Blowing Light: Green-Based Interaction Design

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Abstract. As green being a significant issue of these years, we want to discuss about how to combine green with technology through ambient design. Not only use intelligent methods but also interact with fun playing interaction. The relationship between people and the feedback of installation can make people help themselves to meet the needs of them. This paper provides an innovation concept of ambient Intelligence. People can help themselves through a wind-blower installation by conventional power-generating method.

Keywords: Ambient Intelligent, Green, Human Power, Wind-Blower, Light, Interactive installation.

1 Introduction

Human interaction is often starting by studying how human wants in a specific situation[1]. With technologies embedded in everyday's objects, while more such objects are developed, the smarter materials and environment has become a reality around us. Ambient interaction in current computing approach creates a new paradigm in design as well as computing. On the other hand, with the global energy problems, the Green is an immediate issue that we need to address in our environment and that is often conflicted with the normal energy consumption nature of computing.

The problem of combination between Green and technology (especially computing) becomes more and more significant. With the Ambient Intelligence, designers and scientists explore a vision of future daily life that can apply the Green and technology together. What we want to develop is how to make people help themselves with an installation that embedded to the environment (stair in the prototype in this research) by a conventional making fire gesture.

In the beginning of this prototype, the concept was based on studying the human power activities for gaining energy that we found is making fire. Wind-blower or hand drilling are studied for understanding the gestural details of making fire. With human power, the activity of making fire will remind users the importance of energy and the consumption behind the lighting. Further, the interesting concept and tool design of this installation create a fun interaction that will achieve the concept of reuse, meaningful, and high feedback for the users.

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1.1 Ambient Intelligence as Interaction Theory

In an ambient intelligence world, the everyday's devices will support people in carrying out their daily routines, tasks and rituals in easy [2]. The natural reaction for using information and intelligence hidden in the network are the key to connect these devices. As these devices become smaller, connected and more integrated into our environment, the technology embedded in the devices and the surroundings will become transparent to the users[3]. In addition, ambient intelligence provides electronic environments that are sensitive and responsive to the presence of people. People are presented with the tools and the processes that are necessary in order to achieve relaxing interactions with this environment[4]. Therefore, ambient intelligence is suitable for defining the computing framework for building up our prototype, thus our interaction theory.

1.2 Green Power as the Media

Green Power is the power using non-energy-consumption source to generate energy [9]. Human power is often used as the primary source. As theory of a new media interface, human power should not only provide the energy needed for the installation but also interactive experience that comes along with personal evolvement. We want to discuss how to use green power as the media to implement the interaction theory we used, ambient intelligence.

Logically speaking, green power has to be adapted as the major purpose of this project. Thus people should work this installation through their bodied exercise, they need to help themselves to meet what they need for reducing the waste of energy.

1.3 The Problem of Our Interaction Design

The problem of combining green with technology lies on the familiarity of relating human power with interactivity. How users experience with human power and relate it to the interaction will affect the interactive experience of human in our prototype. We will use several methods to overcome these problem and learning the bits and bells during the implementing our prototype.

2 The Concept

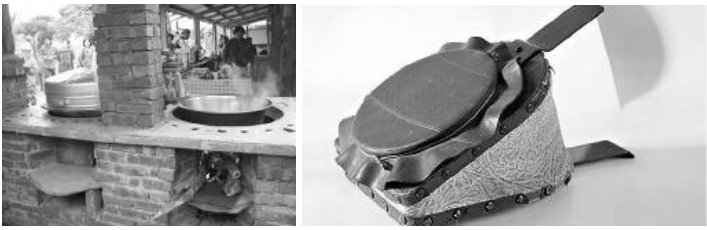
2.1 Motivation

The major motivation for this prototype is how ambient interaction design can be integrated and triggered by human power as an experience. Interaction design cannot be fully realized and understood without the prototypes produced. Therefore, for testing the green-based interaction design with human power-triggered, we developing a prototype called *Blowing Light*.

2.2 Concept

The Concept of our interaction design is to make people use a conventional power-generating method, blowing for fire to turn on the light (As Fig. 1) is found after

testing several alternatives. Additionally, this design concept invokes a mode of interaction that make people aware a well-known saying, “No pay, No gain”. By doing so, people or our users will be more aware of Green issues implicitly in our interaction design.



(a) (b)

Fig. 1. (a) Traditional method of blowing for fire (b) wind-blower

2.3 How We Approach

For implementing the prototype described above, we use three steps: (1) reviewing/analyzing relevant technology and cases, (2) exploring the interaction activities and (3) implementing with a prototype: Blowing Light that are described as followed.

1. At first, we analyze the design researches for green and study some relative projects about saving energy. Since there are only few that are implemented, most of relevant studies lie upon the cases they develop. Therefore, the case studies are the key method used in this step. By exploring those cases, we discovered they use human power and tools to reduce the waste of natural power like electric that achieve the combination of green and technology that was the problem we want to solve.
2. Secondly, the basic model of design strategy is formed that was based on the principles we gained from the analysis above: such like green, playing and human power. Besides, we investigate the intuitive reaction with testing from university level students.
3. Finally we developed a special interactive method for our users (in this case, university students) to turn on the light at night. This installation was built up with some green materials like bamboo wind blower and recycle plastic cup as light lampshade, reuse glass papers for decorating the lampshade.

3 Case Studies

Three cases are selected based on Green, playing and human power. They are (1) *the Fun Theory—Piano staircase,* (2) *Water for people—Playpumps*, and (3) *Playmade energy—energee-Saw*. Each will be described as followed:

3.1 Case 1: The Fun Theory—Piano Staircase[5]

The funtheory.com of the Volkswagen has created a platform to attract a lot of interesting projects with fun as their center motivation that is close to what we want to develop in Blowing Light. Piano Staircase video on *Youtube* has been the famous ambient interaction design since two years ago; it really makes people want to take the stairs instead of taking escalator through a fun refit piano staircase. (As Fig. 2) This project not only makes people take action but also have a lot of fun.

(a) (b)

Fig. 2. (a) The fun theory installed the piano staircase (b) People took the piano staircase instead of escalator. (All images are courtesy of The Fun Theory `http://www.thefuntheory.com/piano-staircase`).

3.2 Case 2: Water for People—PlayPumps [6]

PlayPumps [6] is an interesting project implemented by Water For People. This simple system has the power to change whole communities, from health and education, to employment and economy. The same basic design can be adapted for all manner of situations. It's all thanks to the power of children at play! The design of the PlayPumps (As Fig. 3) water system makes it highly effective, easy to operate and very economical, keeping costs and maintenance to an absolute minimum.

As seen in Figure 3, while children have fun spinning on the PlayPump merry-go-round (1) clean water is pumped (2) from underground (3) into a 2,500-liter tank (4)

(a) (b) (c)

Fig. 3. (a), (b) Children was playing the PlayPumps for providing the power to (c) push water into the tank. (All images are courtesy of PlayPumps International: `http://www.waterforpeople.org`).

standing seven meters above the ground. A tap (5) allows access to the stored water. Any excess water pumped up is diverted back down the borehole (6). The storage tank (7) provides a rare opportunity in rural villages to advertise – both as a commercial billboard, and also for health and educational messages. Revenue from the billboards is used to pay for pump maintenance. The system is capable of drawing 1,400 liters of water per hour at 16rpm from a depth of 40 meters.

3.3 Case 3: PlayMade Energy: The Energee-Saw[7]

The Energee-Saw from PlayMade Energy (As Fig. 4) used the local materials to build the main structure of the see-saw. This greatly reduces logistical costs and the carbon footprint of transportation. It also engages the local community into building the product, fostering a pride of ownership and providing work. Energee-Saw will power low-drain electrical appliances such as LED based classroom lighting, radios and mp3 devices, mobile phones and potentially low-wattage laptop computers.

(a) (b) (c)

Fig. 4. (a) Designer Daniel Sheridan (b)(c) Children was playing the Energee-Saw for providing the power.(All images are courtesy of PlayMade Energy. `http://www.playmadeenergy.com/`)

3.4 Analysis

Basic on the cases upon, we can see that they redesign the interface and make people easier to understand how to use the installation through their experiences. The comparison of each case in terms of input/output/behavior/purpose/material is shown in Table 1. There are some principles gained from the case studies are shown as followed:

Table 1. Interaction Analysis list of related cases above

Interaction analysis			
Case	**Piano staircase**	**PlayPumps**	**Energee-Sew**
Input	Human step stress	Human pushing power	Human power
Output	key tone	Push water to tank	Provide electric
Behavior	Playing piano stairs	Playing merry-go-round	Playing Energee-Sew
Purpose	Make people walk the stair instead of escalator	Provide electric	Provide electricity
Material	Design materials	Design materials	Native recycle or reuse materials

(1) Green: Conventional objects have physical characteristics; mechanical ones also have capabilities[8] so we tried to indicate the green to traditional but good method. However indicate technology to some techniques that need to build up with green materials such like LED light. (As Fig. 5)

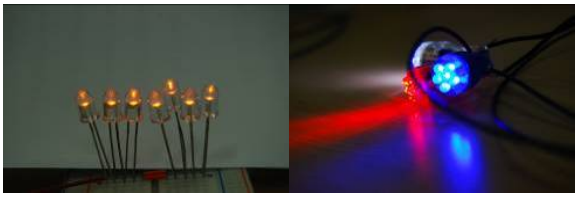


Fig. 5. LED light we used as green materials

(2) Playing with Human power: We re-defined a behavior that was burning the woods for lighting darkness, however, the waste of wood was not that green for the earth now, therefore we kept the behavior that using wind-blower to blow the fire prior of time to be the interaction.(Table 1)

(3) Recycle or reuse material: Those lights were made of recycle plastic cups which were used plenty in Taiwan, the skin of cups were decorated by reuse colorful glass papers for achieving the goal of combine green with technology. (As Fig. 6)

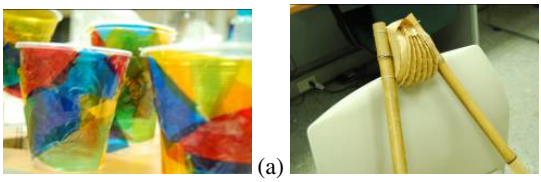


Fig. 6. (a) The skin of lights is made of reuse glass papers. (b) The wind-blower used green materials, bamboo as materials.

4 System Design

People playing with generated power like using air-blower for providing electronics to make the light open that making a zero-energy high-tech playground. The behaviors analysis has conducted for finding the details and intuitiveness of gesture we need.

4.1 Behavior Analysis (The Interactive Process)

When people need lights, they will try to find out some light source or tools for lighting up the dark place. When they find out some light source, they will try to keep it lighting or make it stronger for lighting all of the space around. Base on this point, we

used a LED light as the light source in the dark and drew user's attention to find out the wind-blower, if they took up the blower they would try to blow for keeping the light source, LED light. After blowing, all of lights would open for the user and let user pass safety.

4.2 The Location

We choose a dark and narrow place of school's environment for testing the lighting effects (As Fig. 7) and creating a scenario for motivating people. The installation is set up on the stairs of college of design NYUST where it is very dark during the night and a lot of students stay late for working in the labs or office need to go passed this staircase. Consequently, most of students would take elevators instead. The purpose of Blowing Light not only concerns about the security of students but also makes students get used to take the stairs.

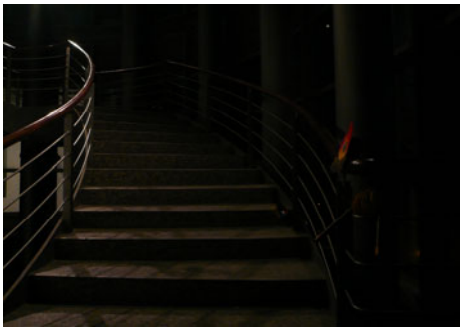


Fig. 7. School's environment where is testing the lighting effects

4.3 The System Process

Blowing light is comprised of three parts (a) user transforms human power into the input signals to sensor, the transformation process is through wind from wind-blower, (b) system computes collected signals and, (c) makes a feedback at LED lights. The light timing of LED is according to the time interval of channel circuit. This concept is that sensor detects the turning speed of fan. When the speed is over the value we set, control component will make the LED light start to shine. (Fig. 7)

4.4 Interactive Process

User passes by the installation and takes the wind-blower to blow the sensor, the controller will accept computed signal from user's energy. The time user blows will determine how long LED lights will light for user and make user pass safety.

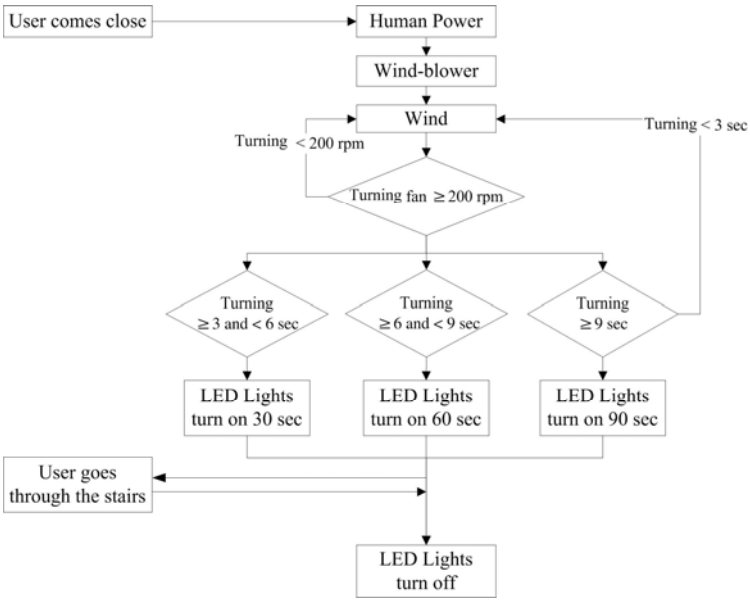


Fig. 8. For turning LED lights on, we used circuit sensor to predicate when user will need and how long LED lights will need to keep on

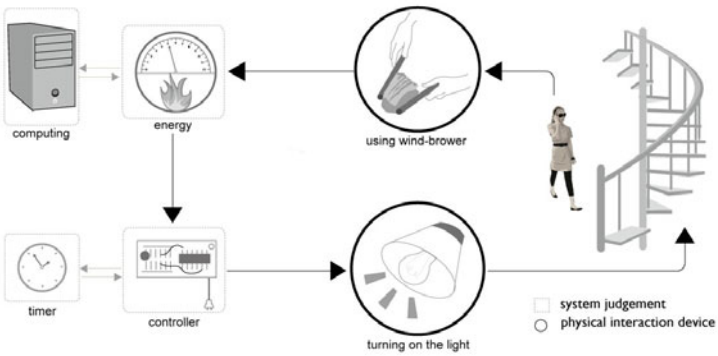


Fig. 9. User provides power to installation by playing the wind-blower

5 Scenarios

For understanding the usages of Blow-lighting system, one scenario is described as followed: blowing the darkness of path away.

Molly is a 20 year-old girl, every time she goes back from school, she needs to pass through a narrow and dark stairs which make her scared on the way home. One day, she was going back home and walking to the stairs as usual, she was trying to run over but she fell down on the floor. Suddenly she found out a wind-blower and many

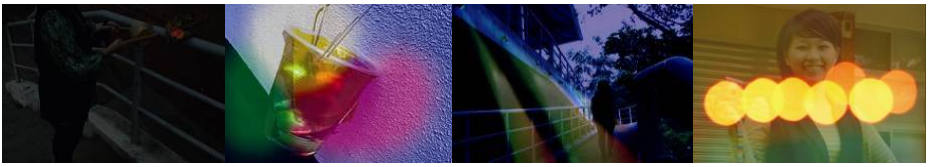


Fig. 10. User Molly was playing Blowing Light installation

maple leaves which as red as fire shining on the handle of stairs, there were little weak lights shining behind the maple leaves so she took up the wind-blower and started to push. (As Fig. 9)

Molly wanted to know if the light will be brighter after she was pushing stronger. When she tried her best to push the wind-blower, she thought that it was so funny to do this, but the colorful lights (As Fig. 9) suddenly bright at that moment, everything was so clear. Molly felt so happy that she didn't need to worry about her security around this stairs anymore. Finally she got home with appreciate. (As Fig. 9)

6 Conclusion

We used conventional method of blowing light as initial concept and combined green and technology through ambient design. In the process of making prototype, we used recycle materials for decorating the skin of lights for achieved another concept, Green. In other words, we used less cost to procure a zero-energy high-tech playground.

On the other hand, interactive interface design was based on most intuitive and natural thinking of user. Furthermore, we used fun interaction for user enjoying the time of playing installation even it cost human power to work on. Our prototype is not only artistic but also practical and provides a safety solution for user.

In the future, we plan to research other movement of body as human power which provides the energy of installation.

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