# Optimize diving information visualization of "Dive+" app

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## 1 INTRODUCTION

"Dive+" mobile application is a diving app that contains diving community, photo color correction, diving spot searching features, and so on. Our team aims to improve "Dive+" in its searching function and provide more detailed information, which including water, temperature, diving shop, and diving equipment information. Since our economy increases based on technology, and better user experience is closely related to HCI [1], we mainly focus on improving this application by 10 usability heuristics [2], such as user observation, user evaluation. Therefore, the problems we found in this application are the application cannot provide specific diving shop information for divers, search function returns all information together without filter to address users, diving spots, diving shops, and they use line charts to provide water and temperature information which is unclear and our target user wants more detailed information.

In addition, we also created diving shop pages and diving equipment pages to provide diving shop information. In order to optimize the search function to return real-time relative results based on keywords, we set up a feature to filter the returned result into users, diving spots, and diving shops. Since the 3D heat map reading does not need users' professional knowledge and can be clearer to illustrate underwater temperatures [3], we chose to use it to present the temperature for detailed information.

The research questions that we decide are what kind of factor our target user wants the most. Besides, according to our interview, the most important information that our target users need are diving shops, surroundings, and underwater information. Therefore, the research questions are shown below:
- When divers plan a dive, what is the main information they want to know about the dive spot?
- When divers are preparing for diving, what factors do they use to compare two or more diving shops?
- When divers look up the surrounding information of a diving spot, what information do they want to know about underwater conditions?

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The main idea of our optimization of the application is modifying search functions that can provide our target users more details, such as diving spot information and so on. However, the search function of the existing application only provides users information about their images or posts. Therefore, we decided to provide the 3D heat map which can let the users get more details with information that they want. Besides, the function also gets some good feedback from our interviews and peer reviews. Based on the feedback and suggestions, we improved the comment function which can let our target users evaluate the diving spot.

In the optimizations that we did, we got our research goals from target users. Based on their feedback and our observations, we also created prototypes for testing. In addition, we iterated the prototype by user evaluation. These optimizations are better for users' experiences than the original app, because provided clearer diving trip-related information for our target users, a color contrast button, and tutorials for use.

## 2 TARGET USERS

The target users of this project are mainly scuba divers and free-divers with diving certification, who has rich experience in using the "Dive+" app and planning diving activities. According to our interviews and observations, we found that participants have some complaints and interesting things about this app.

Therefore, based on the feedback we received, we have summarized the following two insights with the most frequent occurrences, which are:
- Users hope that the app can provide enough underwater information (such as underwater temperature, etc.).
- Users believe that the app does not provide novice/experienced divers with the information of

qualified dive equipment rental places near the dive spots.

# 3 PROPOSED APPROACH AND UI

Diving has become a popular sport as man's exploration of the sea has increased. More and more people need a more convenient way to arrange diving trips for themselves. Therefore, the goal of our design is to allow certified divers to quickly plan a dive trip for themselves by using the "Dive+" app. In order to achieve this goal, we designed this app in a way that is more in line with modern people's thoughts. We designed everything in a simple way, but that does not mean we will miss any details. Overall, we have made the "Dive+" a perfect experience for users by enhancing the principle of human-computer interaction.

We redesigned the search page. When the users click on the search box, users will see "search history" on the very top, and they will get the recommended destinations, users, and dive shops based on the location. We used the classified form to display this information, which is in accordance with principle #1 Visibility of system status. When a user searches for a place name, and the search page will show a list of diving spots that match the information the user currently entered. In addition, when the user doesn't know how to spell the place name, they can press on the matching list to search directly for the relevant location. If the user finishes the search, the current user's search keyword will be displayed below the search box, which will give the user enough prompts. This complies with the #9 Help users recognize, diagnose, and recover from errors. During testing, our testers were very pleased with this search page, and they felt that a recommended diving spot based on location would save them time for searching diving spots. Besides, the categorization makes it easier for them to get the information they want and our test users were satisfied with our combination of graphics and text.
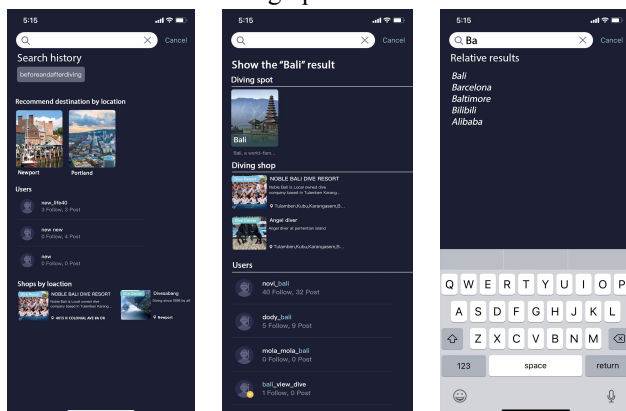


**Figure 1: (Left) Search page. (Middle) No searching. (Right) Searched.**

The diving information page was also redesigned. We added the 3D heat map to that page, which gave more detailed water temperature information for the divers. Figure 2 gives the preview of the 3D heat map. When users use Figma to do the simulation test, they are shocked that we provide such professional water temperature information, and the testers said the water temperature is important to divers to get safe. Besides, the vivid showing style will make their dive activities much more convenient.
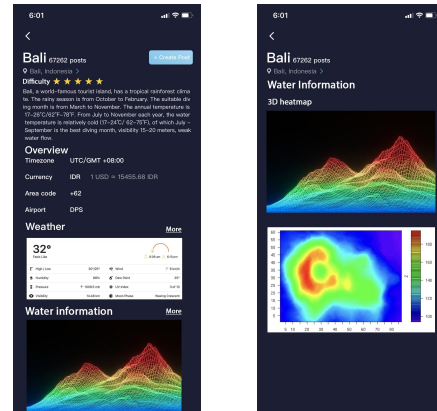


**Figure 2: (Left) 3D heat map in diving spot information page. (Right) Detailed water temperature information.**

Except for the above two interaction methods, we have also made an update to the comment function. We have added the function of comment in the diving spot details page, which will allow users to add their own thoughts to the diving spot, so as to provide reference suggestions for users who will come to this place in the future. This is in line with the #7 Flexibility and efficiency of use. When the users tested this function, they thought it was pretty helpful for them to know a lot of information about the diving spots. In addition, it was also a way to make it easier for them to plan their diving trips. Figure 3 shows below the detail information page and the detail comment page.
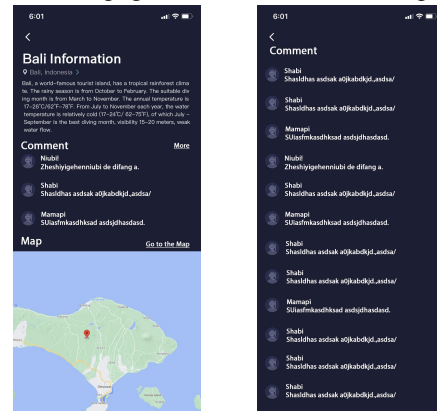


**Figure 3: (Left) Detail diving information page. (Right) Comment detail page.**

# 4 ITERATION

Compared to our previous prototype, we optimized the three updates, like tutorials, real-time results while typing, and color contrast buttons. Based on our test evaluation and observation of tasks finishing, we found that users might have wrong-spell while searching, or they only type a part of keywords. Therefore, we iterated our prototype with real-time results while users are typing. Besides, There were some participants who could not find the navigate button to detailed diving spot information, we added tutorials for users to guide them. Last, we also consistent the color of buttons to satisfy the consistency rule.
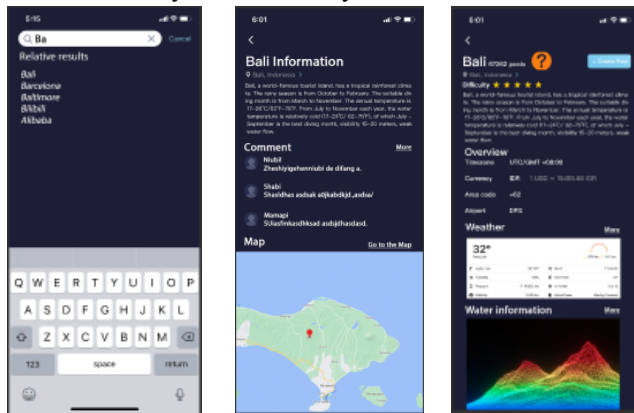


**Figure 4: (Left) Real-time results. (Middle) Contrast color. (Right) Tutorials.**

The reason that we make these changes are these problems found by user evaluation. In addition, to increase user experience, we made these optimizations.

# 5 USAGE SCENARIO

One day, a scuba diver with diving certification has an idea to plan a diving trip. For a certified diver, planning a diving trip is not an easy task.
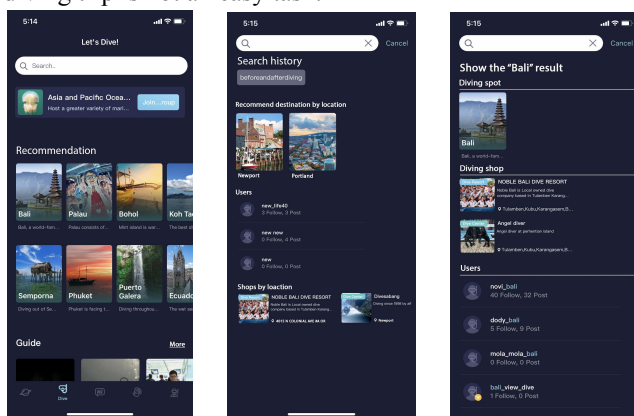


**Figure 5: (Left) Recommended by default. (Middle) Recommended by location. (Right) Search by typing.**

The user will need detailed information about the diving spot, such as its location, recent weather, water temperatures at different depths, equipment rental, and may even need to take advice from someone who had already dived there. Therefore, the user thought it over in the head, as if "Dive+" could provide that detailed information. If the user opens the "Dive+" app, he/she will check the recommend diving spots on the front page.

Figure 5 shows above that there is no diving spot where the user wants to go on the list. Then the user clicks the search icon on the search page, there are several recommended spots listed depending on the location where the user is below the search bar. However, the user checks the list and still can't find the diving spot he wants. After the above steps, the user tries to search the spot by typing on the search bar by himself. The user types "Bali" on the search bar and the result shows the diving spot of "Bali". When the user clicks the image of the spot to check the information, he/she can solve the rest of the tasks, such as booking tickets after he decides the diving spot the user wants to go to.

Below is the storyboard of the usage scenario before he arrived at the spot:
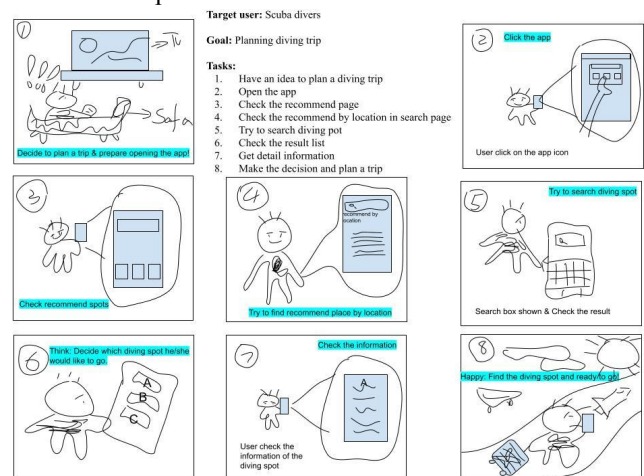


**Figure 6: The first storyboard of the usage scenario.**

When the user arrives at the diving spot and finds the equipment which he/she wanted. The user can open the app again and check the information of the diving spots like the scenario before. Then the user searches the nearby dive shop and checks the equipment list to buy or rent the equipment by direction provided by the map.

Below is the storyboard of the usage scenario after he arrived at the diving spot:
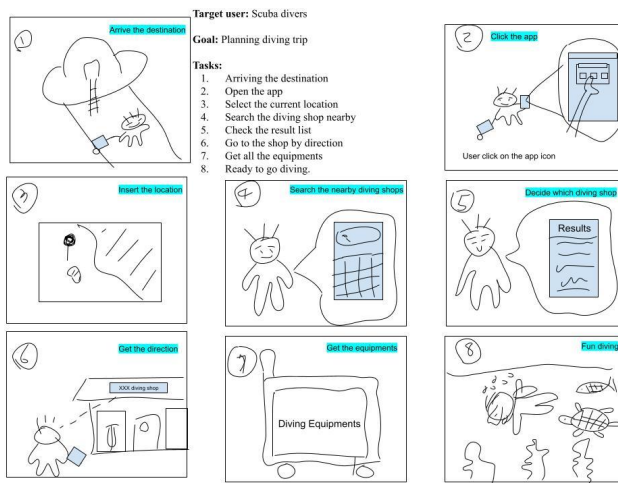
**Figure 7: The second storyboard of the usage scenario.**

<mark>A link to the recorded video:</mark>
https://media.oregonstate.edu/media/1_lhog2yqm

# 6 DISCUSSION

In this project, we use the background of human-computer interaction knowledge to conduct the project by first identifying the application and target user. In addition, we also invited participants to use the origin application and observed their behavior to identify the problems. Based on the above steps, we found what we can optimize and brainstormed how we can improve the problems. After that, we produced storyboards to simulate problems that can happen during usage to created low-fidelity and high-fidelity prototypes based on the problems we found. Finally, we conducted a test evaluation and iterate our prototype to get the expected result.

Due to the COVID-19, most of our work is finished in Haotian's home, and our user observation and test evaluation are finished online by using "Zoom". This might lose some details while we observe but we indeed tried our best to summarize the problem. In addition, we use Figma as our prototype creating tool, but Figma is not a professional prototype app for mobile applications in our opinion. For example, Figma does not have a feature that implements "back to the last page" when a page has two enters, which causes some problems when we create prototypes. The project of this time is the first experience in our HCI designing so that there might be some flaws in our work.

In the future, we need to improve few points later below:
- For the page which has two enter pages, we need to determine which page was the enter.
- For the comments, we can add a translator for users, making sure that it can support users from different cultures and countries.

# 7 CONTRIBUTION STATEMENT

### Guangyu Zhang
As the leader of Group #6, Guangyu Zhang has actively coordinated the time of all group members and arranged meetings in the past few weeks. In this final report, Guangyu's main tasks are the part of the "Introduction" and assign the writing work for each group member. In addition, he is also responsible for this video recording work.

### Guixu Li
In the past few weeks, Guixu Li actively responded to the tasks assigned by the group leader and worked with Haotian to complete the iterative plan mentioned in the presentation process. For the final report, his task is to cooperate with Hung-Chih Liu to complete the third part and complete the writing part of the iteration alone.

### Hung-Chih Liu
In the past few weeks, Hung-Chih Liu has actively analyzed the information obtained from the observation and made suggestions for improvement to the group. In the final report, he and Guixu Li worked together to complete the third part. Besides, he was also mainly responsible for the writing of the fourth and fifth parts of this final report.

### Haotian Jia
Haotian Jia actively participated in team meetings, and he worked with Guixu to complete the iteration plan in Figma together. Besides, Haotian searched for external resources suitable for this final report and created references on the Internet. In the final report, the parts of "Target User" and "Discussion" are mainly written works for him.

# REFERENCES

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[2] J. N. World Leaders in Research-Based User Experience, "10 Usability Heuristics for User Interface Design," Nielsen Norman Group, 15-Nov-2020. [Online]. Available: https://www.nngroup.com/articles/ten-usability-heuristics/. [Accessed: 05-Jun-2021].

[3] A. P. Fernández, , Human computer interaction for 3D model visualization using sensor fusion. 2013.