

Escaping Chair: Furniture-shaped device art

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Figure 1: The chair trying to escape from a person sitting down.

Abstract

Furniture-device is the device having furniture appearance and physical input and output function. The Escaping Chair is a furniture-device having physical and dynamic interaction with a user to let them perceive the intent of their action and personify the furniture.

The Escaping Chair interacts with the bystanders by trying to move away from nearby people. By doing this, the device tries to make the person fail to sit on it, and stimulates their perception about sitting. The idea of a furniture-shaped device was extended from one of my previous artworks, which used furniture as input mechanisms. I exhibited the chair and observed the interaction sit produced with exhibition visitors. It succeeded in making people wonder during the interaction, as I planned, and making them further chase the chair, which indicates a new capability of the device. There were some challenges regarding load tolerance, detection latency and failure, which I have proposed improvements for.

Keywords: device art, virtual reality, furniture device, interaction, perception, personification

Concepts: • Hardware → Emerging Technologies → Analysis and design of emerging devices and systems; Emerging tools and methodologies;

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1 Introduction and Motivation

Furniture-device is the device having furniture appearance and physical input and output function. The Escaping Chair is a furniture-device that tries to escape from nearby people. When it detects a person approaching, the chair moves away from them in order to prevent them from sitting down. Having this characteristic, this furniture-shaped device proposes a new method for stimulating the user's perceptions, such as what the act of "sitting" means. Although this device is a machine with a simple function, and of course without will, I expect that the user feels a semblance of will in the device through their interaction with it, and treats it as another "person."

As a different form of device-art that moves itself in response to a person's action, CirculaFloor can be cited. This device supports a person's locomotion by moving to where the person will walk to in order to convey them [Iwata et.al. 2005]. In a different manner, the Escaping Chair tries to betray a person's sitting motion by escaping from the person when it detects their approach, emphasizing its existence as a communicative subject with the person.

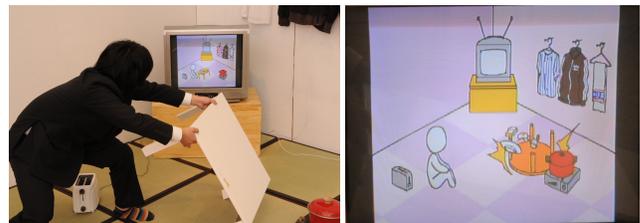


Figure 2: "Hako-Sekai Ojisan." here is an example of input from real world and reaction in the virtual world shown in the monitor.

The idea of a furniture-device rose from my previous

artwork, “Hako-Sekai Ojisan,” which used furniture in a room (e.g. table, cooking stove) as input mechanisms to a virtual world containing the same placement of the furniture. As input mechanisms, each furniture piece had one function to affect the virtual world [Oozu, 2015]. When I displayed this work, many visitors demonstrated interest in the furniture pieces, trying many different ways to interact with them. Visitors would move and tilt the furniture and beat the table in order to get various reactions. Seeing these interactions, I decided to focus on a single object to create richer interaction between the person and the artwork by giving it various means of operation and response, and thus created The Escaping Chair, which has both input/output functions. The function of the Chair was inspired from the mischievous prank of pulling a chair away as another person tries to sit on it.

2 Implementation

The configuration of the chair is as following; 1 Arduino Uno as the processor, 4 USRFs as the sensor, 4 omni wheels connected with the motors as the drive system. The sensors are mounted on each edge of the top cover and detect objects approaching from each direction. When they detect any object within 40 cm, the pre-set threshold, they send a signal to the processor. The processor then activates the motor-units to move in the opposite direction from where the signal came from. The casing material of the Escaping Chair is an actual box chair in order to create a familiar appearance that makes users initially perceive the device as furniture. All the electrical components are contained inside of the chair.

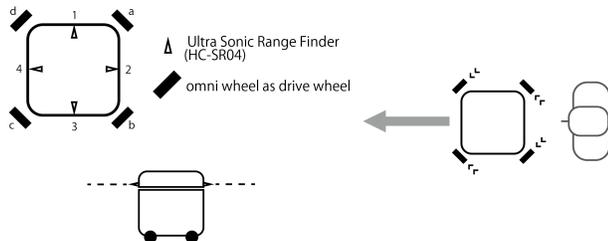


Figure 3: Left, configuration of the chair. Right, depiction of the chair interaction with the person nearby.

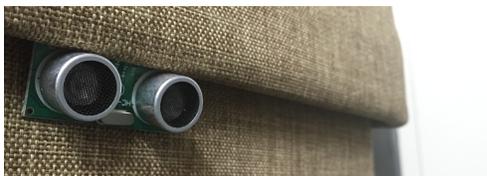


Figure 4: Sensor unit close-up.



Figure 5: motor unit mounted on the bottom.

The USRFs(HC-SR04) has 2cm to 400cm non-contact measurement function and the ranging accuracy is 3mm minimum. The motor units are made of omni wheels which enable omni-direction movement [Kenjiro, 2011] and motors that are mounted on each corner of the chair-bottom and placed along the wheel direction parallel to the diagonal of the chair-bottom. The motor units generate a speed 0.47m/s to move (calculated from the video).

3 Results of Exhibition and Future Work

I exhibited the Escaping Chair at Tsukuba Media Art Festival from November 28th to December 6th, 2016 and evaluated it from observations during the exhibition. Through the exhibition, I observed some cases where the visitor looked contemplative about the failure of their sitting action due to the chair running away, tried to contact with it not only by sitting on but touching with hands, which was mainly shown in younger participant, or where visitors kept chasing the chair while it was running away, which indicates a new capability of this device as the stimulator of physical movement. Thus, it can be said that the Chair has succeeded in stimulation of user’s perception about their action and personification itself. However, there were some cases that the chair failed to detect the visitor approaching. Also, the load tolerance of the chair was too low to let them to sit on. To solve these problems, I propose reinforcement of the drive system for low load tolerance and adding a different type of sensor like PSD for detection failure. As for future development, I’m planning to make multiple these devices, cultivate their communication and interactivity including people nearby, and develop their application in the living space.



Figure 6: An interaction done with a visitor. For more friction with the floor surface for the chair, a rubber board was laid down.

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References

- HIROO IWATA, HIROAKI YANO, HIROYUKI FUKUSHIMA AND HARUO NOMA. 2005. “CirculaFloor”. *IEEE Computer Graphics and Applications*, January-February, pp.64-67.
- TAKESHI OOZU. 2015. “Hako Sekai Ojisan”. *School of Art and Design University of Tsukuba Graduation studies and practice work*, pp.66.
- KENJIRO TADAKUMA. 2011. Omnidirectional Mobile and Driving Mechanism. *Journal of the Robotics Society of Japan*, Vol. 29 No.6, pp.516-519[in Japanese].