FlexRemote: Exploring the Effectiveness of Deformable User Interface as an Input Device for TV

Sang-Su Lee[1], Seungwoo Maeng[1], Daeeop Kim[1], Kun-Pyo Lee[1], Wonkyum Lee[2], Sangsik Kim[2], and Sungkwan Jung[2]

[1] Dept. of Industrial Design, KAIST. 335 Gwahangno Yusung-Gu, Daejeon, Republic of Korea
[2]KAIST Institute, KAIST. 335 Gwahangno Yusung-Gu, Daejeon, Republic of Korea
{sangsu.lee,maengoon,up4201,kplee}@kaist.ac.kr,
{wklee,sskim98,skjung}@itc.kaist.ac.kr

Abstract. We tried to explore the possibility of using deformation-based interaction as a new input method to remote control. We selected eight basic commands to control TV and design deformation-based gestures for each command based on prior studies regarding organic user interface. A prototype, the FlexRemote, was made and tested by informal user study. The study showed that the users have higher preferences to the FlexRemote in comparison with the conventional input devices and the users can make intuitive interactions through physical deforms. From this positive explorative study, we are expecting that this study will present a new direction in intuitive and fun interaction method with TV in living room environments, which is gaining greater importance.

Keywords: interaction design, deformation-based interaction, organic user interface.

1 Introduction

The conventional TV is mainly composed of relatively simple interactions such channel or volume control. However, recently studies have actively been made on the use of TV as a home display which supports various media activities in the living room environment. Thus, methods to interact with TV in a remote distance in the living room are getting greater importance.

Meanwhile, many researchers have been seeking new interface opportunities to move beyond traditional input methods, such as WIMP [8]. Various studies have been made to find out the possibility of deformation as a new interaction method [1,2,6,7].

This study sought the possibility of using organic user interface (OUI) [3], which is a new method different from the conventional ones in the remote distance interaction for TV. OUI is not a fixed form, but can change its form organically according to functions making intuitional interactions possible. We expected that the study will make more intuitional and interesting interactions possible.

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This study tried to design and verify what effect the interactions through deforms have on the actual users as input devices for remote TVs. A prototype was made based on previous studies for understanding user towards deformable interface as an input method, and informal user tests were conducted. For the prototype we made, deformable gestures which were obtained through our prior user reference were mapped concerning commands which are applicable to information devices. FlexRemote, which is OUI device and can implement a total of 8 general commands through deformable gestures, was made. This device of 2-dimentional flexible plastic material can be easily flexed in any direction.

This study looked into the effectiveness of deformable interactions as a remote input device which is remote from the display. It is expected that this study will present a new direction in comfortable interactions with TV in living room environments, which is gaining greater importance.

2 Designing Deformation-Based Interface

We designed the FlexRemote, a deformation-based input device for smart TV, based on prior study regarding deformation-based interaction. For the commands for smart TV, we selected basic commands of general information device which is also applicable to the smart TV. We categorized commands into four: commands for device status, for navigation, for content manipulation, and for action. Two commands were selected for each category, total eight basic commands were selected from existing

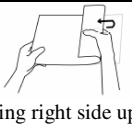
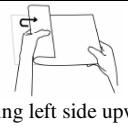
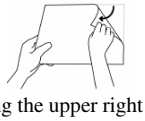
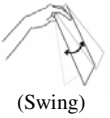
Category	Commands and Gestures	
Status	 (Folding right to left) Power on	 (Folding left to right) Power off
Navigation	 (Bending right side upward) Next Channel/Next	 (Bending left side upward) Previous Channel/Next
Content manipulation	 (Bending upward) Volume up/Zoom-in	 (Bending downward) Volume down/Zoom-out
Action	 (Bending the upper right corner) Favorite channel/Scrap content	 (Swing) Delete content/Back

Fig. 1. Eight basic commands and deformation based gestures we designed for FlexRemote

studies [1,2,4,5,7]. More complex commands, such as typing texts, were excluded due to the difficulty of performing them with a deformation-based gesture at this exploratory study. For eight basic commands we have chosen, eight different deformation-based gestures was assigned according to our prior study of understanding how users manipulate deformable display as an input device [4]. In this prior work, we tried to understand deformation-based user gestures by observing users interacting with artificial deformable displays with various levels of flexibility, and we could gain user-defined gestures for 11 commands. We could map our 8 TV commands with those prior user-defined gestures. Figure1 shows how our 8 commands mapped with user-defined gestures.

3 Implementation and User Study

We made our FlexRemote prototype based on our design. It consists of 16 flex sensors so that it can recognize eight deformation gestures we selected in prior section. (Figure2, left) We setup the virtual TV environment based on Windows PC system. User can control 8 commands we designed by manipulating our FlexRemote prototype. With this prototype we made, an informal user study was conducted with the students in our departments. We gave each participant a use case scenario which involves all 8 commands we designed. First we show them how those 8 commands work with 8 different deformation-based gestures, and then we asked participants to control TV by themselves (Figure2, right). Also we asked participants to do the same task using keyboard and mouse combination.

From an in-depth interview with each participant, most users told us their higher preferences to the FlexRemote in comparison with the conventional input devices such as traditional remote controller or keyboard/mouse. Unlike the conventional method where users have to pay attention to the input device and the screen alternatively, the users can make intuitive interactions through physical deforms without moving their vision from TV. Most of the users became easily familiar with the commands. Regarding workload, the interviews showed that physical demand was rather high, but their joy from the new manipulation was greater than the physical demand. This may mean that physical demand can be an issue as the new effect in a long term, studies should be made on long-term effects of deformable interactions, and also comparative studies should be made with other methods such as body gestures which are recently studied.

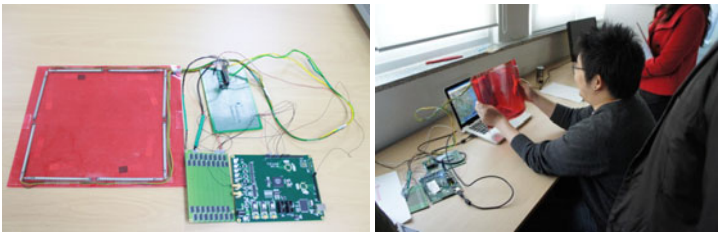


Fig. 2. FlexRemote prototype (left) and user study (right)

4 Conclusion and Future Works

In this study, we tried to explore the possibility of using deformation-based interaction as a new input method to remote control. We selected basic commands to control smart TV and design deformation-based gestures for each command based on prior studies regarding organic user interface. A prototype, the FlexRemote, was made and tested by informal user study. The study showed that the users have higher preferences to the FlexRemote in comparison with the conventional input devices and the users can make intuitive interactions through physical deforms. From this positive explorative study, we are expecting that this study will present a new direction in intuitive and fun interaction method with TV in living room environments, which is gaining greater importance.

For the future works, we are planning to conduct user study within the real context; in the real living room environment when people actually watching TV programs. From this further study, we could gain understanding of social acceptability [6] of new interaction method which is also very important as a practical solution.

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