it's just a prototype, only part of the buttons are functional. The main idea is to express the concept of the design and make sure the design performs well to solve the difficulty finding desired information. As you navigating through the app, I hope you can think out loud, saying what you see or what you are thinking.

## Interactive Prototype Task

### LOBBY

1. Look up the dolphin show time and schedule
2. Check the current location
3. Navigate to where Whale shark is

### FISH FINDER

1. Setting up filter in Fish Finder / Select the gallery tag Ocean Voyage
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#### MY TANK

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