< HASAKI >

PROPOSAL REPORT

<Team Hedgehog >

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Semester 1, 2020

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Team Hedgehog

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Physical Computing & Interaction Design Studio proposal
09 Apr 2020

1.INTRODUCTION

This work is a hearing-centric swordsman somatic game that provides visually impaired people who would like to exercise their hearing sensitivity and common people who interested in physical games. We proposed a handheld physical interactive device that used Infrared laser detectors, wireless headphones. Users will use wireless headphones to listen to game commands while holding the physical interaction device. The user should always stand in one direction, and user's face orientation cannot be changed, and then he or she asked to make an action, which is to swing the sword in eight different directions around him. In the process, the user should always maintain a direction because the device uses a physical laser detector to determine the direction, and the direction of the sensor cannot be changed with the direction of the user's walking. The eight infrared lasers will detect users 'behavior, and the winning or losing of the game depends on whether the user can cut the right laser beam. At the same time, the game will have three modes, which include easy, medium and hard. These modes will gradually increase the difficulty of the game mode through accelerate attack frequency and adding some noise and physical interferences, simulate rain and wind. After the project is finished, we will test the project through collect data, observe whether visually impaired players like this game and evaluate this interaction device from the ease of play and entertainment.
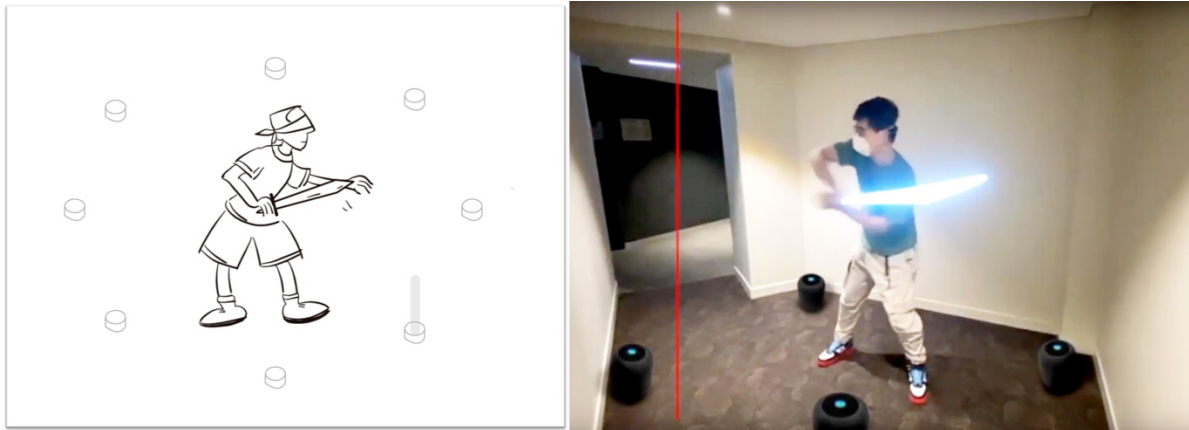
Illustrations used by users and body storming (Figure 1, Figure 2.)

Video games have great potential not only to entertain but also as an instrument to improve skills. [1] Focusing on visually impaired people, different games have been proposed to improve orientation and mobility skills[2][3]. It has been proved that skills acquired in virtual worlds are transferable to the real one [4] [5]. The Inspirations of this project is from marvel superhero Daredevil and movie Zatoich. This idea hopes that through keen listening training for players, they can practice players hearing sensitivity and bring visually impaired players strength and balance in different ways.

Daredevil and Zatoichi (Figure 3, Figure 4.)

Due to innate visually impaired or visually impaired due to acquired reasons, exercise hearing sensitivity becomes crucial for this group of people. The visually impaired people would to find a physical device to exercise their hearing and also could give some entertainment. The primary target user is in provide games for the visually impaired people because in the theme area have fewer projects to provide to users exercise their hearing sensitivity and entertainment. Similarly, the market has no similar game products for visually impaired people. So this problem needs to be solved.

2.RESPONSE TO FEEDBACK

1.Narrator function: In the original conception, the target audience of our work was blind users. So the sound is the only clue that the player will continue the game. When we initially designed the game, we ignored the importance of the boot-loader. I mean, how to guide the player into the game. For a system without an interface, using logical voiceovers to guide users is the key to enhancing the user experience. So we will consider adding a sound-based guidance system to the game to tell the user the current situation, what need to do next, and show users the background story.

2.For multiplayer games, to enhance the game experience, at the beginning of the design, we considered inviting a second player to join the game. However, considering the security of the game, we did not introduce this model in the presentation. In the game, players need to hold a long sword to hit possible targets. And our target users are blind, so we canceled this feature to avoid potential risks. But in our most recent group meeting, we found a way to allow multiplayer games and effectively reduce the risk of injury. That is, during the game, two people need to stand back to back in the center of the field according to the system prompts. Each person is responsible for two or one goals. This can test the player's tacit understanding and greatly enhance the fun of the game.

3.Wearable device. It is considering that our current receiving system based on Laser trip-wire alarm system. If you want to trigger this system, there must be an object touching the laser to get the corresponding feedback. If we use some sensors to mimic the weapon. This will not change the game experience.

4.Haptic feedback. Anyone who has used iPhone 7 has experienced the enjoyable experience brought by Apple's vibration feedback. This is indeed a way for users to receive feedback more directly. Tactile feedback is much more direct than traditional visual and auditory feedback. And this feedback system is very suitable for mounting on our hilt. When the user

swings the sword and cuts off the laser, the vibration feedback system starts to work, and the user knows whether he hits the target.

5.3D-Audios/ Headphones. This is a good idea that can help us to improve the installation and user experience. According to our original design, we considered placing four speakers in four directions: front, back, left, and right. The sound is emitted through the speaker to guide the user to operate. But the disadvantage of this design is that the entire device needs to be placed in a room with good sound insulation. The advantage was obvious for users to play the game by using headphones. We no longer need a separate room to house this equipment. But if we use headphones to play 3D-audios will bring another problem. That is, we need to update the direction of the user at any time. Because in the game design, we initially played by placing four speakers at the front, back, left, and right, so the location where the target appeared was fixed. If the device that plays sound is changed to headphones, the direction of the sound will deviate from the direction of the laser sensor as the user moves. So this is an issue that we must consider. If this problem cannot be solved, it will become the biggest obstacle for us to complete this device.

6.For safety issues, the material of the weapon must be light but with a certain hardness, such as high-density foam. This can prevent the user from causing some potential damage to people around when immersed in the game.

7.'How to Start/Pause' the game. Due to the limitation of presentation time, we have not described too many details about the installation. After several group meetings, We currently have two options for controlling the entire system. The first is speech recognition. Our user group is blind, and this interactive mode allows them to enter the game after a short training. All they need to do is speak a few voice commands into the microphone. The second option is the traditional button. The button is the most familiar interaction mode; it is simple but efficient. If less than three buttons are placed on the hilt, this mode of operation will be more convenient for people to use. But with the addition of new features, the increase in buttons will affect the user experience. The probability of user accidentally touching will increase, and it is not very easy to distinguish the function of each button. So we will give priority to speech recognition.

8.Game boundaries. According to the current design, the four speakers are fixed in four different positions. However, there is a potential risk with this design, that is, when players (blind players) experience this game, they may move away from the original center point and approach the speaker due to movement. This is likely to trip over the speaker. So this suggestion is beneficial; we can use a laser to draw an invisible boundary. The user is prompted to return to the central point by sound, which can ensure the safety of the experience process.

9.Join the maze. How to let the blind player experience the fun of the maze. We can use the maze as a challenge level in the game. This may improve the playability of the game, and during the challenge, some obstacles (sound prompts) will randomly appear, and players need to use their swords to solve them. This is indeed an interesting suggestion, and also in line with our settings.

10.fitness model. In the regular meeting last week, we were using the simulated motion amplitude to determine the area required for the entire device. In the process, we found that some movements can move our waist and shoulders well. Many office workers and students suffer from cervical spondylosis and lumbar spondylosis. For this type of group, it can also be used as the target audience of our device.

11.It could be interesting to have a visualization of your movements after the game finishes.

3.RELATED WORK

This section will introduce the related research work done in our theme,as well as the the reflection on it. The literature review includes a similar exploration, guidelines for voice

interface design and the theoretical support for our project attempt. The research on published games summarizes the types of existing games and our inspirations from them.

3.1 LITERATURE REVIEW

Lahav, O., Gedalevitz, H., Battersby, S., Brown, D., Evett, L., & Merritt, P. (2018). Virtual environment navigation with look-around mode to explore new real spaces by people who are blind. Disability and Rehabilitation, 40(9), 1072-1084.

The original intention of searching this article is because after our presentation pitch, in our feedback some people mentioned a game for the blind people that uses sound and haptic feedback hints to explore the unknown space, such like exploring the maze. We also believed that this mode will bring a interesting game experience, and suitable for the theme of our hearing ability-centric theme as well. However, we found that this concept has already been explored. In the article, in a virtual cane system(Figure 1) simulating a room similar to the reality, the authors presented a new look-around method which enables the user to explore the unknown by the auditory information without moving in addition to the traditional walk-around way in which the user has to explore while walking. Besides, the authors selected the Nintendo Wii device(Figure 2) as the visual and movement orientation controlller due to its widespread, easy and novel manipulation. In the experiment, the participants explored the unknown space and the obstacles information in it by these two methods. By comparing the accuracy and efficiency of the drawing mental maps, the authors verified the effectiveness of the look-around method.
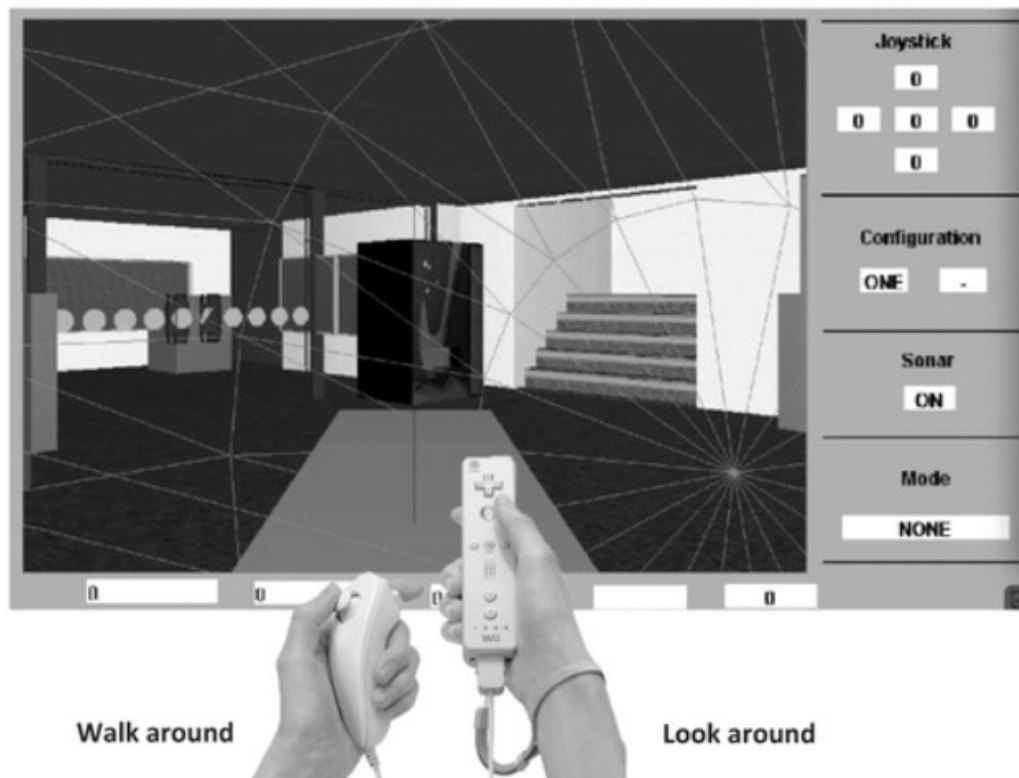
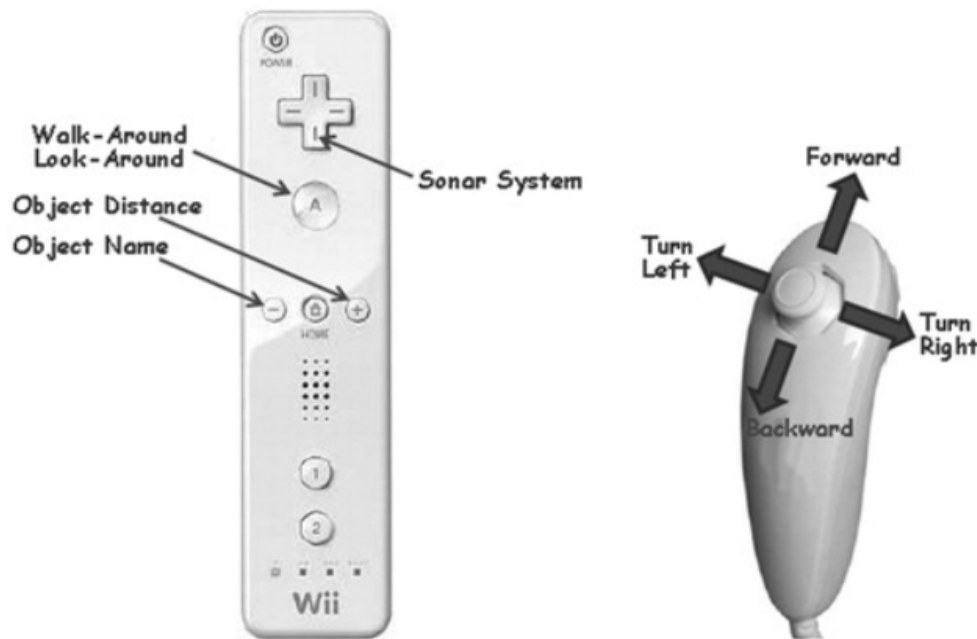*Interface of the Virtual Cane System (Figure 5)*

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Figure 2[2]. Wiimote and Nunchuck. (Figure 6)

Although the new direction of our project theme we wanted to work on has already been done by others, we also learned a lot from others work. First, the effectiveness and the ability to exercise spatial skill of this look-around method has been verified, which means we could apply this pattern in our design to help users perceive the gamified scene. Second, the Nintendo Wii controller can be a option or we can use the settings of his button to determine what necessary functions are available in our own controller. Third, we planned to add a voice prompt system to describe the virtual environment to our users, which has been introduced in this article as well. The authors provided their participants with obstacle information by different kinds of the auditory and haptic effects. Last, it presented us a method of verifying the validity of the design through comparing the mental map and map model, which could be taken to test the connection in the design of our auditory system and game scene.

Kristjánsson Á1, Moldoveanu A2, Jóhannesson ÓI1, Balan O2, Spagnol S3, Valgeirsdóttir VV1, Unnthorsson R3. Restor Neurol Neurosci: Designing sensory-substitution devices: Principles, pitfalls and potential. 2016 Sep 21;34(5):769-87.

In our future design, there is a great possibility to use voice and haptic system as input and output. Due to the loss of visual sensory, it is an inevitable challenge to convey information to them completely and accurately. Since when conveying information, different personal understanding, unclear expression and sensory caused by redundant information etc. are all the potential risks for unexpected results. Therefore, we have to follow certain rules when designing sensory substitution for the blind. In this article, the authors highlight some main points in the sensory substitution devices
Only convey critical information.
Focus on task.
Need research in basic psychophysical representation.
Must not interfere other perceptual function.
Feedback modality can be various.
Need consider the spatiotemporal continuity for different senses.

Although the sensory substitution system is slightly different from our design concept, because this system is designed to pass the information of the real environment to the blind people in the way of auditory and haptic, and our game environment will be a virtual scene. The design guidelines proposed by the author are also of great reference significance to us, because their common ground is to accurately convey information to users in the same sensory function.

On this basis, we have to mention the Voice-User Interface(VUI), a voice platform that makes human interact with computer. Nielsen also mentioned that the VUI is very suitable for the cases that the users can't see because of the disabilities or other issues[6]. It also has been widely used in products, such as the Microsoft Windows, Car Navigation, Android and OS etc. There are some practical tips should be informed for our design as well:
Simple and conversational communication.
Confirm of the finished task.
A personality of the VUI.

Dunai, L., Lengua, I., Peris-Fajarnés, G., & Brusola, F. (2015). Virtual Sound Localization by Blind People. Archives of Acoustics, 40(4), 561-567.

In addition to designing a game with a new experience for the blind, the original intention of our project is more important to help them train their hearing ability. The hearing ability is such important that it enables them perceive the environment, predict the danger and localizing, etc.The level of this sensory function largely determines the quality of their lives. Therefore, we wish our game could contribute to improve this ability. However, at that stage, we have not yet sought theoretical support for our will. For instance, can hearing ability be improved through training? Will our game settings have a positive effect on this? Fortunately, all our concerns have been confirmed in this article. At first, they demonstrated the blind people have a better performance on localizing sound than sighted people. In addition, through the experiment, the authors concluded that the blind can interpret the sound in the real environment more effectively after practice with the headphone. Sound sources in real life are often confusing because they are mixed with noise and the sound is mobile. However, after training in an ideal environment with earphones, the blind people's recognition of the sound source in the interference environment has also improved. In short, all kinds of theoretical support and experimental verification ensure the theoretical support and significant meaning of our project.

3.2 PUBLISHED GAMES

At present, there are not many games specially developed for the blind, the American Foundation for the Blind website(https://www.afb.org/node/16207/games-and-activities) listed some typical games, which mainly consists of two types: the haptic physical game, and the auditory electronic games. For the former, most of them are card and chess board games, players mainly distinguish game objects through different touch senses. For the latter, the game mode is mainly to let users make direction and simple decision-making promptly changes through voice or vibration information. A more complicated video street fighter game (https://www.youtube.com/watch?v=aX0oPwQPo9A) provides the player a training mode to remember the attack sounds of different characters, in this way the player can imagine what his opponent is doing. It inspires us a lot that we can apply a similar training model to help the player get familiar with the different sound effects as well. In addition, a game with a storyline published by Tencent(https://www.sixthtone.com/news/1003921/new-tencent-games-highlight-challenges-of-visual-impairment) provide us reference to set up game flow and voice cues.

4.AUDIENCE

Based on our project, our target users are mainly divided into two groups. One type is the visually impaired, and the other is ordinary players.

VISUALLY IMPAIRED:

Visual impairment is a term experts use to describe any kind of vision loss, whether it's someone who cannot see at all or someone who has partial vision loss [7]. According to data from the World Organization, there are about 2.2 billion people with visual impairment worldwide Or blind. This is not a small number. Therefore, we realize the importance of providing services for this group of people [8].

First of all, regarding the characteristics of visually impaired people, due to their own physical conditions, there are some inconvenient places in life for visually impaired people. For example, this has led to problems with their travel, due to the lack of blind passages, the more significant impact of the weather or the scarcity of guide dogs, etc. Secondly, their social interaction in life is also a problem. Due to the small social circle, they can only obtain information through radio and television, so their sources of information are relatively limited. Besides, psychologically, their hearts will be more sensitive than healthy people, because sometimes they will feel that they are not valued, and many experiences in life are much less than normal people. At the same time, they are also at higher risk of being deceived because they cannot clearly distinguish objects due to vision problems. Because of this, the hearing or other aspects of these visually impaired people will be more demanding than ordinary people. Therefore, the original intention of this game is to improve people's hearing and ear sensitivity. In addition, according to statistics, the general education level of visually impaired people is lower because of their physical inconvenience. These are the pain points for the visually impaired or blind. Since there are relatively few games on the market that directly target the target audience as visually impaired people, most of the game development ideas are adapted from ordinary games played by normal people to versions used by the blind. Therefore, we hope to design a game that takes visually impaired people as the starting point, provides better and richer choices for their gaming experience, so that they can also experience the colourful game world, so as to develop a game that is deeply loved by visually impaired people.

ORDINARY PLAYERS:

In addition to the main visually impaired people, our target audience also includes average users without physical disabilities. For this part of users, first of all, their advantage in this game is not apparent, because we do not have a visual graphical interface, all users must rely on the voice navigation system to play the game. Secondly, the purpose of their games is slightly different from that of the visually impaired. Normal people have far more choices for games than the visually impaired. Because there are so many exciting games on the market, entertainment is not the main reason for them to play this game. There are currently two reasons for their participation in this game. The first reason is to simulate the life of visually impaired people, that is, to experience the daily life of visually impaired people. Second, because the game content uses weapon simulation to fight the enemy, this game will generate some body twists and movements, which brings convenience for users to exercise the waist, shoulders and arms. Therefore, take exercise may also become one of the reasons why ordinary users experience this game, especially for young people who are often sedentary now.

Regarding how to improve user participation in the entire project, I think that for visually impaired friends, the design of the game can bring them a rich interactive experience, which will be one reason they want to play the game. Moreover, most players are very willing to participate in the game design and are also very active in providing feedback and

suggestions to developers, because they can participate in the design of the game while entertaining. For those ordinary users, it is also an important reason for them to appeal for their care for the visually impaired. The multiplayer interaction mode of the game also provides users with a way to socialize with friends, which is a reason for increasing interest in the game for both visually impaired people and ordinary users. Also, for the difficulty of the game, we will provide users with a variety of choices, increasing the user's challenge is also an excellent way to encourage users to participate in the game.

5.INTENDED EXPERIENCE

There are many interactive experiences in game design, with voice interaction and tactile interaction as the primary interaction methods. Furthermore, emotional interaction will also be integrated into the plot design of the game. Regarding hardware devices, users will also interact with physical hardware facilities. For example, users perform attack actions based on sound and laser sensors.

In terms of voice interaction, users will use voice navigation to perform a series of manipulation instructions such as opening or closing the game. In addition, the function of the narration will also be transmitted to the user in the form of sound so that the user gets a more profound sense of game substitution. For the interaction of the game storyline, we will also provide customers with sound feedback through different sound effects, such as the environment sounds of the game scene, the sound of the user and the enemy attacks, the sound of successful counterattack and the sound of unsuccessful victory over the enemy. The feedback of these sound effects will also become an essential reason for the user to be able to manipulate the game more skillfully in order to obtain a better game experience when the user has a certain familiarity with the game.

In terms of haptic interaction, we will use tactile effects to provide users with more realistic game scenarios. For example, when the story occurs in a stormy or rainy day, we can start the wind and rain effects in the game to simulate the reality and game scenario. What is more, we will also provide tactile feedback to bring more direct and clear interactive feedback to users through the vibration reminder of wearable devices.

In terms of emotional interaction, we will make full use of the storyline of the game to interact with the user's emotion with the game. Games that simply provide fighting are somewhat too simple, which can easily make users lose interest in the game in a short period of time and reduce user viscosity. Therefore, based on this consideration, we will complete the design of the game storyline according to the user's psychological needs, so that the user can have a certain emotional dependence on the game to enhance the user's enthusiasm.

In terms of physical interaction, users mainly interact with physical devices, such as laser sensors around users and wearable devices. The user needs to participate in the game, fighting with the weapon in his hand to win the game. At the same time, the sensing device will judge whether the user's behaviour can be successfully cleared according to the user's action.

Based on the above interaction methods in the game, our concept aims to provide a richer gaming experience for target users. However, the final design of the game may be adjusted and improved according to the user test results and feedback information during the project implementation process in order to meet the needs of the user better.

6. RELEVANCE TO THEME

This overall idea also provides exercise for physical coordination in Daily life. Because when players use this physical device, they not only exercise the sensitivity of hearing but also need to do some physical actions according to the instructions. The user needs to face one direction and wave the device around. It can maximize the satisfaction of people who want to exercise at different levels, which includes players who want to exercise every day and get coordinated exercise. This exercise has no physical contact, so users are not easily injured. At the same time, this is an open interaction, because there is no venue limit to play this game. The theme that the teams chose is ability-centric interactions, in detail creating the new "normal," designing interactions from an ability-specific point-of-view. This work focus on novel physical interaction with technology, which including a shape similar to samurai, the handheld physical device of the knife, and some Infrared laser detectors complete the final project.

7.INDIVIDUAL PROPOSAL(YUNAYUAN WEI)

INTRODUCTION

I am good at graphic design, product design, user data evaluation, and iterative design. The familiarity of graphic design skills will support the previous work on the design of this physical interaction device. At the same time, skilled in graphic design can also design instructions, brochures, etc. Familiar with product design can support product design drawings of physical interaction devices. Applying 3D modeling requires creating the appearance of the device so that the device can be intuitively displayed in front of the audience. Every day, companies design products and services to improve their customer's lives, but 72% of new products and services innovation fail to deliver on expectations. [9]This equipment is also the same principle. In the previous user research, I searched for the user's requirement and adjusted it. For example, I can use design tools for analyzing the user's pain points to find the value proposition of the design. It will make this device more suitable for users' habits.

My weakness is I am unfamiliar with Arduino programming, which is significate meaning in this course. So, the most important aim of the course is helping me grow more knowledge about Arduino programming in the cooperation of the team. This skill will improve in the workshop that the tutor will help us to learn, and learning within the group is also crucial because, in the group, we have two teammates who are very skilled in this area.

The project delivery method has two parts, including finished the written work with repost and the display project video. Project video will use Arduino and Arduino components such as Infrared Laser and sensors to complete, which also contains the essential functions of the device and full interaction details. More involved some paper prototypes in expressing the appearance of the entire device, including, for example, the samurai sword in the device and eight circular infrared emitters. Through the realistic prototype to restore the working process of the device, let the user experience the product in advance.

FOCUS AREA

The focus in the team research space is about preliminary user research, including collecting user characteristics and customer bans. Based on this information, the project will design the physical device for the specificity of the people. When the project finished, I will evaluate the project later, which includes the design evaluation process and the iterative design of the product after each prototype evaluation. This work hopes that through the preliminary investigation of the user, according to the user's living habits and operating habits, convenient for the users, meet the user's functional demands and meet the user's psychological needs.
The focus in the team build and development physical device space it will focus on the multiplayer interactive play section of the game. The multiplayer interactive section is part of the function of this device, which will support two people to use this device together and increase the device 's Interactivity and fun. If the research time allows, the speech recognition module will be considered, which may involve the TTS speech synthesis module, which is from text to Speech and user speech recognition. This part can make the device input efficiency high, the interaction mode more natural, and transfer rich information.

DISCOVERY

Due to the particularity of the target audience, we cannot develop the visual design, and we could only develop the design from hearing or touch, such as from the storyline. For me, most of the devices or applications previously designed were designed visually. The design of how to make the device more interactive from the hearing and increase the playability of the device needs to be further explored. The next step will be a case study to solve the problems encountered in this regard. Finding and research some excellent cases from the internet or book is a good way to study practical exercise, and it is best to find some design frameworks to guild this project, which is essential. In addition, for the application of technology to finished the project part, the use of Arduino is another challenge, which requires understanding and learning C language programming to understand the circuit board and various types of Arduino IDE. Finding some tutorials for self-study and learning in the classroom and learning by reading books are the solutions to this problem. It is essential to understand Arduino through reading books and classroom study, and then look for some tutorials similar to the project to solve it.

PROJECT CONSTRAINTS

In the theoretical constraint part, due to the influence of COVID-2019, I was unable to attend workshops and other courses at school. All courses became online courses. I communicated with the tutor through zoom, but many problems that face-to-face could easily solve became difficult. For example, with regard to Arduino issues, if a face-to-face communication tutor can help you quickly solve some problems that occur in your device, this only needs to be operated on your device. Still, now all that becomes a challenge in online education. Spending more time on YouTube to self-study tutorials or asking students to meet you in one safe place to help you solve technical problems may help to alleviate these constraints.

In the evaluation constraint part, finding test users may be troublesome. Because visually impaired people belong to a special group, we will try to find as many testers as possible. In the end, if we are looking for fewer visually impaired users, to reduce constraints, we will choose to let common people blindfold to complete the test.

In the practical constraint part, this project needs to use a lot of Arduino IDE. If our team buy these Arduino IDE in Australia, the price of some single Arduino accessories will need dozens or hundreds of dollars, which is costly overhead. Therefore, we consider buying the Arduino IDE from China and mailing it, which can significantly reduce the constraints. During transportation, due to some uncontrollable factors, for example, weather and COVID-2019, the express delivery may be delayed, which may delay the development process. To solved this constraint, we have selected the fastest express delivery. More from this week, we will first connect the c language programming required by the project and the connectable Arduino module. When the express delivery arrives, you can install these Arduino IDEs directly instead of learning from the tutorial, which can also reduce the constraints.

A PLAN FOR COMPLETION OF THE PROJECT

FIRST SEMESTER OF PROJECT									
	Week6	Mid-break	Week7	Week8	Week9	Week10	Week11	Week12	Week13
Prototype Demonstration	▓	▓	▓	▓					
Prototype Appraisal					▓				
Final Delivery						▓	▓	▓	
Final Delivery Team Outcomes									▓

Timetable of project (Figure 5)

PROTOTYPE DEMONSTRATION

The detail of finished time: 09/04/2020-03/05/2020

Resources: Arduino, Sensor, Adobe After Effect, Paper

In this process, there are about four weeks to prepare. In week6, I will buy the corresponding sensor online, and to collect similar tutorial videos to clarify how to build and develop Arduino in the future. In mid-break, the game flow will be ok, and the physical device will be built with Arduino. In week8, the physical device will be perfect and start to produce display video and complete written work.

PROTOTYPE APPRAISAL

The detail of finished time: 04/05/2020-10/05/2020(week 9)

Resources: Internet

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After the prototype demonstration, we will conduct a group meeting, submit a written comment to the other team, and upload this comment to the Miro board.

FINAL DELIVERY

The detail of finished time: 11/05/2020-31/05/2020(week10-week13)

Resources: Arduino, Sensor, Adobe After Effect,

From the 10 week to the 12 week, my main job is to adjust the prototype completed in the ninth week according to the comments given by the last prototype appraisal to meet the requirements and improve the prototype. In 13 week the tasks required for written work will be completed.

FINAL DELIVERY TEAM OUTCOME

The detail of finished time: 01/06/2020-07/06/2020(week13)

Resources: Internet

After the finished the individual work, our team will conduct a group meeting, and then complete the team's report.

8.INDIVIDUAL(SHUANG WU)

INTRODUCTION TO YOU

I'm energetic and responsible. I am happy to be the one who actively investigates and seeks solutions, answers questions, makes reasonable suggestions and guarantees that the project progressing smoothly. Past experience, especially when acting as a team leader have proved that i am able to think about problems from different angles and find solutions, as well as guarantee the project move forward. In addition, i majored in Electrical Engineering during my undergraduate, which provides me experience working with bread board and the circuits stuff. I wish i could improve my design process and get familiar with the Arduino though this project.

YOUR FOCUS

My main responsibilities are researching related work and realizing our functions. For the former, it includes finding out and evaluating the possible technology supports, as well as searching similar works, design principles, theoretical concepts and etc. For the latter, i will participate in the physical installations building and the Arduino functioning. In addition, i asked myself to master all aspects of the project and ensure the whole project progress smoothly.

DISCOVERY

The biggest concern for me is the safety. In our intended experience, the players would have some great physical movements comparing with the the other published games for the blind

that when playing other games, players are basically sitting there. However, i have not found other games like us involves such movements like standing and waving around. For now, i have not found any safety guidelines in design can be directly applied in our project. In the following progress, i will search available safety guidelines in other fields, and will focus on eliminating potential safety hazards through our own experiments. For example, we could first construct the physical installation and then get ourselves blindfolded to stimulate the intended experience.

PROJECT CONSTRAINTS

To deliver the intended experience, there still bunch of things to do. For example, to design the whole game flow, find out feasible technologies to realize our functions, building the physical installation, conduct user testing and etc. Technology issue is one constraint that at present we are not clear whether the Arduino devices we chosen can achieve our expected goal and not certain whether we can build the Arduino system. Another constraint is that the accessible to our audience. There are obstacles to getting in touch with our target groups, not to mention the outbreak of Corona Virus. If it impossible to get in touch with them in person, i would try to find related organizations online for assistance, and use proxy users during the user testing and evaluation sessions.

A PLAN FOR COMPLETION OF THIS PROJECT

This project is definitely huge and challenging, both for the team work and individual focus. It's necessary to carefully divide the tasks and follow the plan. We will start from Week 7, and the table below lists all the work should be done and the timeline for my individual.

Milestones & Tasks	W7	W8	W9	W10	W11	W12	W13	W14	W15
Determine the final intended experience/Design the game flow and interactions.	■								
Build up the physical installation and test the safety issue		■							
Keep researching on design principles, related works, possible technologies.	■	■	■						
Design Arduino system, build and program.			■	■	■	■	■	■	
Make prototype, design test protocol and interview, contact to related organizations to touch on our target users, and test our prototype.					■	■			

Individual Prototype Demonstration				🟧					
Prototype Appraisal				🟧					
Improve our product according to the feedback.							🟧		
Evaluate the final products, write the report.							🟧	🟧	🟧

Timetable of project (Figure 6)

9.INDIVIDUAL(HAO YAN)

INTRODUCTION

I 'm Hao Yan (Horace), my undergraduate major is animation. I am good at using some professional software to do some graphic design work. However, in our group, I am mainly responsible for designing hardware circuit diagrams. Then, look for any sensors that might improve our project. And will also be responsible for the preparation of some programs. This is because last year, I had experience developing Arduino programs and achieved an excellent result. Besides, some courses related to electrical components were taken during the undergraduate period, so no one in our group is more familiar with the functions and usage of some Arduino sensors than me. This is also the main reason why I am responsible for this work.

The project will be an Arduino-based interactive device that allows single/multiple players to participate in the game at the same time. There are four members in our group, and we know each other. Shawn and me came from a same university, and his undergraduate major was electrical engineering. Cindy is a student of visual communication at a top university in China. Bonnie is good at almost all Adobe software. We knew each other even before we came to the University of Queensland. So our task of assignment is straightforward. Initially, I will determine and purchase some sensors and other hardware facilities that we may use in the next few months. Then Cindy and Bonnie are responsible for a storyline and some related audio production. I am in charge of hardware and code with Shawn. This is indeed a challenge for me, but through the efforts of our team, this interactive work will eventually be completed.

FOCUS

One of my tasks is to find and finalize the sensors we need. All future work will be carried out on this basis. If the sensor I chose is not suitable for our project, it will be a disaster.

At present, our hardware facilities include two main parts, the sound feedback system, and the laser tripwire system. Many people come into contact with Laser tripwire alarm through movies. Some people in the film use sunglasses or other means to determine the position of the laser to avoid triggering an alarm. In our installation, the laser also acts as a trigger to receive user actions. When the user uses a weapon to pass the laser, the resistance of the photoresistor will change. We can determine whether the user has killed the enemy by judging the change in the resistance value.

In the original design, the sound feedback system was composed of speakers. These speakers are placed in fixed positions. The user needs to complete a series of tasks by judging the direction of the sound. Four speakers need to design four different channels, which form a surround sound (how to give some feedback when the four speakers play background sound at the same time, which requires much code to run simultaneously). But there are some doubts here. Before the test, no one knows whether the user can judge the direction of the sound through the sound of the speaker. And if the surrounding environment is boisterous, it will seriously affect the user experience, so our PlanB is a headset. This requires us to produce four surround sound channels on one audio track.

DISCOVERY

Storyline: Interesting story background and guidance can help players to continue the game. Different from ordinary video games. Our project does not have gorgeous illustrations. We can only provide sound to users. How to deliver different information to users through pure tones, kill feedback, guide sounds, background music, sound effects, enemy sounds. Among them, enemy sounds, background music, and guide sounds will be made into a track, and the user's orientation must also be determined to obtain the best stereo effect. In response to this problem, we have tried to make a demo using some audio processing software. Although the demo can achieve our expected effect, the audio file of the storyline is much larger than the file required by the demo. We have only mastered the skills of making 3d-audios, but we cannot predict some bad results that will happen unless we go through the first test. After the test, users 'feedback is obtained through questionnaires. If necessary, we need to make further improvements based on their feedback

PROJECT CONSTRAINTS

PROJECT CONSTRAINTS #1: COST

Affected by the epidemic, many flights have been suspended, including cargo flights. But we need more than 20 lasers. If all of these lasers are purchased from Australia, it will cost more than 500 Australian dollars, so at present, we have decided to buy from Alibaba. If it goes smoothly, the package will arrive in Australia within two weeks. If the package was delayed. We need to reduce the number of such lasers, but this will significantly affect the user experience. But, in addition to the laser as a trigger switch, we have many other sensors that can be used, for example, by sensing the acceleration of gravity to determine whether the user has performed a sword swing. Or we can change the weapon to a firearm so that we only need a laser to complete the design of this project.

PROJECT CONSTRAINTS #2: RISK

We need to reduce the threats of potential risks in a project. For example, If the package

cannot arrive in Australia within two weeks, it will directly lead to our first test not being completed on time. Although we have Plan B able to keep, the project going. But this is just a measure of expediency

PROJECT CONSTRAINTS #3: USER SATISFACTION

Determining whether our device meets the expected effect is directly related to customer satisfaction. The target audience / potential audience needs to be determined at the beginning of the formulation of a project. Their experience is the key to judging the success of a project. This is also the reason why a project needs to go through multiple tests from project establishment to completion. After testing, we can get feedback from users, and then improve the project based on the feedback. So user satisfaction is a key Constraints.

PROJECT CONSTRAINTS #4: TIME

To avoid some unrealistic promises. Our team must make a timeline. In the past year, we have completed many projects, these projects can serve as our precedent. We have a relatively clear understanding of our abilities and understand the time required to complete specific tasks. So for our group, making a Gantt chart before the project officially starts can help us check the progress of the project at any time.

PLAN
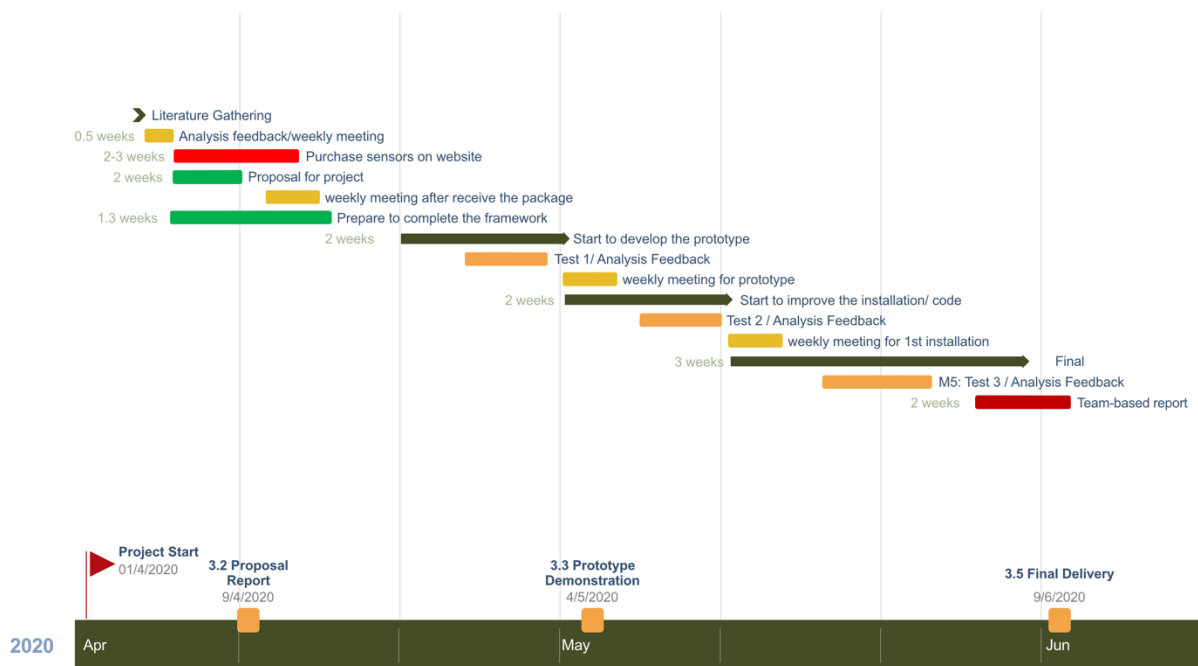
Timetable of project (Figure 7)

10.INDIVIDUAL(SHANG WANG)

INTRODUCTION

I'm Bonnie, and I'm very happy to work with other members of Hedgehog to complete the course of physical computing. Through this course, my aim is to enhance the ability in physical interaction, and hope to make a very interesting installation at the end of this course. My strength is to find insights from limited materials and inject new inspiration into the design. At the same time, I am also willing to do conceptual design work, because this can take my ideas from the beginning to another form for everyone. As far as my weaknesses are concerned, I think I will have some difficulties in doing the work of connecting physical devices, due to reasons I am not familiar with the hardware facilities. Therefore, in the next few weeks, I will be actively participated in the discussion of the replacement of hardware equipment with my team members and inquired about relevant information to make up for my deficiencies in this regard. In this project, the main parts of my focus are the audience analysis of the project, the design of the game storyline and the interactive experience design of the game. At the same time, in the later part of the project, I also participated in user testing to improve our design.

Regarding our team, I think our group is quite balanced. Each team member has their own focus of expertise due to our different educational backgrounds. Therefore, in our team, we are respectively responsible for research, UX, UI, user testing, and hardware device connections according to our strengths. As for the implementation and final delivery of the project, as long as each member has done its part of their main responsibility, I suppose that the completion of the project should be very impressive. This is also the reasons why I am confident in our project because we can also use each person's strengths to make each of the sessions complete and complete the best.

INDIVIDUAL FOCUS

The main content of our project is to develop a game based on voice recognition for the visually impaired. Therefore, the entire project from design to final delivery involves preliminary research, product positioning, audience analysis, conceptual design, electronic prototyping, physical prototyping, and user testing. Among them, I am in charge of audience analysis and game conceptual design, including game content and storyline design, and interactive experience design. At the same time, I will also participate in user testing. In this part of my work, I will design the details of the game according to the characteristics of the target audience. For example, to determine the controlling form of the game for the visually impaired people, set the difficulty of the game, the rationality of the game plot, the interaction of physical senses, etc. These contents will be completed one by one in the next seven weeks, and I will list my plan in the following part.

I will research related games and then form our conceptual design after analyzing these cases. The areas I will mainly explore are game storyline design, game interaction experience for visually impaired people, accessibility design cases, and user safety. Because the visually impaired people are our main audience, they are a relatively sensitive and special group, and we must pay attention to their safety in the game due to the physical behaviour interaction of the game. Moreover, I will consider modifying and improving the diversity of the interactive experience of the game based on the previous feedback to achieve the ultimate goal of designing a game they really love for the visually impaired.

DISCOVERY

In this part, as for the content of my main work, my main problem is that the psychological understanding of the visually impaired people needs further investigation. Because to make a game, we need to understand the target audience very well. It is essential to conduct a comprehensive analysis of the user's psychology, which is out of consideration for user stickiness. I don't want the final product of our project to be a game that we think the visually impaired people will love, not a game that the real visually impaired people love. Also, the design of the game's storyline should also be carefully considered, because this game does not have a visual user interface, it requires users to follow the sound prompts to complete the game. Therefore, how to make the storyline have a sense of substitution based on sound interaction is also a problem I want to focus on.

Given the above considerations, I will first analyze the psychological needs of our audience, find the things they are concerned about and worry about, sort out their internal needs, and then design the game's plot content for these needs. Besides, the expression form of the plot, as mentioned above, is achieved through voice prompts. Therefore, the design of sound effects will be a very important part of this project. On the question of how to increase the experience of sound interaction, I will express the voice of the narration, the hints of manipulation, and the sounds from different enemies and different attack weapons in the game through different types of sound effects to maximize the sensory experience of the game. Additionally, the connection between the user's physical feedback and the game's plot in the game is also my concern because it requires a lot of code to achieve. Therefore, this is a relatively complicated task. I need to discuss with my team members in terms of how to solve this problem and request technical support from experienced friends when necessary.

PROJECT CONSTRAINTS

1. User test

Because the main target audience of our project is the visually impaired people, we cannot find enough users to test our prototype, because this is a minority group after all. Moreover, due to the impact of the epidemic, we will reduce face-to-face contact with users as much as possible, which has hindered our user testing of visually impaired users to a certain extent.

2. Complete hardware equipment

Since the laser detector used in our project is not included in the current Arduino kit, we need to purchase it separately. However, because of the significant reduction in express delivery efficiency during the special period, it is highly likely that our hardware modules will be incomplete, which will have a great negative impact on the completion of our prototype and greatly reduce the user experience during user testing.

3. Limited time and high quality of deliverables

Sufficient time has a lot to do with the final delivery quality of the project. According to the content of our project, the amount of work we need to do is relatively large, and all members of our team do not have much experience in game development. Therefore, we may face a lot of practical problems that affect the quality of the products we deliver during project implementation. For this problem, we will make a project plan in the form of a Gantt chart to follow up the project progress and set aside time to deal with the problem in order to maximize the final deliverable.

4.Technical constraint

Since a physical module we need to use is a laser detector, but if we need to use other sensor modules due to force majeure, we must consider the problem of the sensor's sensing range. Because, as far as is known, the sensing distance of other sensors is not suitable, which will limit the user's gaming experience range and activity space.

PLAN

Project Plan

2020 S1

TASKS	DELIVERABLE	WEEK 6	BREAK	WEEK7	WEEK8	WEEK9	WEEK10	WEEK11	WEEK12	WEEK13	WEEK14
Determine the project domain, problem space; Clear individual division of labor	Project proposal	■									
User research (mainly aimed at the psychological needs of the visually impaired)	User analysis document	■									
Previous case studies of the game -Game scene -Accessible Design	Summarized document		■								
Interactive concept design (based on technical support) -Game flow design -Game mode -Game difficulty -The final interaction mode is determined	Final project plan document		■	■	■						
Digital interactive prototyping plan						■	■				
Prototype 1(video)	Prototype videos & documentation 9						■				
User testing and evaluations	Annotated Portfolio to Blackboard & Physical prototype to UQ 3.6 Team findings report to Turnitin							■			
Modify the prototype									■		
Make physical prototype; Planning for the exhibit	Final deliverable								■	■	
Demo for the deliverable and collect feedback	Virtual exhibit										■
Focus on individual and team assignments	Annotated Portfolio to Blackboard & Physical prototype to UQ Team findings report								■	■	■

Timetable of project (Figure 8)

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