Production and Research of Interactive Media Art Reacting to Environmental Factors

*DuBeom Kim, Doyoon Ahn, YoungHo Chai **

Chung-Ang University / Seoul, Korea
**Corresponding Author (yhchai@cau.ac.kr)*

Abstract: This paper suggests potential new experiences and applications for users interfere in the collection of various environmental factors and production of media art creating artificial life in a virtual environment. Real environmental factors influencing the growth of artificial life in products include soil, illumination, moisture, and temperature. It is possible to realize interactive artificial life by applying real environmental data collected from each sensor to the L-System.

Keywords: Interactive Media Art, User Interface, Digilog, L-system

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1. Introduction

User interface implies a physical, virtual medium that is created as a means of temporary or permanent communication between user and things or a system, particularly machine or computer program [1]. With the development of technology, user interface has also been developed continually and variably for using that technology.

In recent years, Artificial Intelligence (AI) technology is rapidly progressing. Human plays go with computer, and the AI technology is being applied in various fields, from the small software Siri of Apple to the automatic system of vehicles. However, the growth of user interface does not match the speed of technology growth, and studies regarding active and personalized interface are insufficient. Therefore, it is valuable to suggest a possibility for an interface development by developing products that interact with the environment.

2. Reaction of User interface to environmental factors

It is very simple to construct a user interface with various digital installations deeply relevant to our daily lives. It has made by focusing on carrying out to command, not considering user's situation or environment. The construction follows the principles of interface design held in long time. In the past, we lived in an analogue environment in which we drew on soggy papers in rain and hung fluttered hearts on postboxes. Although numerous people are nostalgic toward the analogue environment, digilog services have emerged. For example, we can write on the display of smart phones with electronic pens or listen to the shutter sound when we use the smart phone camera [2].

It is not expectable that user interface principles of a human-computer interface applied interaction between existing users and computers apply for future technology and sensitivity of analogue. These principles must be changed to suit the new environment. Therefore, in this research, we attempted to develop a product that changes actively with the environment instead of the user's demand, focusing on the principal changes of user interface.

3. Production and research of product

We attempted to reflect the concept of an active user interface through an 'interactive media art reacting environmental factors.' (This title later changed to 'Tree wants to get Your Attention') Figure 1 shows an interactive art that creates virtual environment and nurtures artificial life. In this product, information on illumination, moisture, and temperature collected from digital sensor is presented on four displays as 3D animation through data categorization and the algorithm of growth.

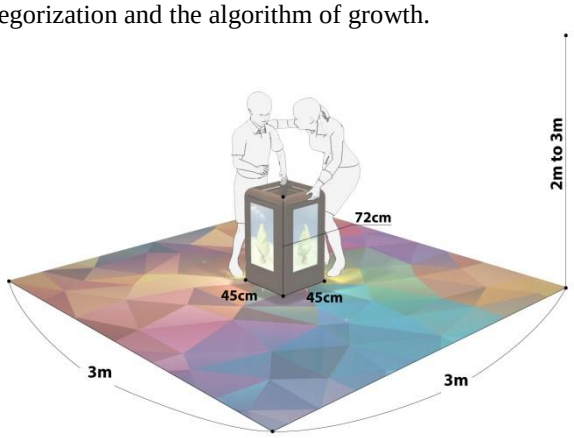

Figure 1. Image of the exhibition

A. *Product development*

The cube is made of wood of size 45×45×7cm, with wheels for smooth movement.

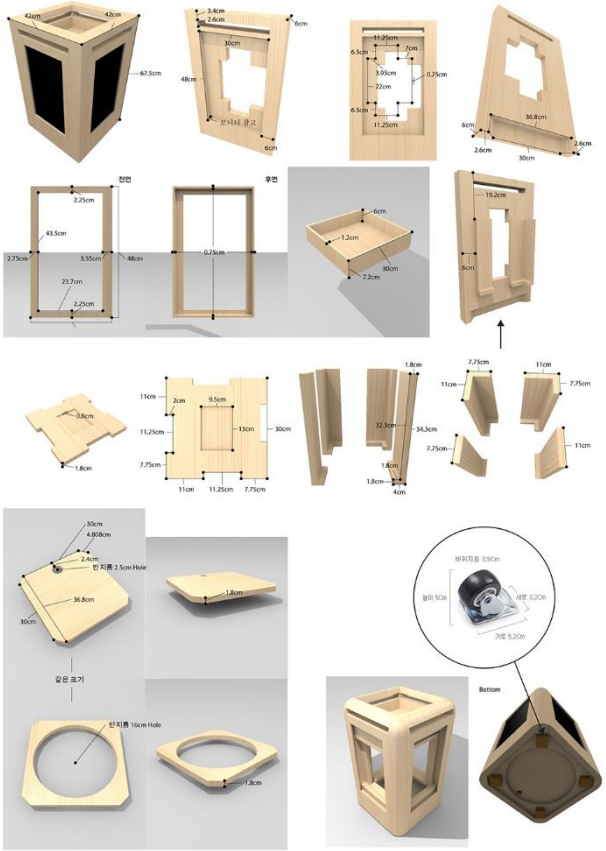

Figure 2. Cube design

SHT15, TSL2561, APDS-9960, HMC5883L, and HX-711 sensors are connected through an Arduino board inside the cube. An LED lamp is equipped on the bottom of the cube to promote recognition ability of the APDS-9960 sensor. Table 1 lists the functions of each sensor.

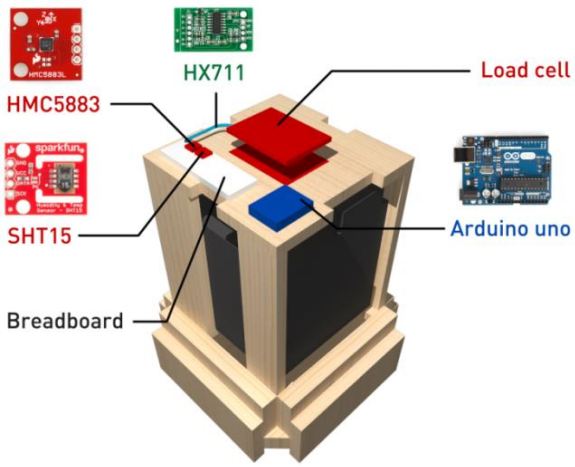

Figure 3. Connected sensors

Table. 1
Used sensors

Sensor	Image	Function
SHT15		Collection data on temperature and moisture of the environment
TSL2561		Collection of illumination data
APDS-9960		Analysis of ground color
HMC5883L		Measurement of absolute bearing of the created virtual environment
HX-711 & load cell 5kg		Analysis of user's interactive will

B. *System promotion for artificial life*

The promotion of the system for artificial life is realized to present results of artificial life according to system use. This system chooses a sort of mesh and decides the growing direction of the mesh produced using the genetic algorithm [3] and fractal structure of the L-system [4].

When the color of the ground is detected, the vegetation is decided following the classification provided in Table 2.

Table. 2
Climates following ground colors

Color of ground	Climate
	Desert
	Steppe
	Temperate
	Savanna
	Tropical rain forest
	Subarctic
	Tundra
	Ice and snow

The main environmental factors that decide the specific species and form of vegetation growth are light, moisture, and temperature. The algorithm of formation and growth of vegetation must be applied for application of these factors to the growth and for resolution of the vegetation growth. The Roulette wheel algorithm is used as a selective

algorithm among genetic algorithms. The value of the selective algorithm is set according the vegetation in the environments. The formation of branches uses the fractal structure of the L-system. In addition, the reactive growth simulation to vegetation growth is produced as a factor influencing the formation of vegetation. The product thus created reacts sensitively to changes in the surrounding environment. When the audience plants seeds on the cube, the load cell of the cube perceives this and creates vegetation as an artificial life.

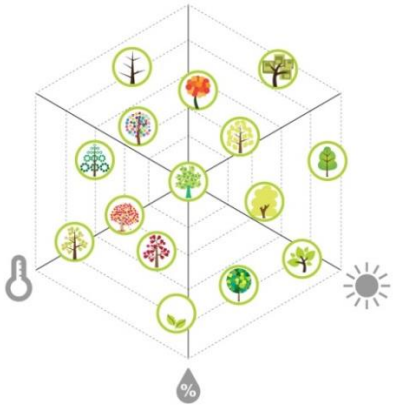

Figure 4. Connected sensors

C. Prototype Test

This product realizes all the active user interfaces and promote a system for artificial life that has already been projected. Moreover, the product was tested in various environments, and the problems obtained through this test will be corrected and supplied in the future.

Figure 5. Test in outdoors environments

4. Conclusion

Through this project, a collecting device is developed. It is proved that an active user interface constructs various artificial environments and artificial life based on the collected environmental factors.

If only a marvelous interaction is emphasized, the interactive media art can be treated as a useless toy or industrial waste. We attempted to maintain the concept of realizing an active interface for developing this product. Users can enjoy this product and apply this in various fields. We hope that this product will help in our daily life as a Mondrian masterpiece. Future studies must consider studying how digital devices around us consider user's conditions sufficiently.

References

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Biographies

Dubeom Kim received his MS degree in Art & Technology from Chung-Ang University in 2007. Currently, pursuing his PhD degree in Art & Technology at the Graduate School of Advanced Imaging Science, Multimedia and Film, Chung-Ang University, Seoul, South Korea. His research interests include, UI/UX of humanoid control and HCI.

Doyoon Ahn graduated from the School of Electrical and Electronic Engineering at Chung-Ang University. Currently, and is pursuing his MS degree in CG & VR at the Graduate school of Media Device Development & digital art created algorithms, Chung-Ang University, Seoul, South Korea. His research interests include the Algorithm of artistic application.

Youngho Chai received his M.S. degree in mechanical engineering from the SUNY at Buffalo and Ph.D. degree in Mechanical engineering from the Iowa State University in 1997. From 2006 to 2007, he was with LITE (Louisiana Immersive Technology Enterprise) at the University of Louisiana at Lafayette, U.S.A. He is currently a professor with the Graduate School of Advanced Imaging Science, Multimedia, and Film, Chung-Ang University, Seoul, Korea where he heads the Virtual Environments Lab. His research interests include spatial sketching.