



Wenhui Liu

Portfolio

Check more: wenhuiliu.com.

I certify that the work included in this portfolio is my own original work, including the contents, illustrations, charts, and data.

Wenhui Liu

CONTENT



- Pet Handbook



- Research of Key Technologies for Underwater Acoustic Communication



- Personal Website Design

PET HANDBOOK

• Introduction

Pet Handbook is a pet-related information provider. It mainly helps pet lovers without experience in raising pets to learn and choose a suitable pet for them. The App covers the information about the whole process from adopting to taking care of a pet.

• What I Learned

HCI design process & UI design

The importance of making design decision

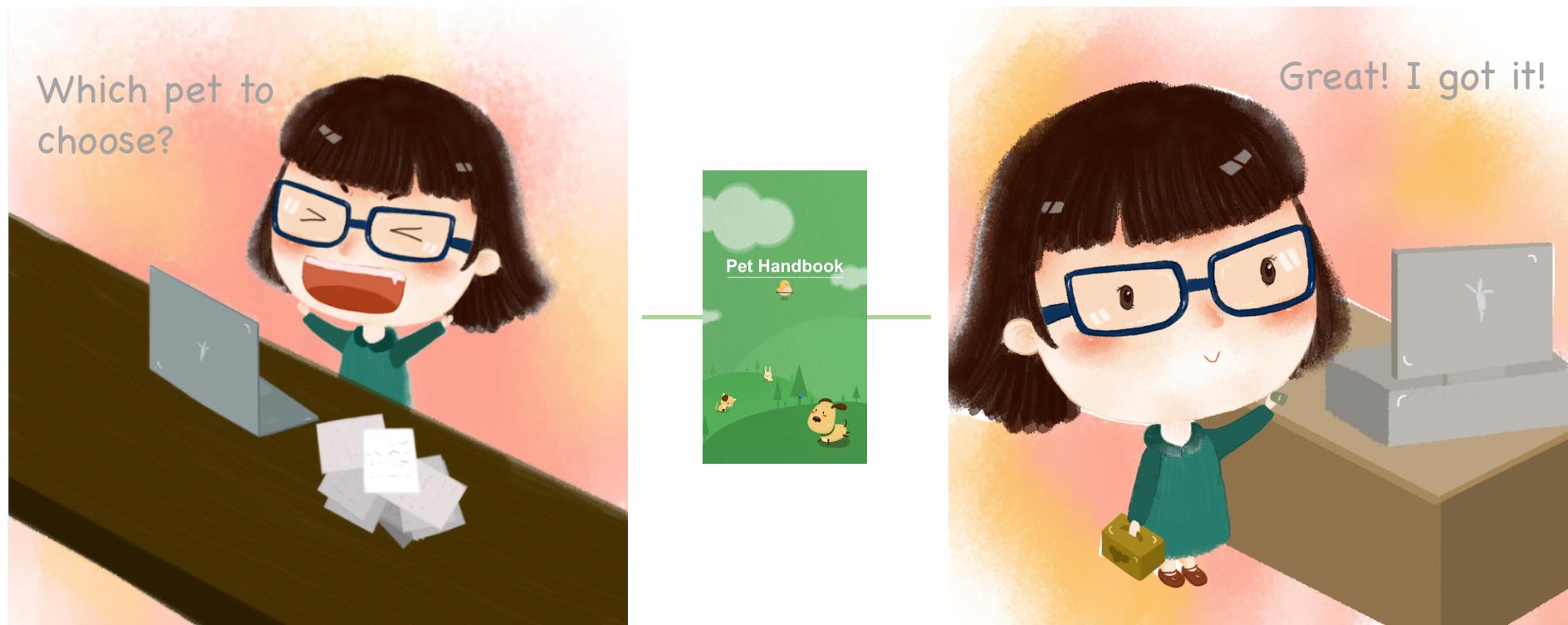
How to determine functions based on user research

How to use tools like Axure, Illustration, AI, etc

• Work For Myself

• Background

America is the paradise for pet lovers, and pets, as a part of their family, keep company with them. Choosing a suitable pet is very important to not only the pet, but also to us. When I first moved to Seattle, I really wanted to have a pet. But without experience in raising a pet, I don't know where to start. I tried to search the Internet and related Apps, but only got scattered posts. I had to read all of them and made notes of the habits, diet, tips, and training information about each pet. I searched Corgi, Alaskan Malamute, Chihuahua, American Shorthair, lop, hamster, guinea pig, chinchilla, etc. The whole process took me about 2 months, and motivated me to design an App which could provide all information about all pets.



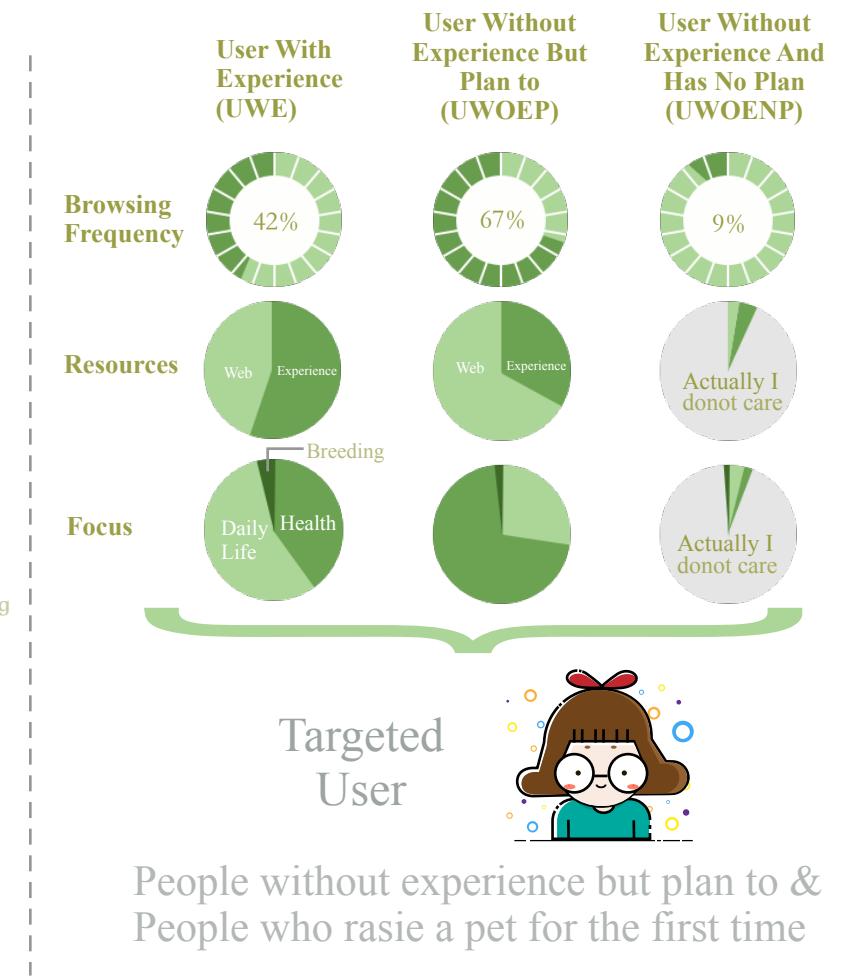
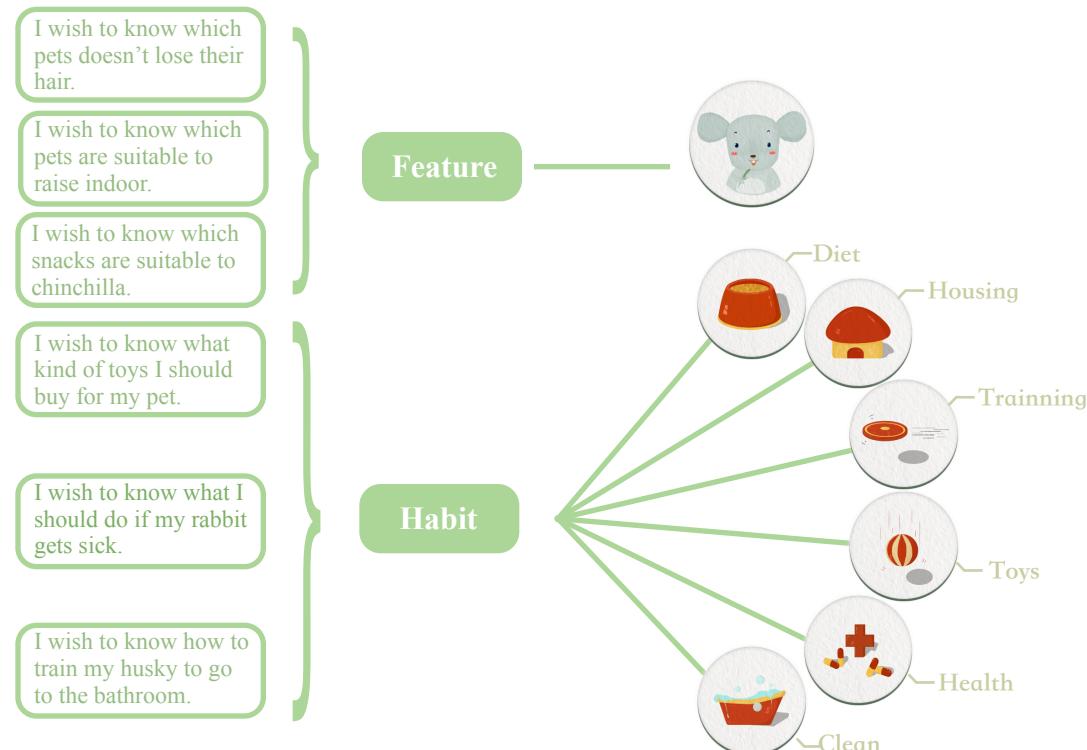
• User Research

I conducted user interviews to gather users' behavior patterns in raising pets and their preferences towards our competitors. I was particularly interested in seeing their attitudes towards existing apps on the market.

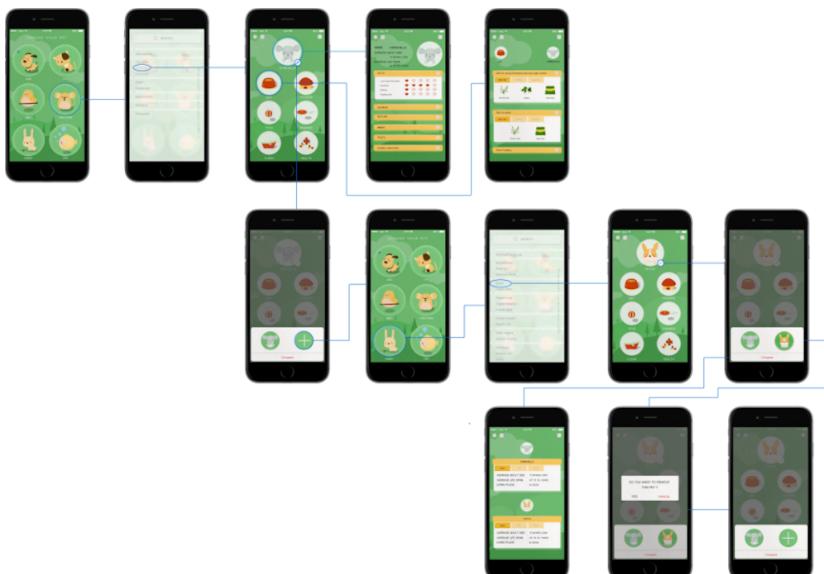
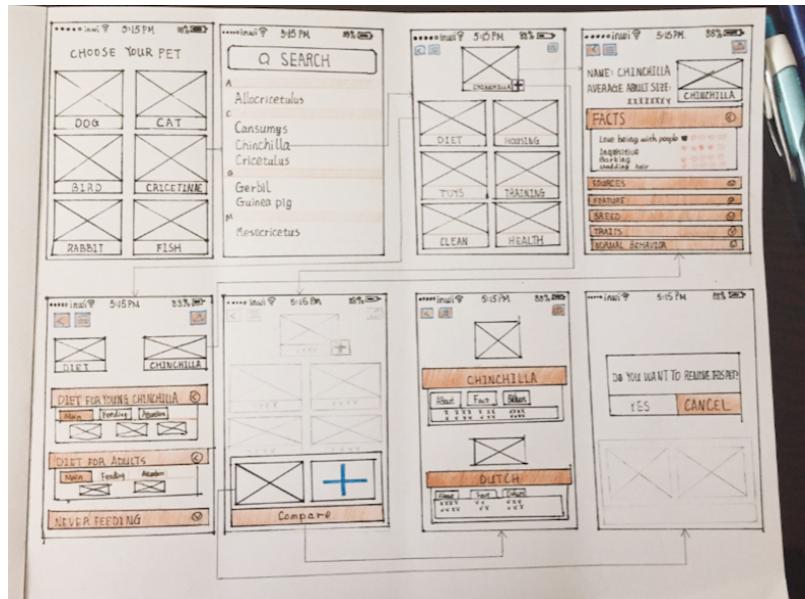
I have interviewed 21 users (14 males and 7 females), including 7 users with experience, 8 users without experience but plan to raise a pet, and 6 users without experience and also have no plan to raise a pet.

• Function & Targeted User

Based on the feedback, I settled down the functions of the App to fulfill the requirements gathered from the interview.



• Sketch & Prototyping



• Feature

SIMPLE

No need to login to find a pet's information

CLEAR

Simple and clear interface

COMPLETE

Including the basic information and habits of hundreds pets

FUNCTIONAL

Including search and compare function

• Two big versions



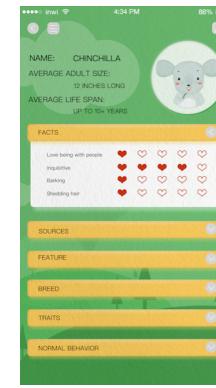
Version1.0



Version2.0

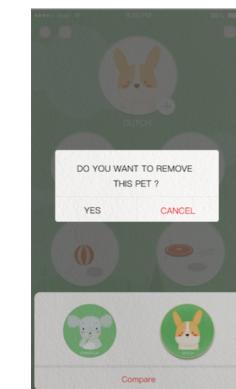
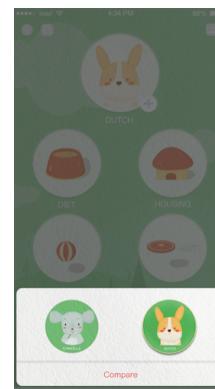
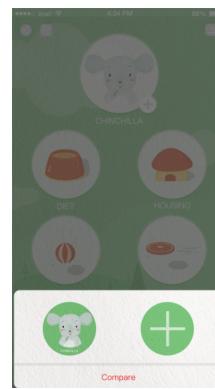
I optimized the UI in Version2.0 to conform the style. I also added the style of paper texture so that the UI is more like a **real paper** and you are holding a real booklet.

- UI



Search pets' information

- There are 7 buttons and a “+” button besides the avatar which is used for comparing in a pet's details page. Clicking the avatar will show the detailed information about this pet.
- The other 6 buttons are about diet, housing, toys, training, clean, and health.



Compare pets' information

- Clicking “+” sign will add this pet into the dialog for comparing, and user can compare two pets at the same time.
- The comparison page will provide the detailed information of these two pets.
- User can remove one pet by clicking the avatar in the dialog which will show up by sliding up.

- Comparing with similar Apps in market

APP LOGO & NAME	No Need Login	Form	Offline Events	Pet & Goods Market	Schedule	Compare	Complete	Simple	Targeted User
 Smellme	✗	Blog	✓	✓	✗	✗	☆	☆	UWE
 有宠	✗	Pet Management	✗	✓	✗	✗	★	☆	UWE
 The Pet Pal	✗	Blog	✓	✗	✓	✗	☆	☆	UWE
 Pet Handbook	✓	Handbook	✗	✗	✗	✓	★	★	UWE & UWOEP

Research of Key Technologies for Underwater Acoustic Communication

• Introduction

This project mainly introduces the application of Time Reversal in Frequency Domain algorithm based on channel estimation and Decision Feedback Equalizer in Time Domain algorithm. We studied how to improve the acoustic communication data rate when the transformation is reliable. Based on the theoretical research, we also conducted simulation of real channel measured in ocean and analyzed the data.

• What I Learned

How to do research in an unknown area

How to study theory and use experiment to verify

How to analyze and verify data

• Work For

Key Laboratory of Underwater Acoustic Communication and Marine Information Technology
Ministry of Education, Xiamen University

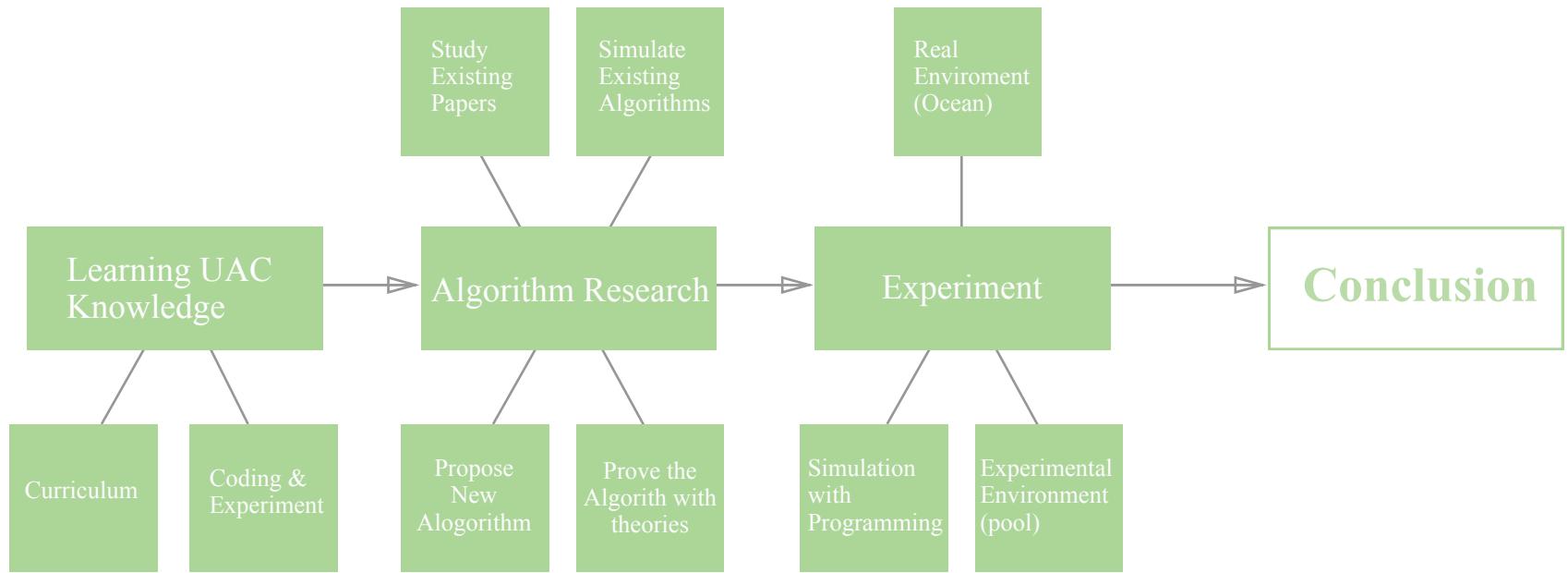
• Thesis

<http://mobileir.xmu.edu.cn:8080/dspace/handle/2288/79248>

• Background

Underwater Acoustic Communication (UAC), as the name implies, is to transmit the information, such as text, video, and audio, by using the water as media. The information is first transformed into electrical signal, and then the signal is encoded. The sending-end will transform this encoded signal into acoustic signal and send it out. At the receiving-end, the signal is received, decoded, and recovered into original information. This is the only way that we can communicate in the ocean in long distance, and also the hardest way due to the complicated environment, such as multipath effect and signal attenuation. My research is to study algorithms to increase the communication quality and decrease the bit error rate.

• Research Process



• Algorithm Research

I researched and compared three algorithms in details. The algorithms including:

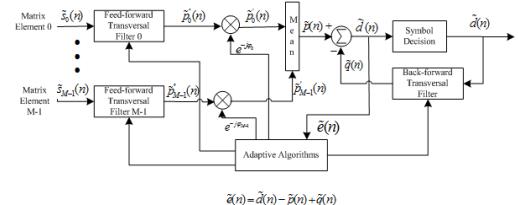
- SIMO-DFE: Multiple-Channel Decision Feedback Equalizer(DFE)
- TR: Time Reversal Algorithm
- FDTR-DFE: TR in Frequency Domain(FD) plus DFE in Time Domain(TD) based on Channel Estimation

For each algorithm, I compared them in two types of Channel Estimation - Linear Squre (LS) and Mathcing Pursuit (MP). And also did verification in two situations - Single-Input-Single-Output (SISO) and Singal-Input-Multiple-Output(SIMO).

• How I Proposed the New Algorithm

In order to have better performance, we will process the data received. I found that Equalizer and TR were worth to study.

• Equalizer

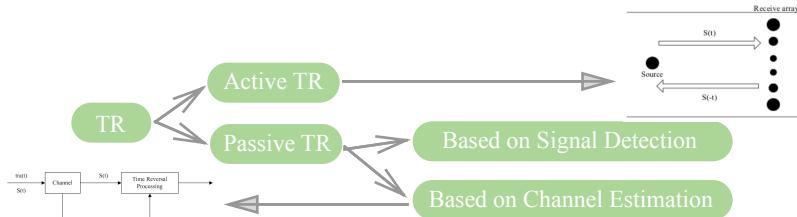


Theory and simulation shows that DFE is better than Linear Equalizer (LE).



- Could eliminate multipath effect
- Multiple-channel is better than single-channel
- High Complexity

• TR



The theories and simulations of **Passive TR** shows that:



- Could eliminate multipath effect
- Can't get the collecting time of multipath effect
- Can't get the length of data unit carried by the detection signal



By simplify the system, I proposed TR in TD based on Channel Estimation

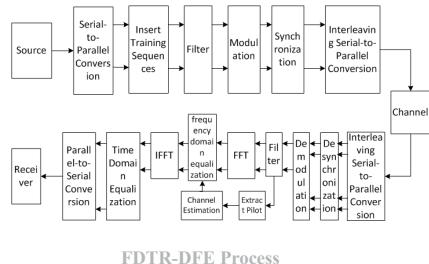


- Low complexity
- No need to consider the collecting time and the length of data unit
- In low Signal to Noise Ratio (SNR), Multiple-Channel DFE is far more better than Passive TR and Equalizer in TD



The equation of TR in FD is similar to the equation of LE in FD

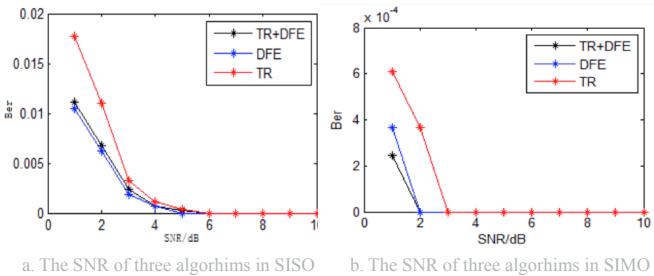
• FDTR-DFE



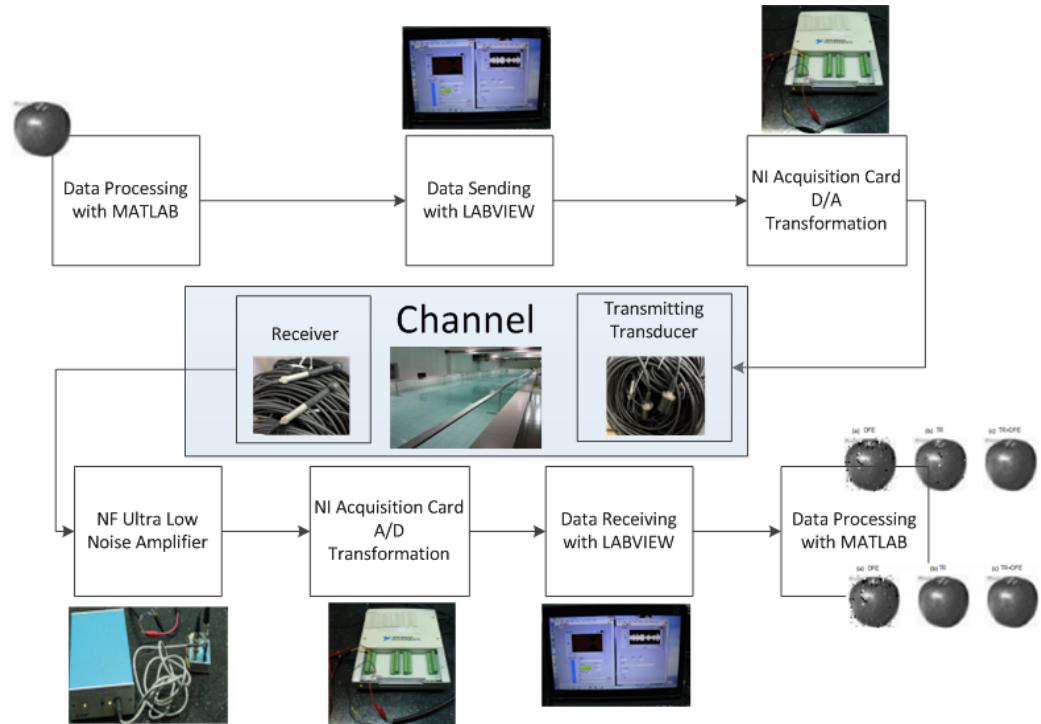
- Better performance in low SNR
- Low complexity

• Results of Experiment

1. Simulation with Program



2. Experiment in the Pool



The equipments and process

Conclusion

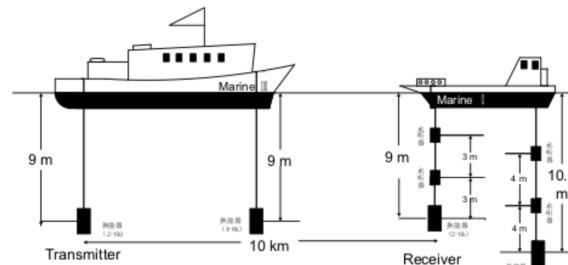
SISO	
SNR<6dB	DFE>FDTR-DFE>TR
SNR>6dB	SAME
SIMO	
SNR<2dB	FDTR-DFE>DFE>TR
2dB<SNR<4dB	FDTR-DFE=DFE>TR
SNR>4dB	SAME

Conclusion

- FDTR-DFE is more effected by Channel Estimation
- Under SISO, FDTR-DFE is more robust
- Under SIMO with 4+ channels, the bit error rate is approach to 0

3. Experiment in the Ocean

On January 21, and March 22, 2013, we did two experiments in the ocean near Xiamen. The equipments are as below. Point A is the sending-end, and point B is the receiving-end.



The condition and parameters:

Parameters	January 21	March 22
Distance	10 kilometers	10 kilometers
Condition	Level 3	Level 3
Temperature (°C)	15.7	18.4
Sending-end Position	N24°18'955", E118°13'.85"	N24°18'48.0", E118°13'26"
Sending-end Depth	20m	18m
Receiving-end Position	N24°21'.75", E118°08'.48"	N24°21.39", E118°08.08"
Receiving-end Depth	15.8m-17.1m	20m
Transducer Depth	8m	9m

Data Length	8192 bit	Beginning Frequency	3500 Hz
Sampling Rate	60kbps	Ending Frequency	8500 Hz
Carrier Frequency	6kbps	Length of Chirp Signal	2s
Data Rate	4kbps	Lenght of Sequence	512bit
Code Width	0.5ms	Type of Sequence	Gold Sequence
Frame Number	8	Modulation Mod	QPSK

Conclusion

- FDTR-DFE is more effected by Channel Estimation
- Under SISO, FDTR-DFE is better than TR (in FD) and stable than DFE (in TD)
- In general, FDTR-DFE is better under SIMO than SISO
- Under SIMO, FDTR-DFE is the best

PERSONAL WEBSITE DESIGN

- **Introduction**

My personal website to introduce myself and my work.

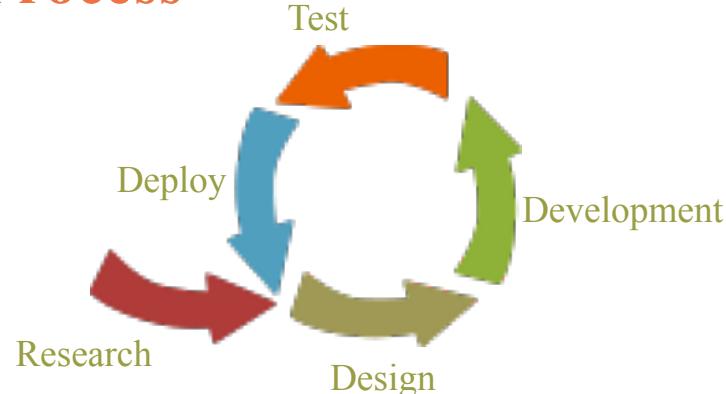
- **What I Learned**

The agile development process including research, design, coding, testing, and deploy
Design thinking

- **Work For** Myself

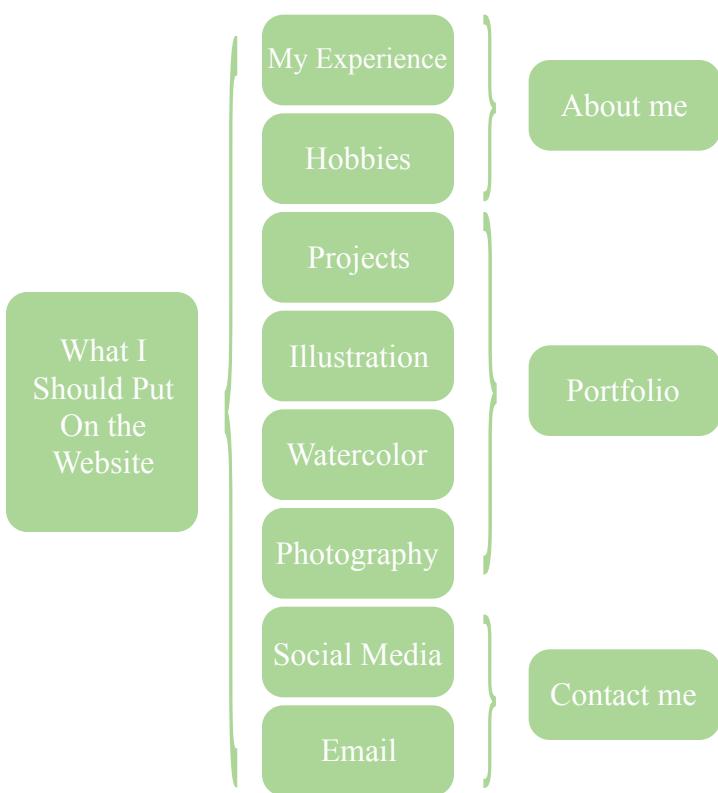
- **URL** <https://wenhui.liu.com>

• Process



• Research

• Content Analysis



• Web Technologies Analysis

Frontend	HTML5, CSS3, Javascript	
Backend	Java, Php, Python, Jsp, Asp.net	
Database	Mysql, Oracle, etc.	
Frontend Framework	Bootstrap, Jquery	
Backend Framework	SSH, Flask, Django, Laravel, Yii, etc.	

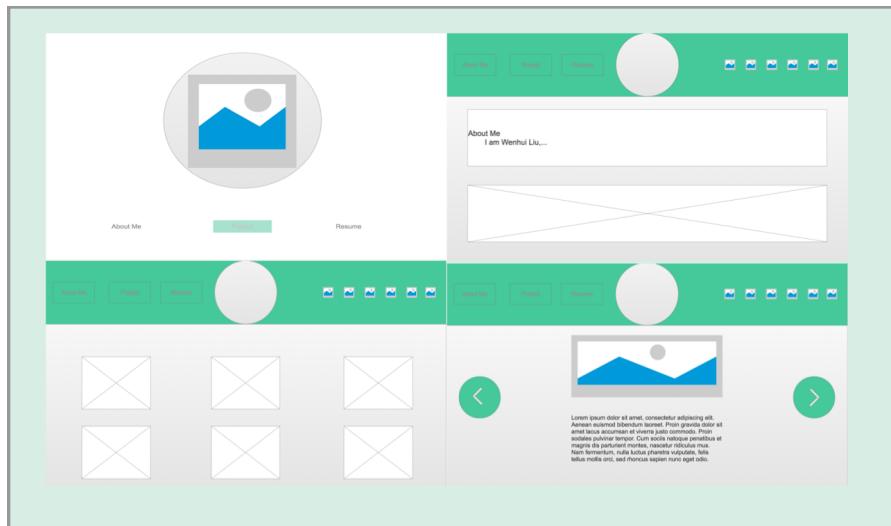
HTML+CSS+JS	Hand-drawn Elements
<ul style="list-style-type: none">• Popular• Easy to develop and maintain• Lots of available frameworks	<ul style="list-style-type: none">• Unique• Personality

By researching lots of personal websites and my preference, I decided my website to contain three parts:

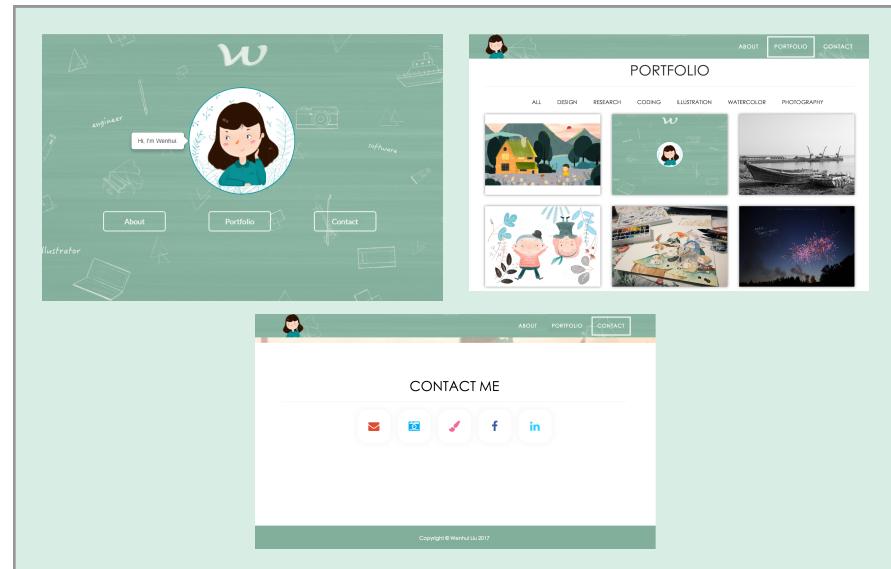
- About me
- Portfolio
- Contact me

By researching web technologies I could use, I decided the website purely to use frontend technologies (HTML+CSS+JS), and use One-Page website style. At the same time, I also added **hand-drawn elements** into the design to make it more unique.

• Design



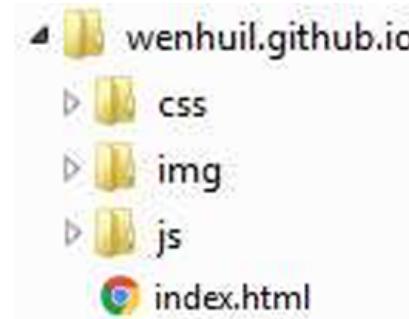
Sketch with Axure



Current Design

• Development

• Folder Structure



• Tools

Design: Photoshop, Axure, AI, Sketch, digital pad

Coding: Sublime

Version Control: Git

Other: Chrome Developer Tool

• Challenges

How to animate elements such as buttons and texts

Solution: Use On-Scroll-Animation technique with animated.css and waypoint.js

How to hide or show an element when scroll to a position

Solution: Use the *fadein* and *fadeout* attributes in Javascript

How to filter the projects by type

Solution: Use *data-filter* in Bootstrap

How to do responsive design

Solution: Use different CSS styles for different size screen. In my website, it will change the style into mobile friendly design if the screen length is smaller than 768px.

• Testing

I mainly did two types of testing: functional testing and compatibility testing.

Functional testing: Make sure the design, buttons, actions, etc are all worked as I expected

Compatibility testing: Make sure the website works well in major browsers (Chrome, Firefox, IE, Safari) and looks good in both iOS and Android devices (phone and tablet).



• Deploy

To publish a website, I need a domain name and a host. Luckily, Github provides a service to host a website for free and is also suitable for the website developed by HTML+CSS+JS.

Domain name: wenhuiliu.com

Host: <https://github.com/wenhuil/wenhuil.github.io>

• Further Improvement

1. Add Google Analytics code to gather the data such as how long a user stays on my site, where they are from, etc. I will analyze this data and see how to improve the website.

2. Conduct user testing. I will first interview some friends to gather their opinions, and integrate good ideas. Then I can use [usertesting.com](https://www.usertesting.com) to gather more opinions.

3. I want to try some other fancy effects like parallax scrolling, and alternative fixed & scroll background. I can do a A/B testing to see which version is better.



Thank you for viewing my portfolio!

To see more details, please go to my website:
✓ wenhuiliu.com