

Low-Fidelity Prototyping and Heuristic Evaluation

Brainstorming Results

In the brainstorming session, our team members met in a study room and imaged how our interface looked like. The first part of the brainstorming is fact-finding. In the fact-finding stage, we used point of view statements and “how might we” questions to help us identify the users’ needs. Our primary users are university students and office workers who don’t have much time to accompany their pets. The age distribution of these users is roughly between 20 and 29 years old. Meanwhile, we identified some main problems with these users:

1. Pet owners are too busy to feed their pets regularly.
2. Pet owners want to observe the behaviour of their pets and interact more with them when they are not at home.
3. Cleaning is time-consuming for pet owners.

Our system is dedicated to solving these problems for the end-users. At the next step, we moved on to the idea-finding stage. First, we collected some existing interfaces design and similar applications’ designs to illustrate good design considerations. We also used some SCAMPER methods to help inspire our ideas. Then, we came up with many interesting ideas about creating the interface and sketched them out on our tablets or paper. We decided to focus our main features on feeding, interacting, cleaning, and health issues. According to our user research, they are the most important things for a pet care system to contain. Each of the team members focused on different aspects of the system. For example, the sketches of Xinxin Wu concentrated on the system’s feeding function, while Linyao Hou concentrated on the function regarding interaction with pets. Finally, all of us sketched the main page based on our understanding. Below are some of the featured sketches from each team member that we decided to consider involving in our system or further develop to achieve a higher level.

The first idea is about pet information (Figure 1). When the pet owners use our system, they need to establish the profile for their pets, including some basic information, such as name, type, gender, age, etc. This feature helps our system to give users more scientific and intelligent suggestions by analyzing pet information. Based on the diversity of pet species, our system should also provide a large enough database, like pet species.

Figure 1: Junhao Lin-sketch

The second idea is about the pet calendar (Figure 2). This function is essential because the pet owner needs to have a good image of every activity the pet has and make a unique calendar to follow the daily schedule. When we first thought about this idea, we immediately came out with existing calendars like google calendar. However, this pet calendar needs to be more simple. Since most of the events are automatically scheduled by the systems, it won't be a great to change the events.

Figure 2: Daming Wang-sketch

The image displays a series of hand-drawn wireframes for a pet care system, organized into columns representing different screens or sections of the application.

- Column 1 (Pet Care System):** Features a large paw print icon and the text "pet care system".
- Column 2 (Login):** Includes a "Login" title, fields for "Username" and "password", a "sign up" button, and a note "or sign up using".
- Column 3 (Add new pets):** Contains a "Add new pets" title, fields for "Name", "gender", "breeds", "Age", "weight", "height", "long", and a checkbox "I agree the terms of service and privacy policy".
- Column 4 (Advise):** Features an "Advise" title, a "Feedings" section with "amount" and "frequency" fields, a "clean" section with "days" and "year" fields, and a "Recommendation" section with "Best diet plan" and "Best park" options.
- Column 5 (Online Details):** Includes an "Online Details" title, a "Vaccine 1" section with "Available" and "Inject/Treat/Parasite" options, and a "Communications" section with a "Why my pet doesn't like to eat in second dogs?" question and an "Answers" field.
- Column 6 (Pet-specific Screens):** Shows multiple screens for a pet named "Audasia":
 - Feeding:** Includes a "Feeding" title, a "Amount" field, and a "Frequency" field.
 - Health:** Includes a "Health" title, a "Clean" field, and a "Year" field.
 - Clean:** Includes a "Clean" title, a "Days" field, and a "Year" field.
 - Interaction:** Includes an "Interaction" title, a "Best diet plan" field, and a "Best park" field.
 - Audasia:** Includes a "Vaccine 1" section with "Available" and "Inject/Treat/Parasite" options, and a "Communications" section with a "Why my pet doesn't like to eat in second dogs?" question and an "Answers" field.

The fourth idea is about interaction with pets (Figure 4). This idea uses an embedded camera of the intelligent robot to capture the motion of the pets. Also, the users can control the robot to play with their pets with a laser pen or a cat teaser. There's an app called Cute Pet CAM that also has interactive features.

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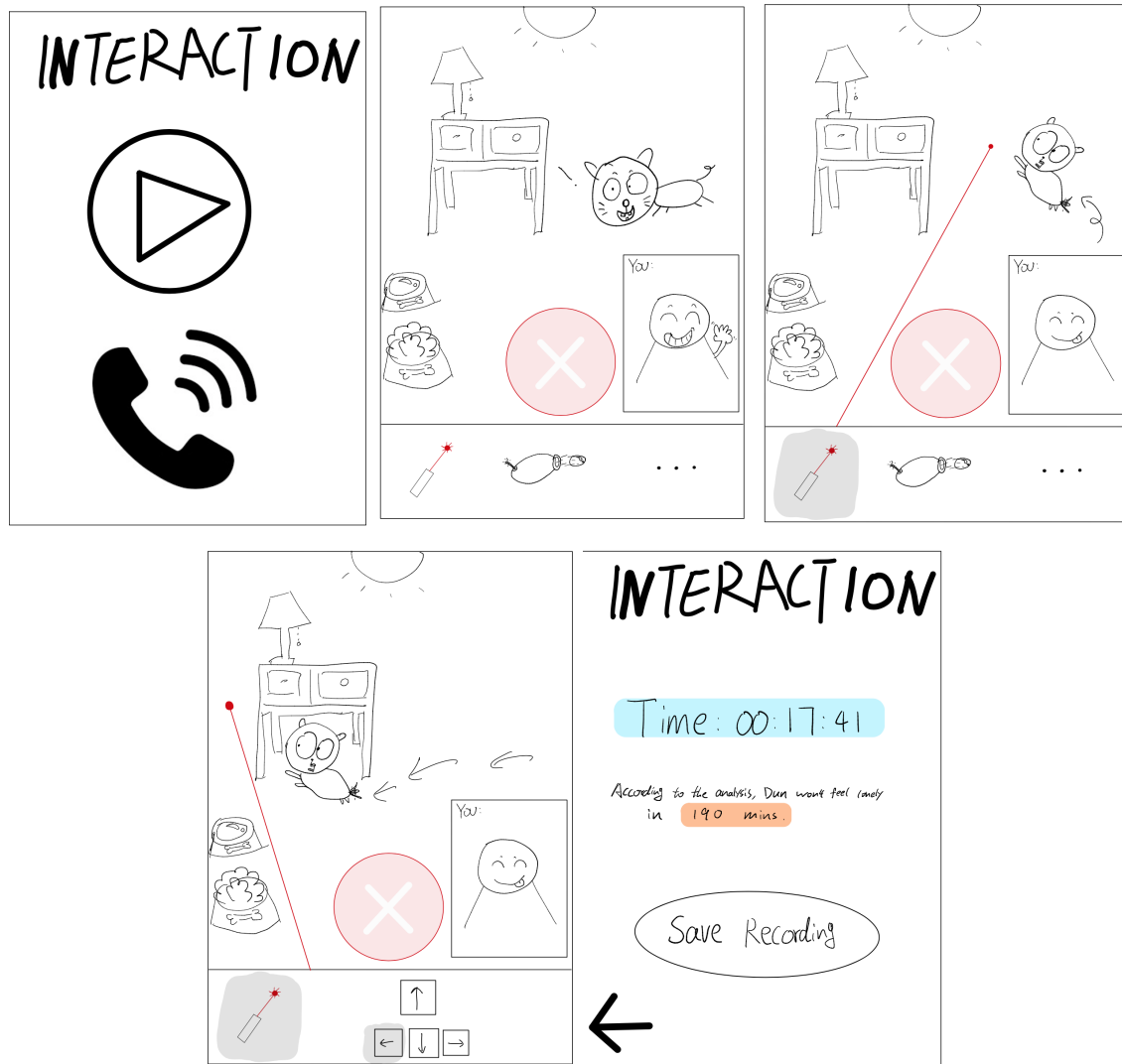


Figure 4: Linyao Hou-sketch

The last idea is regarding the customized auto-feeding, which automatically helps users to feed their pets at a predetermined time (Figure 5). In addition, the system will recommend a feeding plan based on the pet's information. Users can make the pet feeding schedule. There are many kinds of automatic feeding machines, but they are not smart enough and just refills the bowl when the amount of food is lower than a specific value. However, our idea is to use a robot to feed the pet regularly at a set time.

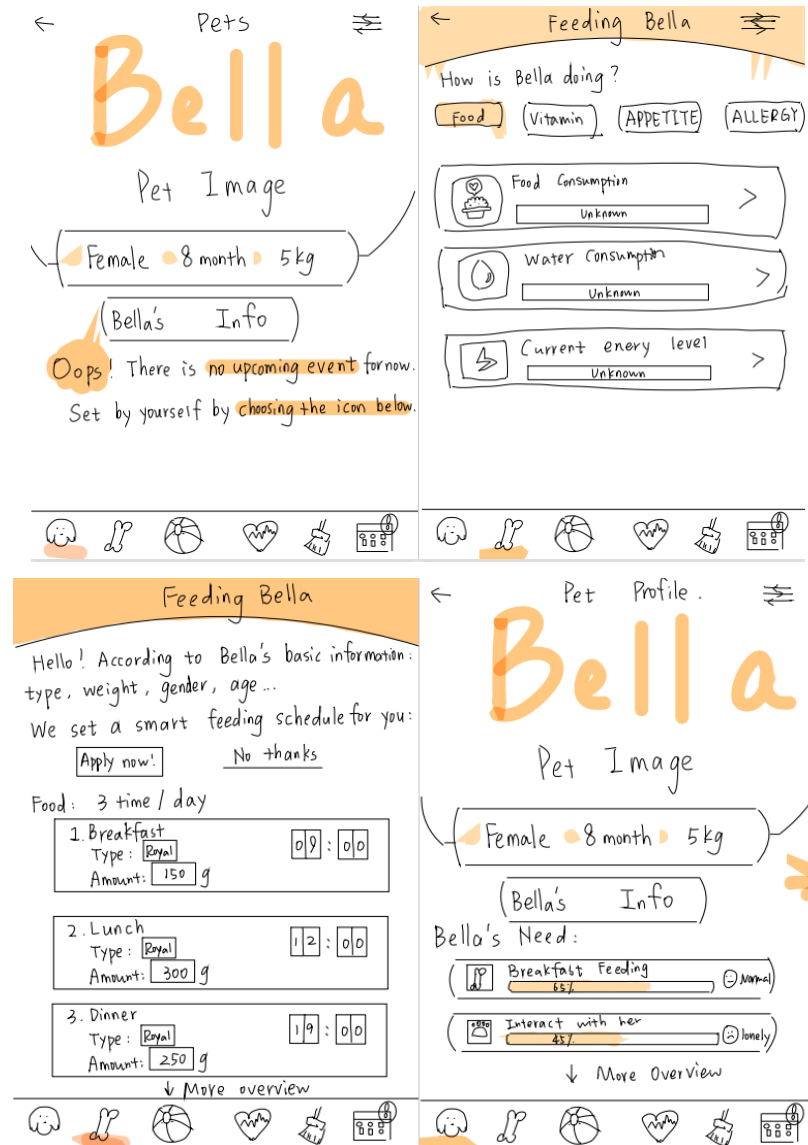



Figure 5: Xinxin Wu-sketch

The discussion and group ideas section involved an evolutionary way. We first looked at our initial thoughts about the system's design. Next, each team member showed their own ideas and sketched them to the others. Finally, we gathered the reviews and feedback on the pictures and then made them perfect and more user-friendly. Every team member went through others' works patiently and gave many valuable and constructive suggestions from strength, weakness, and feasibility in these three dimensions. According to the overall opinions, we grouped these ideas

into four categories: rational, delightful, darling, and long shot.

Category	Idea	Sketch	Reason
Rational	Custom auto-feeding	Figure 5: Xinxin Wu-sketch	It helps the users feed their pets at the scheduled time automatically when they are busy with work or study. In addition, it is technically feasible to use a small robot to fill the bowl with pet food.
	Daily food consumption report	Figure 5: Xinxin Wu-sketch	It informs the users whether their pets finish the meals on time. Furthermore, it is technically feasible because the robot can measure the remaining food after each meal.
	Pet calendar	Figure 2: DamingWang-sketch	A Pet Calendar is a unique calendar for pets where the users can write down any critical date (vaccination, regular health examination, pet cleaning, etc.) so that the app can remind them in the future. This idea is not hard to implement technically because there are many calendars on the cell phone.

	Real-time monitoring	Figure 4: Linyao Hou-sketch	It helps the users observe the behaviour of their pets when they are not at home. In addition, it is
			technically feasible because a camera can be installed in the robot to capture the motion of the pets.
Delightful	Video interaction with pets 	Figure 4: Linyao Hou-sketch	Most pet owners reported that they wanted to have more interaction with their pets. This idea helped them interact with their pets remotely using a cell phone.
	Pet information filling	Figure 1: Junhao Lin-sketch	It enables the system to analyze the pets' information and give helpful suggestions on feeding and health.
Darling	Remote voice interaction with pets	Figure 4: Linyao Hou-sketch	Another method to interact with pets. However, the pets may not understand how this function works.
	Notification of cat litter replacement	Figure 3: Mengyang Zhang-sketch	It reminds the pet owners to replace the cat litter at the proper time. But determining the appropriate timing to replace the cat litter is complicated.

Darling	Remote voice interaction with pets	Figure 4: Linyao Hou-sketch	Another method to interact with pets. However, the pets may not understand how this function works.
	Notification of cat litter replacement	Figure 3: Mengyang Zhang-sketch	It reminds the pet owners to replace the cat litter at the proper time. But determining the appropriate timing to replace the cat litter is complicated.
Long Shot	Online health advising	Figure 3: Mengyang Zhang-sketch	It is challenging to achieve because we need to check the qualifications of the people who give advice.
	Intelligent recommended food	Figure 5: Xinxin Wu-sketch	It is challenging to convince users that the cat food recommendations given by the app are
			not advertisements. If any cat food brand has a quality problem that causes the cat to get sick, the app is also responsible for it. Therefore, there is a high risk for the app.

The most promising idea was chosen by the voting method. We decided on the interaction idea made by Linyao Hou because interacting with pets is one of the design requirements for our system. Furthermore, most pets feel bored because they lack company from the keepers, and almost all owners hope that they can interact with their pets when they are not at home. Also, This feature is not difficult to implement. First, a camera can be installed into the robot to capture the motion of the pets. Then, we can control the robot to use a laser pen or a cat teaser to play with the pets. The advantage of this feature is that users can quickly complete interacting with their pets anytime and anywhere. Interaction includes the following features:

- Interacting at any time/anywhere
- Voice calling and video calling

- Simple interacting games (ex. Laser pointer, little ball cannon and treats dropping)
- Recording of the interaction

The most compelling aspect of this feature for users is that it solves the worry that their pets will feel lonely and depressed when they are not at home. The difficulty with this feature may be how to arrange the interactive games that come with the robot in the user's home.

In the brainstorming session, using the existing ideas and SCAMPER methods helped us generate many exciting ideas, such as the intelligent auto-feeding system and video interaction with pets. We sketched the concept down enabled team members to give helpful and detailed feedback to each other. For example, when we went through the sketch of the auto-feeding system, we found that a 'pause' button was necessary, and a daily consumption report could be beneficial. In addition, grouping the ideas using the 'four categories' method helps exclude unrealistic ideas such as online health advising.

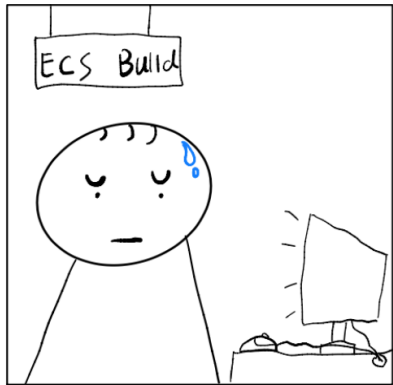
Everyone participated in the brainstorming process and put great effort into coming up with such interesting thoughts and converting them into prototypes. However, we also encountered difficulties finding related works because the pet-care system was a novel idea, and we could not find many similar systems or products. Also, deciding which was the most promising idea was not easy. In the voting session, each team member can only choose one feature they think is the best. After voting, three people in our group decided on the pet interaction function, and only two simultaneously selected the feeding function. Finally, next time, we can do it more scientifically by collecting more data and maybe from the literature to enhance our brainstorm phase. We also should be more inspired next time to come up with more crazy ideas.

Storyboard

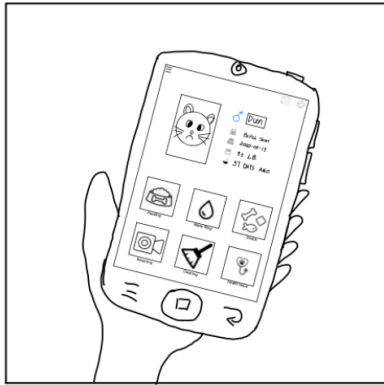
Persona: Tom, 25, the 4th-year engineering student at UVic.

Scenario: Tom has a lot of work that needs to be finished this week, so he has to spend most of his time staying in the lab room. He wants to make sure that his cat will not be too bored at home

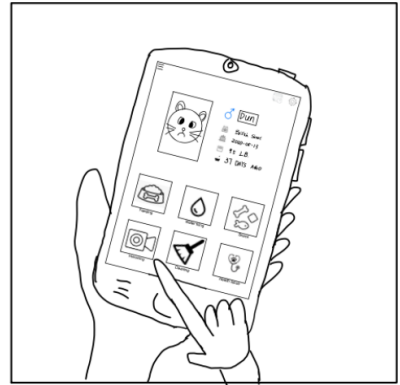
because he constantly interacts with his cat when he is free.



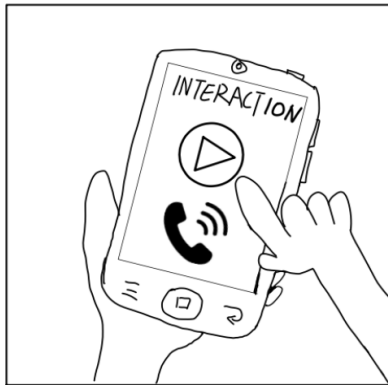
Tom has been staying in Lab room for 12 hours, he is worrying about his cat.



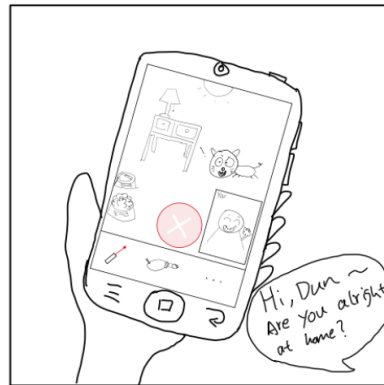
Tom opens the pet monitoring application on his phone.



Tom wants to say what is cat is doing now, so he selects the 'interaction' button



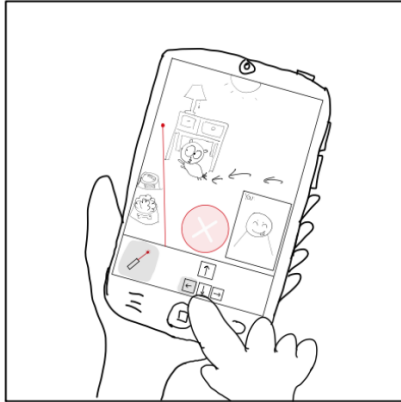
Tom wants to see his cat, so he selects the video interaction.



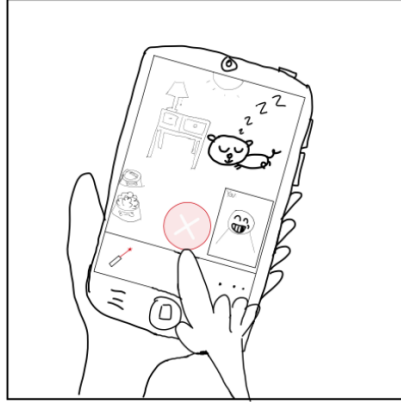
Tom starts the video interaction, and says "Hi" to his cat.



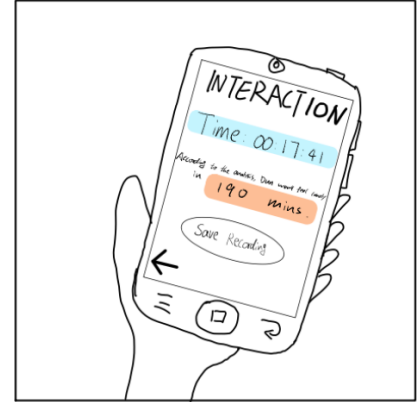
NOW, at Tom's home, the robot says the words from Tom.



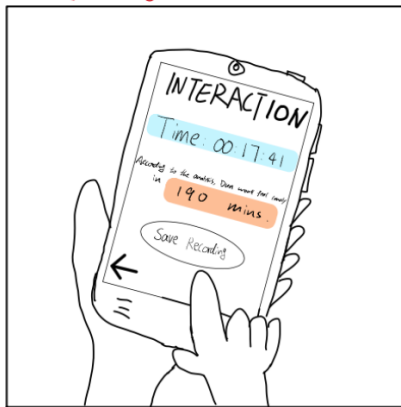
Tom turns the Laser Pointer on and control it on the arrow buttons. His cat starts playing this game.



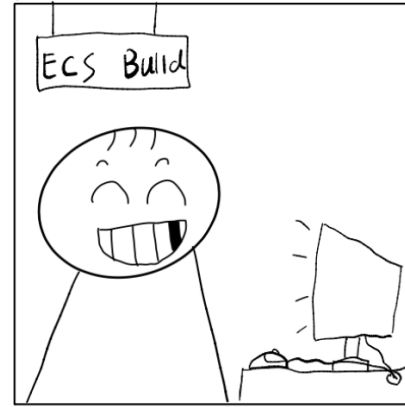
When the game is finished, his cat starts sleeping. Tom feels very happy and relieved. He ends the Video interaction.



After the interaction is finished, there is a summary pops up and shows that his cat won't be lonely in around 190 minutes.



Tom wants to save the recorded audio, so he clicks the 'save' button.



Tom stops worrying about his cat, and continues his lab works.



At the same time, Tom's cat is still sleeping and doesn't feel lonely.

Video Prototype

The idea we chose for the video prototype is the second most promising idea, the feeding system. The video prototype illustrated how users could use our app to feed their pets. The video was first showing the login interface when the user comes in at first. And then add the pet information to go into the primary interfaces. Then, by clicking 'START', 'STOP' and other likewise buttons, users can design the feeding plans for their pets. In addition, the 'Feeding Schedule' is convenient for users to know the progress of pet feeding, and the 'Weekly Report' function allows users to see the diet status of their pets. Below is the link to the video prototype.

<https://drive.google.com/file/d/15oaPLRTg6M6X419PEDKdCmXu5Ysm6R8x/view?usp=sharing>

Heuristic evaluation results

Principle Violated	Reason	Severity and reason
#1 Visibility of system status	not clear enough in some interfaces. Users may get confused about which stage they are currently located at, especially in the pet feeding interfaces.	3, the visibility of the system stage is vital to be included. It will give the users a better experience with the overall process.
#3 User control and freedom	There is no 'undo' button when the users make mistakes in the feeding plan. So, for example, if a user clicks the 'delete' button by accident, he cannot undo that.	3, should be fixed because when the users make a mistake in the feeding plan, they need to do much more extra work to fix that.
#5 Error prevention	<p>(1) when users enter their pets' basic information on the 'Add a pet' interface. Additionally, a warning should appear when users enter the special characters for their pets' names or other characters that are not numeric for the weight.</p> <p>(2) When the users try to modify the feeding plan, the system should make sure to click the 'pause' button first.</p>	<p>(1) 4, a non-numerical or non-positive pet weight is a big mistake, must fix</p> <p>(2) 4, must be fixed because modifying a proceeding feeding plan will confuse users and the system.</p>
#8 Aesthetic and minimalist design	There is too much information on the main page of 'Feeding Bella'. The 'Food' button can be deleted.	3, too much information will make the users dizzy.

	'Vitamin' , 'Appetite' , 'Allergy' buttons should be moved to another page.	
#9 Help users recognize, diagnose, and recover from errors	This is violated when the users try to set different feeding plans that begin simultaneously. The time of every feeding subtasks must be different since pets can not have two meals simultaneously. A window should pop up, expressing the error messages and indicating the problems to help users notice them.	2, most users will not make these mistakes, minor usability problems.
#10 Help and documentation	There are no tips or tutorials for inexperienced users trying on some functionalities and making some changes on settings.	3, although the UI is simple enough, the helping page or tutorial function is still needed in this application for inexperienced users (minor usability).

In the heuristic evaluation, our team members discovered some major problems such as the lack of an 'undo' button, and the lack of proper error prevention (add limitation when users type the weight and age of their pets and make sure the feeding plan is paused before it can be modified). The discovery of these problems can be beneficial to our interface design. However, our group also encountered some issues when doing the evaluation. Some of the team members misunderstood the meaning of some of the principles and thus made some mistakes when they wrote down the principles that the system violated. Next time we should discuss the terms and definitions first so that we can reach a common understanding. Besides, we should have more discussion time to make some adjustments. Overall, it's a successful heuristic evaluation.