

ThermoGame: Video Game Interaction System that Offers Dynamic Temperature Sensation to Users

Tetsuaki BABA*
Tokyo Metropolitan University

Kumiko KUSHIYAMA †
Tokyo Metropolitan University

Kouki DOI ‡
National Institute of Special Needs Education

1 INTRODUCTION

Today, many researchers reports studies about haptic, tactile or tangible art and entertainment. Particularly about temperature sensation, few interaction system has ever been presented because of it does not have good responsiveness. In this study, we shall design the video game interaction system that uses temperature sensation to users. First of all we investigate the relation of the rapidity of temperature change and user response time by using prototyped controller. Our game controller can offer temperature to users dynamically according to game situations. As a result, It was able to propose a basis of interaction system to take the temperate sensation to the game interaction.

2 EXPERIMENT

Figure1 shows the graph of amount of temperature change per second of our prototype game controller. By using the controller, we have an user test in order to know how long time users take to get noticed from the moment of heating/cooling. Figure 2 shows the result of user experiment about response time. The heating response takes about twice times of cooling response. This is due to difference of the number of cold sensation and hot sensation on the palm[Rein 1925]. There are two peltier elements on the both side of the controller. Figure 3 is a screenshot from thermo camera(APISTE, FSV-7000), which shows the left side of the controller is heated by the peltier element.

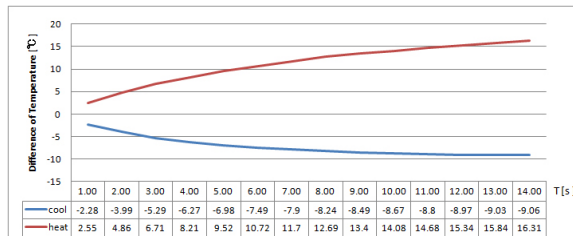


Figure 1: The graph shows the relation between difference of temperature per second of heating and cooling.

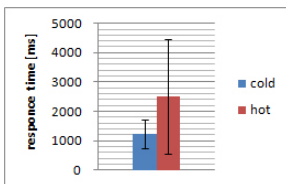


Figure 2: User response time to temperature sensation from peltier elements on the controller

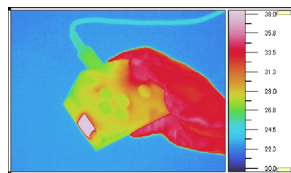


Figure 3: Screenshot from thermo-camera while an user hold the heated controller.

3 IMPLEMENTATION

Figure 4 shows our controller device. As we mentioned it, it has two peltier elements on the both side. The controller is connected to PC via RS-232 and controlled by game software. After these steps, we have made video games, one is to use heating, the other is cooling. Figure 5 shows screenshots of the video game. For example, one game contents which is named “Eruption Jumping” is an robot action game. A player operates a robot. When the robot is near by the heating or cooling position, the controller offers temperature sensation to the player according to the situation.

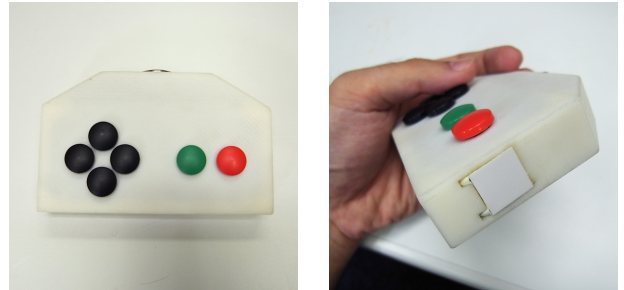


Figure 4: left : Front of the controller , right : A peltier element (15x15[mm]) on the side.

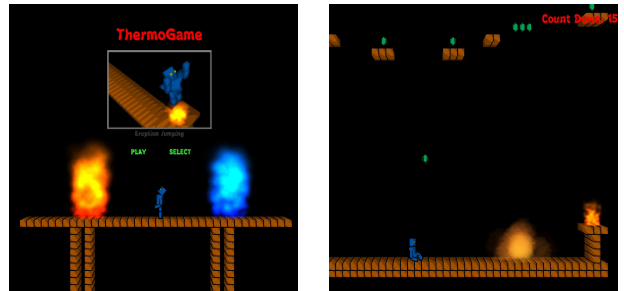


Figure 5: left : Screenshot of menu , right : Game example: Eruption Jumping

4 GOAL

The goal of our study is to establish the basis of temperature sensation interaction system with peltier elements in the field of entertainment. As a future work, we shall create a new type of game system that enables blind users to play by using temperature sensation.

References

REIN, H. 1925. Uber die topographie der warmempfindung. In *Beziehungen zwischen Innervation und torischen Endorganen.*, Zeitschrift fur Biologie, vol. 82, 513–535.

*e-mail: baba@sd.tmu.ac.jp

†e-mail:kushi@sd.tmu.ac.jp

‡e-mail:doi@nise.go.jp