

# Comparing and Exploring New Text Entry and Edit Methods for Smart TV

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**Abstract.** Smart TVs are becoming an increasingly important multimedia device for home entertainment. The need of effective input methods for television text entry or edit is growing as the number of smart TV explodes. In this paper we evaluate and compare four current input methods (traditional remote controller, touchpad, physical keyboard, and smart device virtual keyboard) for smart TV. Based on the result of research, we propose an approach that provides a more effective method of text entry and edit.

**Keywords:** Smart TV · Text input method · Text edit · User experience

## 1 Introduction

In these days, Smart TVs are becoming an increasingly important multimedia device for home entertainment (Banerjee et al. 2012). Generally, Smart TV is defined as a medium that provides TV broadcasting, Internet, applications, and intelligent services via the mounting of a CPU and an operating platform on the set-top box or display (Barrero, 2014). Smart TV has its own operating system, so it can provide not only TV channels but also different applications. Unlike traditional TV, people have more interaction needs on smart TV platform, such as playing games, browsing websites, social networking, sharing images/videos and searching information. However, one of the most critical problems of interacting with a Smart TV is that there is not an efficient user interface for entering and editing text (Geleijnse et al. 2009).

The most common interface with a traditional TV is a standard remote control. With it, users can adjust volume, change channels or inputs. Smart TV platform are different in that text input is required to use many features (Geleijnse et al. 2012). For example a user may need to input online account credentials, input key words to search for favorite TV shows, write comments in forums or app stores, or enter text in many other scenarios. Editing and correction of entered text in any of these cases is currently a challenge (Hess et al. 2011).

There are some technologies and new devices to help users input text, but there is no efficient method that allows users to edit text (select, copy, or paste) on a Smart TV. A more efficient method of text entry/edit is needed for interactions with Smart TVs.

## 2 Specific Aims

The purpose of this research is to evaluate four different text entry/edit methods (traditional remote controller, touchpad, physical keyboard, and smart device virtual keyboard) for smart TV and propose an approach that provides a more effective method of text entry and edit on smart TV. Based on the literature, the critical parameters to be evaluated in the proposed research include:

- Text input efficiency- how much time a subject spends on completing a text input task.
- Text input satisfaction- the rate of satisfaction a subject gives to an input method after completing a text input task.
- Text edit efficiency- how much time a subject spends on completing a text edit task.
- Text edit satisfaction- the rate of satisfaction a subject gives to an input method after completing a text edit task.

## 3 Research Design

To provide a convincing evaluation of four text entry/edit methods, the study includes both self-report data from subjects and objective measure of time from tester. The independent variables of the test are different text input methods, and the dependent variables are efficiency (time) and user satisfaction. Thus the study combines both qualitative data and quantitative data collection procedures.

### 3.1 Subjects

The study is conducted at College of Architecture on Georgia Institute of Technology campus with a sample of 20 currently enrolled college students. The subjects are aged 18 or over. Participants should have a minimum of 1 year of using smart phone experience and 1 year of watching TV experience.

### 3.2 Setting and Materials

The test facility is put in an empty space. The main facility is a television which supports smart TV boxes, like Amazon Fire TV, Google Chromecast.

The four text entry/edit methods are tested as follows:

Input Method 1: Traditional TV remote controller, subjects can use up, down, left, right and OK button to select the letters of the virtual keyboard on TV to input/edit text.

Input Method 2: Touchpad, subjects can move their figure on the touchpad to select the letters of the virtual keyboard on TV to input/edit text.

Input Method 3: Physical TV keyboard, subjects can type/edit text on TV by pressing the letter buttons on the physical keyboard.

Input Method 4: Smartphone virtual keyboard, subjects can use the touchable virtual keyboard on smartphone to type/edit text on TV.

### 3.3 Procedures

Prior to testing, the participants are asked to fill a pre-test questionnaire about their demographic information—including age, gender, experience of using smart TV and smartphone. Then participants are oriented to the experimental procedures.

The experiment is organized in 2 sessions per participant. The procedures takes approximately 50 min but lasts no longer than 90 min. The order in which the input methods are used in each session is randomly selected, and the purpose is to counterbalance the effects of learning. The participants are asked to sit on a chair about 7 feet in front of the smart TV.

Session 1: The subject is given a sentence which includes letters, numbers and symbols. The sentence is shown on a small screen on the side of subject's seat. The subject is asked to use four different input methods to type the given sentence onto the TV screen. The subject has to correct any typing errors before starting to use next input method. We measure the time the subject spends on typing with each input method. After using each method, the subject is asked to fill a NASA TLX form and a System Usability Scale form.

Session 2: A sentence which includes letters, numbers and symbols is shown on TV, but there are several typing errors in the sentence. The correct sentence is shown on a small screen on the side of subject's seat. The subject is asked to use four different input methods to correct the sentence on TV screen. The subject is not allowed to clear the whole sentence but has to correct certain letters/numbers/symbols in the sentence. The time the subject spends on correcting the sentence with each input method is measured. After using each method, the subject is asked to fill a NASA TLX Form and a System Usability Scale Form.

After the participants finish each session, they are asked to complete a Session Overall Review Form to evaluate four input methods.

## 4 Discussion

From the research study we mentioned, all the data collected are valuable in this study. The quantitative data is the time subjects spend on using different input methods. By comparing the time of using different input methods, we can find which input method is more effective for typing or editing text on Smart TV. The qualitative data is from the questionnaire filled by subjects. By analyzing the score subjects give to different input methods, we can compare which input method gets the highest score, so we can find which input method has the highest user satisfaction.

From the literature review and field study, we analyze the pros and cons of four input methods as below:

- Traditional remote controller is not suitable to input and edit text on smart TV;
- The interaction like Touchpad is suitable to edit text, but not for text entry;

- Using physical TV keyboard to input text is fast, but it is not very good for edit;
- Virtual keyboard on smart device has the same function as physical TV keyboard, but it is more flexible.

Basing on our research, we found that the virtual keyboard on smart device is more flexible for smart TV text input. User can easily switch different keyboards (number, symbol). However, the biggest problem of current smartphone keyboard apps for smart TV is that users cannot easily move the cursor on smart TV, so it is very hard to correct typos users inputted and it reduces the efficiency of both text entry and edit. We also found that when users use Touchpad to input text on smart TV, it is not effective to type but users have the flexibility to move cursor on smart TV. So we decided to move the advantage of Touchpad to smartphone keyboard app.

We proposed a new input method for smart TV. It is a mobile app on smartphone which can connect to smart TV, and users hold a smartphone and use the mobile app on it to control smart TV. Users can use the virtual keyboards on smartphone to type in text on smart TV. Users can use touch gestures (Slide, tap, press) on the phone screen to control the movement of cursor on smart TV so they can edit the text no matter where the text is, and they can also use touch gestures to select, copy and paste text on smart TV. In the app, subjects can switch different keyboards by using slide gesture on the phone screen.

Our further study will be implementing our new design and doing usability test to evaluate our new design. Our new design combines the advantages of Touchpad and smart phone virtual keyboards, so we expect that it is more effective for users to input and edit text on smart TV. We also expect that our new design is more satisfying than currently smart TV input methods when users input or edit text on smart TV.

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