Kinect Sensor based PC Control Interface for Handicapped Users

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Abstract. From its early existence, personal computers assume that all users have no abnormalities in using their hands, arms, and feet for interacting. However, for users with physical disabilities it is barely possible to control computer due to the limitations of existing interfaces, access devices, such as mouse and keyboard. Users with physical disabilities desperately need a new interface to control personal computers in the same manner as general users do. In this paper, we provide a voice recognition interface and new motion interface by using the Kinect sensors to provide users with physical disabilities ability to control PC without using their hands or arms.

Keywords: Kinect, pc control, motion interface, voice recognize, interactive

1 Introduction

In recent years, many interfaces for the human-computer interaction have been developed. Initially, graphical interfaces were increasingly as batch processing based, and eventually they have evolved to process the natural input method as motion recognition and voice recognition. The purpose of these interfaces is to allow users to interact with a computer in full specter of controls. Kinect [1] is made by Microsoft, Inc. It is an emerging next generation interaction interface. The device embodies pestle clock program, movement recognition sensors, image sensors, a multi-microphone array of depth, and various interfaces that utilize above mentioned sensors.

2 Related Studies

Currently, various user interfaces of Kinect sensors are being tested. The examples include interface based motion detection and skeleton extraction that is recognized by Kinect depth sensor, makes possible tracking the coordinates of both hands [2], the hand gestures recognition system based on the depth sensor and camera image of Kinect [3], some sound resource tracking technologies that use Kinect microphone [4] and others. In this paper, we propose a speech recognition interface and motion

recognition based methodology using Kinect sensor. This proposal provides users with disabilities of hands and arms the ability to easily control PCs.

3 Kinect Sensor based PC Control Interface

In order provide the same level in using computer between handicap users and regular users, such as playing music or video, surfing the Internet, and editing documents, a conventional input interfaces (mouse and keyboard) must be replaced. Figure 1 shows our process of determining the amount of damage to hands, arms, and foot of disabilities user.

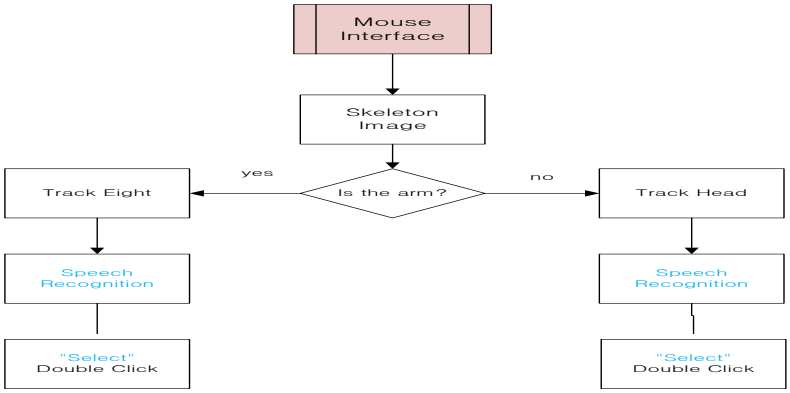

Fig. 1. Decision-making process of the mouse interface

In this paper, a Kinect-based recognition system that replace the mouse cursor and double click event by using arm and head recognition and speech recognition, respectively. The voice recognition interface is divided into data input mode and command mode. In data entry mode, speech is converted into text and entered as a text for word processor or email. In command mode, speech allows users to run and operate the program. The input contents in speech recognition are executed based on the program and the running state of the current system according to the context, and speech commands. The speech recognition word of command must be defined to distinguish the system control commands and applications. Figure 2 below is a configuration diagram of a speech recognition commands for controlling audio/video program.

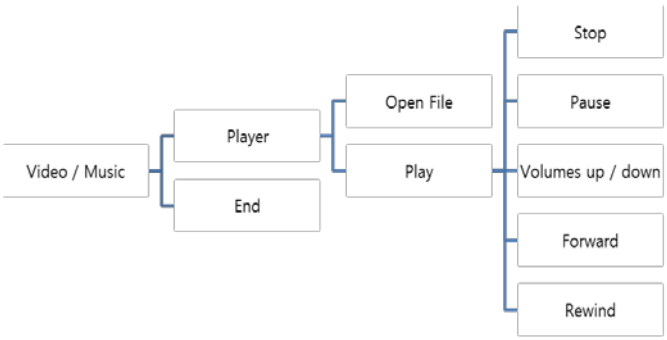

Fig. 2. Recognition commands for audio/video program

4 Experiment

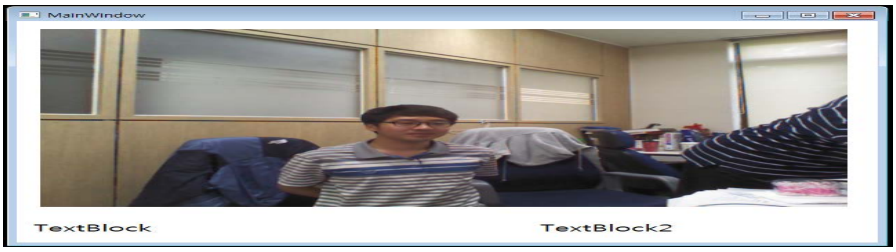

Fig. 3. Head recognition mouse interface execution screen

Figure 3 is an execution screen of replacing the mouse cursor by head movement. Two text blocks show the command of speech recognition. This confirms that we can control the computer via Kinect-based interface. However, it needs to adapt some motion recognitions.

5 Conclusion

In this paper, we study on how to use Kinect sensor for recognizing voice command and body movement, especially hands, arms, and head movement in order to control the computer. It also can be used in human health fields. In the future, this development may helpful for handicap user in using computer.

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