# Future Botanical Garden

**MSC Creative Computing**

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**Key Words:** Plants, Botanical Garden, Immersive game, future

## Abstract

I have been working on a game project to explore the futuristic direction and possibilities of the relationship between plants and humans, providing a new perspective on the possibilities of future botanical gardens. Merely defining this concept took weeks for me. I have done a lot of research to understand the growth factors of plants and the relationship between humans and plants, which ultimately determined the form of my work: immersive game experience and interactive interface art. I have made a lot of efforts to express my ideas in a better way, letting people experience the fun of the work and relax in the process of the game, and inspiring people's imagination of the future of botanical garden. The game is divided into a main scene, four rooms and a physics model. I combined both virtual and physical environment so people who experience it will have a more intense interactive experience. These rooms bring different interactive experiences. I want people to visualize the future as they experience the game. I reckon that my concept will have more possibilities in the future.

## Introduction

With the continuous development of science and technology, people constantly explore and think about the future. People also use conceptual design to realize their imagination of the future and constantly fantasizes about their future life. Speculative Design is a design concept proposed by Prof. Anthony Dunne and Prof. Fiona Raby of the Royal College of Art in the UK, which evolved from critical design. Its value lies in "challenging narrow assumptions and prejudices in a critical way, and reflecting on the role of design in everyday life". Rather than being constrained by existing thoughts, it is better to completely abandon rational thinking, imagine an idealized or extreme future (reality) without any consideration, and use design products to represent alternatives in this worldview. Thinking of reality borrows this artifact to reflect on today's society, breaking the existing inflexible thinking and promoting the progress of modern thoughts.

Many artists have their own ways to express their vision of the future, and I am curious of how the botanical garden will look like in a few decades. In the future, mankind and nature may face various crises. For example: water shortage, soil desertification, greenhouse effect, and many more. What will happen to the plants in the botanical garden? We need to rethink of our relationship with the nature, build stronger relationships between people and plants. My design gives people the opportunity to experience different botanical gardens and start thinking about how the botanical garden will look like in the future, and the changes that the botanical garden might face with so many problems that may occur in the future. I will use people's curiosity to experience a new interface method that makes people feel surprised.

After eight weeks of research, I decided to create an immersive game that would allow everyone to experience different botanical gardens through digital devices. This work consists of six different scenes, which is named Future Botanical Garden. This is designed to reflect my own feelings about the future construction of the botanical garden. I want to give my audience an immersive environment where they can get the most authentic experience. In the main scene you will see four rooms, where each of them represents a different world. Different characters have different stories. Entering each room will bring you into that specific world.

## Development

In this information era and with the support of various technologies, artists have obtained more ways of expressing their art. Their social responsibility is to let people better understand this era, try to image future, and guide their mind to think forward. They discussed the connection between plants and people in their own way, many of those works revolve around electronic data and plants. Through discovery, artists used the characteristics of this era to connect big data with plants.
Technology affects our lives and growth environment of plants. Florentin Aisslinger used data to express her thoughts. Her experimental installation "Data Garden" expressed the concept that data may cause trees to grow. This makes people wonder what happens if nature and data grow together? They explored the concept of a sustainable future between humans and plants.

Interactivity has always been an important part of the game design. Interactive art builds the traditions of participating art forms by allowing the viewer to get involved or

intervene in action. However, in most works, unlike in "incidental events", this interaction is not equal to an attack against the established art audience. Instead, it meets the needs of a media educated public.

In the history of art, one finds imaginative associations between anthropomorphic and botanical forms advancing notions first articulated by Descartes, Julien Offray de La Mettrie (1709-1751) already proposed in his book L'Homme Plante, which means  Man a Plant (1748), that “the singular analogy between the plant and animal kingdoms has led me to the discovery that the principal parts of men and plants are the same.”

Artist Marta Roncero connects the human breath to plants. Her work, Breathe with Me proposes to connect with plants through a meditation based on Hindu Yoga practices which involves awakening off divine energy located at the base of the spine, and sound healing to exercise with plant. It makes the connection between people and plants necessary, so they can coexist better. This meditation starts with breathing, where the energy will provide water to the plant. In exchange. the plant will give back a vibrational with tone that helps raising energy in the body and completing the meditation. Breathe with Me demonstrates that we need nature to survive and it is a matter of giving back. She realized this expectation by means of physical calculations and gave people the opportunity to feel this connection.

**Room 1  Watering Succulent**

Watering Succulent is an e-plant that uses the data received by the sensor to grow. It is an attempt to cheer people up. Having a good mood is important to every people's daily life. Humans are emotional beings which experience a wide range of feelings on a daily basis. I will use an anthropomorphic interface for people to interact with. The appearance of plants will also differ a lot from reality. This makes sense because cute object or beings will makes us feel better, like how some people use pets to brighten up their mood.

People will spray water on the small plant, then it will start to grow on the screen. Depending on the humidity, the plant will grow. People feel pleasant when they grow their own plants and see the results. I hope that through this interactive game process and its lovely background music, people will be able to relax in the observatory and get some spiritual healing.

**Room 2  Balloon Cactus & Room 3 Digital Garden**

The two worlds discussed biodiversity. In the future, will our plants show up in different materials and forms and become a new form of living things? Let us make the impossible possible in the virtual world.

In Room 2, I created an interactive world, represented by the cactus. In this world, cacti are like inflatable balloons, and their texture and appearance have changed a lot. The user needs to rescue balloon cactus trapped in the cube and interact with them. In the interaction between the physical part and the screen, the cactus is deformed and has an elastic appearance like a balloon. It is completely different from the cactus that should be touched in utmost careful in real life. This world allows people to discover in-

teresting interactive experiences in the exploration and get close contact with futuristic creatures.

Room 3 is a computer art garden, where the flowers are made with code-generated shades and pictures. The world is a maze and the exit will lead people back to the main scene. It is completely different from a real garden. You will see flowers up close in 3D space and instinctively touch the beautiful flowers. The original intention of designing Room 3 is that I want to unleash the limitations of simulated reality and create a virtual world garden, which of course is completely virtualized. I do not want to bring real things in the real world to the screen.

People get to experience and interact with creatures that are different from the normal ones in my game. They are completely virtual, and different from reality. In the immersive environment, one can think further about the future possibilities of plants and their relation to space.

The advanced technology has promoted interactive, and biotechnology has made great

progress in recent years. Artists and scientists are also getting more technical support to connect people and plants. Eduardo Kac created a "plantimal", a new life form he

call "Edunia", a genetically engineered flower that is a hybrid of himself and Petunia flower. Edunia expresses Eduardo's DNA exclusively with its red veins. Eduardo brings the realization of the contiguity of life up forth between different species.

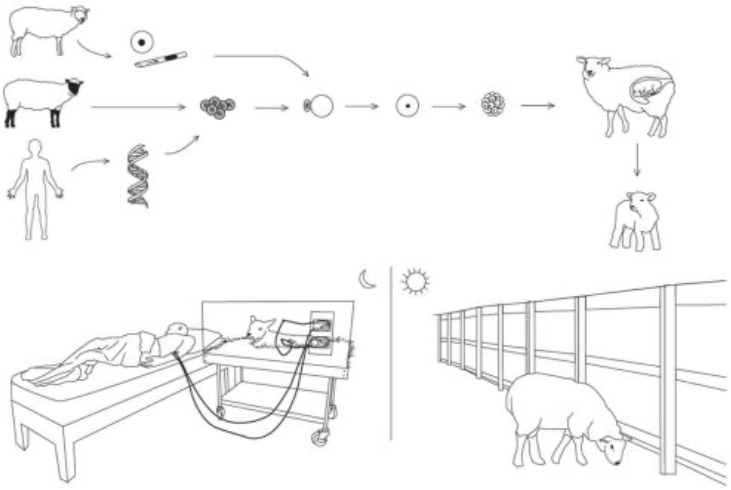
This made me contemplate about the relationship between humans and plants in the real world, in the fields of genetic engineering and biotechnology. It also made me think about whether human and plant DNA could be linked in a closer way.

**Room 4  Organ Tree**

There is a towering tree in this room, which cultivates human organs. You can see the square fluid hanging from the tree keeps the organs growing, and the big trees feed and help them grow. They are like the fruits of plants, from bearing fruit to maturity. In the room, human organs and plant organs are closely linked, and can grow together. Eventually, humans will use the matured organs to help those in need of organ transplants. Under the transformation of biotechnology and genetic engineering, big trees have become completely different, and they can meet the human needs while growing in a better way.

On one hand, I think the world expresses the connection between plant and human genes, the possibility of future life, the prospect of biodiversity. Biodiversity has long met people's needs for survival. In the project "Life Support" by Revital Cohen & Tuur Van Balen Studio, Revital Cohen proposed that commercial animal reproduction for consumption or entertainment can be used as a supplier of external organs. Service animals can coexist with patients and establish a natural community of life as a whole of its life mechanism, but only a part, such as guide dogs. Could it be transformed into medical equipment? The commercially-bred competition dog was returned to the

National Health Service and trained to be a medical alert dog that helps patients with respiratory disease, as their respiratory assist device. The dog is mainly used to provide oxygen, symbiosis with the patient, and even match the patient's blood type. This is an example of symbiosis between humans and animals in the book, and another example that is similar to this is the genetically modified sheep of China is used as a kidney dialysis machine. Every night, the patient’s blood flows through the sheep’s kidneys and gets purified in the sheep’s kidneys. The next morning, the impurities in the patient’s blood are excreted through the sheep’s urine.

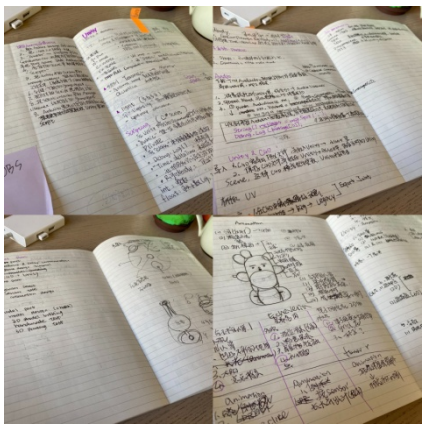


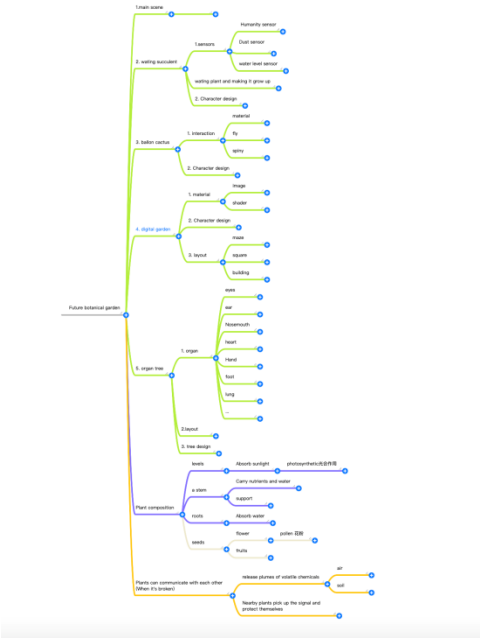
I want to use my imagination to provide an unknown future, a utopian future. Through the rapid development of science and technology, perhaps this will be more than utopia, a reality that can be realized.

On the other hand, I want to use this room to inspire people that we need to be kind to animals and plants. With the advancement of science and technology, people's lives are getting better and better. However, pollution has caused many natural disasters, such as global warming and land desertification. Because of the hunting and a lot of other reasons, many creatures are facing extinction. Human beings are consuming nature; over-using and wasting natural resources, causing water shortage and land desertification. Plants cannot survive. These problems may become more serious in the future. Human beings, as intellectual and advanced creatures, achieve their own selfish

purposes by using other creatures and utilizing nature regardless of the consequences. For example, they capture many creatures for experimental purposes. Try to view this from another angle. Everything that humans do was not approved by the creatures. However, people keep on doing them spontaneously.We use these creatures to do what we want to do, such as changing their appearance, and creating new species. We use them to achieve our own goals, but we don't know if the result will be positive. I consider this as something worth thinking about for all of us.

Biodiversity has long provided people's needs for survival. For example, food, medicine, building materials, clothing, chemical raw materials and many more are provided by various organisms. Human beings enjoy the benefits of diverse values and results. When the number of biological species in the ecosystem increases, the ecosystem is unlikely to cause major environmental changes due to the movement of a





few species, and maintain the stability and balance of the ecosystem by maintaining biodiversity.

## Methods

Before starting the technical part, I planned and brainstormed the content of my design. I use the mind map to clarify my thoughts. It helped me in describing and analyzing the problems in a comprehensive and systematic way. It was very helpful for me to think deeply and creatively about the problems I am studying. The use of mind maps is helpful to find the key factors or links to solve the problem. In my project, I used the mind map to plan the game details and the interactive process in advance, while the mind map played a big role in my post-production game.

For other projects in the future, I will continue to apply the mind map method. More than just a recording tool, it also inspired my imagination.

In the design process, I had spent much time discussing with plant loversmy tutors, and classmates to hear their opinion regarding the design.

The emergence of digital technology has brought a leap for visual design and traditional graphic design. Information transmission and the communication mode become more and more inactive, and are involved with sharing characteristics. Since dynamic graphic language grows in importance and a lot of breakthroughs have been made through the incorporation of new media with graphic design, designers can integrate their subjective feelings and the objective realities to generate memorable and artistic effects. This helps with transmitting information and sending strong emotions into the audiences. In my future design, I am going to take advantage of internet interaction and make my work more attractive.

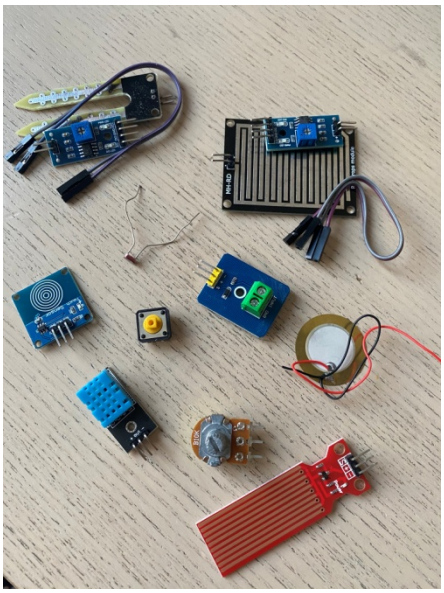
Pioneer designers' works are not merely constrained by

the surface, but they are required to be clear about the real expectation of the public as they focus on the business and utilitarianism themes. As a designer, I always insist that

an excellent design can't only depend on the aesthetic perception, but also on its practicability and functionality. A work can't be considered as a good work if it can't serve its users well. Sometimes I prefer to apply my design concepts into specific carriers, such as the spaces, human beings, and the physical objects.

**Arduino and Unity Interface**

I have conducted a thorough research on game production and physical computing. First of all, you need to use sensors to get real-time data for the air humidity, so the Arduino learned in the Creative Making class of Phoenix Perry is used for programming and experiments. I bought and tested some sensors, including photosensitive, raindrop, and water level sensors. After numerous experiments, the humidity sensor was finally selected to transmit data to Unity. Because it can obtain data well, achieve good interaction effects, and simulate the watering process better.



At last, there may be a challenge in the technical aspect. I had never really used Unity before, and this is my first attempt at making a game. So, it is challenging for me. I encountered a lot of problems during the designing process and spent a lot of time solving technical problems.

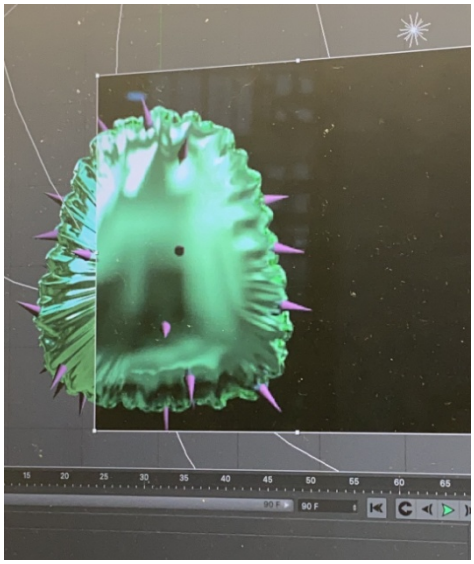
After connecting the Arduino circuit, you need to write code to observe the sensor data in real time. Then, convey the information to Unity. Unity and Arduino need a unified port, and the frequency of receiving information should also be considered when connecting. After implementing the communication between Unity and Arduino, the most

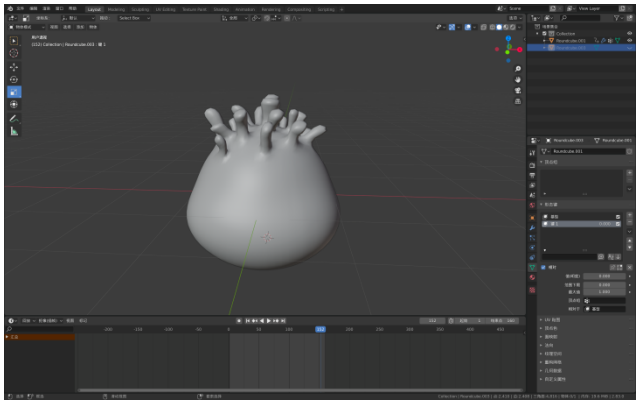
difficult part for me was writing scripts in c#. I had browsed many resources, read many tutorials on c#, and tried for so many times. Everything needs to be scripted, including the switching of game scenes, first-person game perspectives, character dynamics, shading material and UI button interactions. But for me, the coding part of the plant growth process was the most difficult. At first I had decided to use Blender to make animations and then import it into Unity, but I encountered some difficulties. Animation works very well in Blender, but not in Unity. It took me a few days and I had no idea why. Finally, I wrote a script to realize the animation, and finally achieved the effect I wanted. Making games required a lot of CPU, my computer froze for so many times, and even the computer fan sounded like a plane taking off.

After realizing the basic functions of the technology, I made the game prototype. The next step afterwards was to beautify the game interface and design the characters.

**Character Design**

I used ultra-light clay to design the prototype of the game characters, which made it more convenient for me to design virtual characters on the computer. All 3D models are created in Blender and C4D. At first I had chosen C4D for the character creation, be-





cause the C4D renderer was very good. But after numerous attempts, I found out that the model imported into Unity could only display some basic materials. Thus, the results were not great. Therefore, after some researches, I found out that Unity could import Blender files directly, so the following models were all built in Blender. During the production of this work, I became more familiar with these softwares.

## Iterative design methodology

Steve Jobs said that design is not just what it looks like and feels like, design is how it works. I am convinced that he is right, but I think that there is more. When we consider the design, we actually think more about how to solve the problem. Simply put, design is paying attention to the problem, trying to solve the problem, and focusing on users. I will use iterative design and collaborative design methods. I selected the iterative design approach for my design.

I established demos, tested and analyzed, confirmed the problem, and then repeated the process all over again. Each time, it is improved with my experience of the previous results.

I encountered a lot of difficulties in the design process, and many of the difficulties were caused by my lack of clear thinking and planning in advance. I always hesitate on each decision of expressing the idea. I spent too much time on design ideas, which caused a lot of delays. The experiments in the design process are very important. They played a big role in my design process, avoiding unnecessary problems, solving the encountered difficulties in the coding process, and saving time for the final effect in the later stage. These experiences will play a big role in my future design. In this design process, I learned about the shortcomings of my plan and corrected it after multiple inspections. This way, I will be able to avoid the same problems in future designs and any time wasting process.

## Conclusion

We do not know what the botanical garden will be like in the future, but I will continue to research and create in this direction. There are infinite possibilities in the future, and we determine the life of future generation. I think the first step to realize the future is to imagine, because the people in the past also imagined and worked hard for the present life we are living now. I hope my project can inspire people to look forward to the future and realize a better life.

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