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A Study on Touchless Panel based Interactive Contents Service using IrDA Matrix

Minwoo Lee*, Dongwoo Lee**, Daehyeon Kim**, Myungsuk Ann***, Junghoon Lee****, Seungyoun Lee****, Juphil Cho*****, Jaekwon Shin******, Jaesang Cha*©

**Graduate School of NID Fusion Tech., Seoul National Univ. of Science & Tech., Seoul, Korea*
E-mail: alsdnya@gmail.com, chajs@seoultech.ac.kr
***NAMUGA Co., Ltd, Seongnam, Korea*
E-mail: {winglee, ginkokim}@namuga.co.kr
****Dept. of Theology, Seoul Jangsin Univ., Gwangju, Korea*
E-mail: winglee@namuga.co.kr
*****Dept. of Electrical Information Control, Dongseoul College, Seongnam, Korea*
E-mail: {jhlee, alyssa}@dsc.ac.kr
******Dept. of Integrated IT & Communication Eng., Kunsan National Univ., Kunsan, Korea*
E-mail: stefano@kunsan.ac.kr
*******Fivetek Co., Ltd, Seongnam, Korea*
E-mail: shin0038@fivetek.co.kr

Abstract

Touch panel is mainly applied to pressure type touch panel but it occur a low recognition rate and error during long-term use. So, it is partly applied to capacitive touch panel to compensate for these problems but it also can occur a same problems via pollutions. Touch technology has developed a various method but it is not used because of high costs and difficult installation process. So, in this paper, we proposed an input method of touchless panel using IrDA matrix. This method is conducted using an IrDA Matrix composed of depth sensor. It is possible to offer a various contents for multi user. The proposed technology need a development of a high sensitivity sensing method and high-speed processing method of position information for Seamless operation control. And, it is required high-precision drive technology. Also, we proposed a Seamless user recognition for interactive contents service through a touchless panel using IrDA matrix.

Keywords: *Gesture, Touchless Panel, IrDA Matrix, Interactive contents service.*

1. Introduction

The touch panel that is installed on display is used for display input device such as a various KIOSK, LCD monitor, cellular phone and game. Touch panel is composed of a resistive overlay, ultrasound, infrared

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Corresponding Author: chajs@seoultech.ac.kr
Tel: +82-2-970-6799, Fax: +82-2-970-6800
Graduate School of NID Fusion Tech., Seoul National University of Science & Tech, Seoul, Korea

and capacitive overlay method depending on the implementation method. And, there is a demand on the touch panel of a various touch methods through a growth of the smart device market [1].

Touch input method has a sanitary or contamination issues. And, it is difficult to deal with for the multi-user. Also, it has a problem of resolution and sharpness decrease, because it is installed on the display. So, Sony Corporation of japan was developing a floating touch method of a non-contact method. But it is difficult to commercialize a technology due to enlargement and multi touch. So, in this paper, we proposed a touchless panel based interactive contents service using IrDA Matrix which can improve problems of touch panel. The proposed technology is as follow: section 2 describes an advantage and necessity of proposed technology through an investigation and analysis of the related works. Section 3 describes a detail procedures for the interactive contents service. The performance of the proposed technology is verified in section 4. The paper is closed with a conclusion.

2. Related Works

In this section, we describes an advantage and necessity of proposed technology through an investigation and analysis of the related works.

Fels' Glove Talk [1] focused on a gesture-to-speech interface. Moreover, a multilayer perceptron model was used in Beale and Edwards' posture recognizer [2] to classify sensed data into five postures in ASL. To help people with disabilities, Newby worked on the recognition of the letters and numbers of the ASL manual alphabet based upon statistical similarity [3].

A simplified method, using approximate spline, was proposed by Watson [2]. Gestures are represented by a sequence of critical points (local minima and maxima) of the motion of the hand and wrist[4][5]. This approach is more flexible in matching a gesture both spatially and temporally and thus reduces the computational requirement.

Starner and Pentlands' American Sign Language system [6][7][8] could recognize short sentences of American Sign Language (ASL) with 40 vocabularies, each was attached with its part of speech, which greatly reduced the computational complexity. The feature vector was fed to a hidden Markov model (HMM) for recognition of the signed words. This system gracefully integrated a useful concept in computational linguistics into gesture recognition. Furthermore, Nam's system [9] tried to recognize hand movement patterns. A HMM-based method for recognizing the space-time hand movement pattern was proposed, and 10 kinds of movement primes could be recognized successfully.

Liang and Ouhyoung proposed a sign language recognition system [10] using hidden Markov model and integrated statistical approach used in computational linguistics. This system intended to recognize large set of vocabularies in a sign language by recognizing constructive postures and context information.

CRFs were first introduced by Lafferty et al. [11] and have been widely used since then in the natural language processing community for tasks such as noun coreference resolution [12], name entity recognition [13] and information extraction [14]. Recently, there has been increasing interest in using CRFs in the vision community. Sminchisescu et al. [15] applied CRFs to classify human motion activities their model can also discriminate subtle motion styles like normal walk and wander walk. Kumar et al.[16] used a CRF model for the task of image region labeling. Torralba et al.[17] introduced Boosted Random Fields, a model that combines local and global image information for contextual object recognition.

Dynamic time warping (DTW) is the core of uWave. It was extensively investigated for speech recognition in the1970s and early 1980s [18], in particular speaker-dependent speech recognition with a limited vocabulary. Later, HMM-based methods became the mainstream because they are more scalable

toward a large vocabulary and can better benefit from a large set of training data. However, DTW is still very effective in coping with limited training data and asmall vocabulary, which matches up well with personalized gesture-based interaction with consumer electronics and mobile devices. Wilson and Wilson applied DTW and HMM with XWand [19] to user-independent gesture recognition. The low accuracies, 72% for DTW and 90% for HMM with seven training samples, render them almost impractical. In contrast, uWave focuses on personalized and user-dependent gesture recognition, thus achieving much higher recognition accuracy. It is also important to note that the evaluation data set employed in this work is considerably more extensive than previously reported work, including.

So, in this paper, we proposed an advantage and necessity of proposed technology through an investigation and analysis of the related works.

3. Touchless Panel using IrDA Matrix for Interactive Contents Service System

IrDA-matrix based leap motion sensor can detect a user's gesture and offer a user's skeleton information. So, it can offer a touchless panel based interactive contents service. Figure 1 shows a flow chart of technology which can offer an interactive contents service through detection of user's gesture using IrDA matrix.

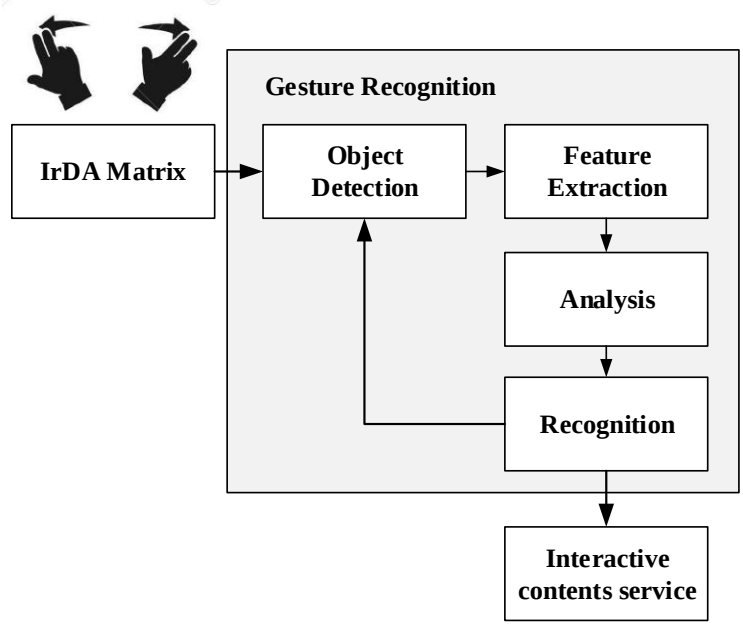

Figure 1. Flowchart of Interactive Contents Service using IrDA Matrix System

This process is consist of the object detection, feature extraction, analysis, recognition and interactive contents service. This technology conducts feature extraction and analysis of detected an object using leap motion sensor for offering an interactive contents service to user. This technology confirms recognition process through the analysis of data and controls transmitted information to main server, if it is not found a problem in gesture recognition process. In the opposite case, this technology conducts a gesture recognition process using leap motion sensor Leap Motion. Therefore, this technology can provide a user with interactive contents service. So, this paper proposed a Touchless panel based interactive contents service which can offer an interactive service using IrDA Matrix.

4. Experiments and Discussion

In this section, we implements the IrDA matrix using leap motion sensor based on proposed technology. And, it can provide a user with interactive contents service. Figure 2 shows touchless panel using IrDA Matrix system which can offer an interactive contents service to user.

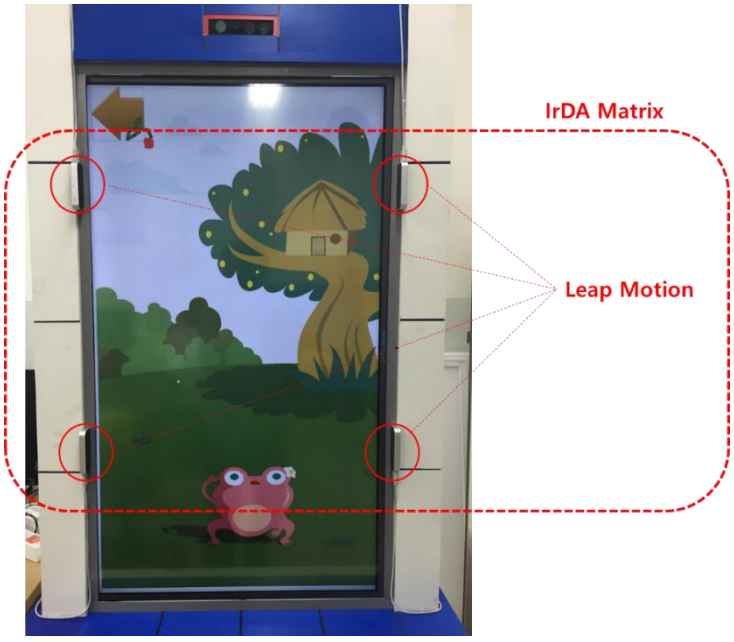

Figure 2. Implementation of Touchless Panel System using IrDA Matrix

The experiment was conducted to verify whether the Interactive contents service are offered to user through touchless panel using IrDA matrix system. Figure 3-4 shows display of interactive contents service depending to user's gesture.

Figure 3. User Gesture (Up / Down)

Figure 4. User Gesture (Left / Right)

In the experiment, leap motion sensor can send a user's gesture information using IrDA matrix and precise gesture information. We confirmed the offering an interactive contents service from user's gesture information using IrDA matrix without blind spot based on this experiment.

5. Conclusion

This paper demonstrated a touchless panel based interactive contents service using IrDA matrix. We conducted an experiments of interactive contents service technology using IrDA matrix through the following step: first, this technology conducts feature extraction and analysis of detected an object using leap motion sensor for offering an interactive contents service to user. Secondly, this technology confirms recognition process through the analysis of data and controls transmitted information to main server, if it is not found a problem in gesture recognition process. Finally, this technology can provide a user with interactive contents service. We confirmed that proposed technology shows accurate result through and experiments of touchless panel based interactive contents service using IrDA matrix.

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