

Gesture-Based Mouse Using Kinect Sensor

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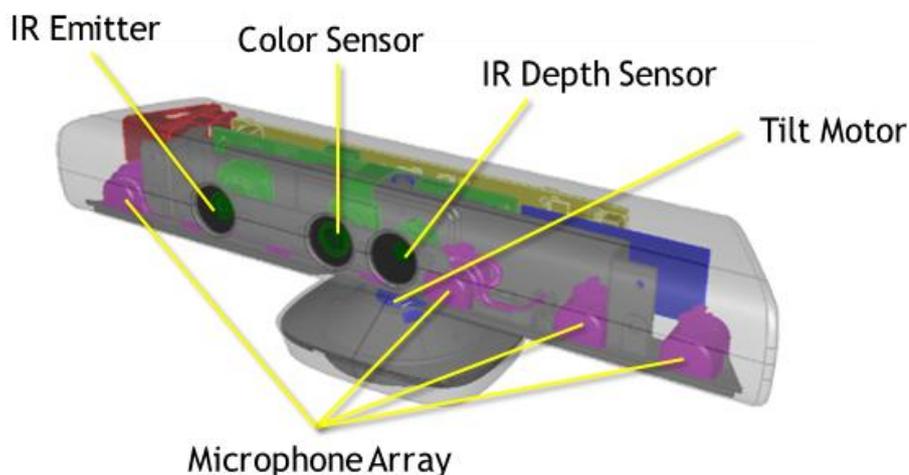
Abstract

Many new concepts have recently been developed for human computer interfaces. This paper introduces a hand gesture based mouse system, which is roughly independent from the lighting conditions, because it only uses the depth data for hand sign recognition. A Kinect sensor was used to develop the system, but other depth sensing cameras are adequate as well, if their resolutions are similar or better than the resolution of Kinect sensor. Our aim was to find a comfortable, user-friendly solution, which can be used for a long time without getting tired. The implementation of the system was developed in C- sharp. We investigated which controls of the graphical user interfaces (GUI) are easy to use and which ones are difficult to use with our gesture mouse. Our system is precise enough to use efficiently most of the elements of traditional GUI such as buttons, icons, scrollbars, etc. The accuracy achieved by advanced users is only slightly below as if they used the traditional mouse.

Keywords: Kinect sensor, PC-Control, Motion Recognition.

1. INTRODUCTION:

In Human-Computer Interaction (HCI), mouse is still one of the most commonly used input devices. One great benefit is, that it makes possible for the users to control all kinds of application with GUI. Some gesture-based systems take over the control of the mouse pointer and mouse events to solve this problem. Microsoft Kinect sensor is integrated with a variety of sensors. As shown in the figure, comes integrated with a red-green-blue camera, an infrared sensor, a four array microphone and a three axis sensor.



The above figure shows the components of the Kinect Sensor

In this system we propose an interface for Windows operating system using Microsoft's Kinect. Instead of using traditional mouse, the interface supports human interaction with a computer using hand gesture recognition. To interact with the system you stay a few meters away and sway your palms to move the mouse pointer.

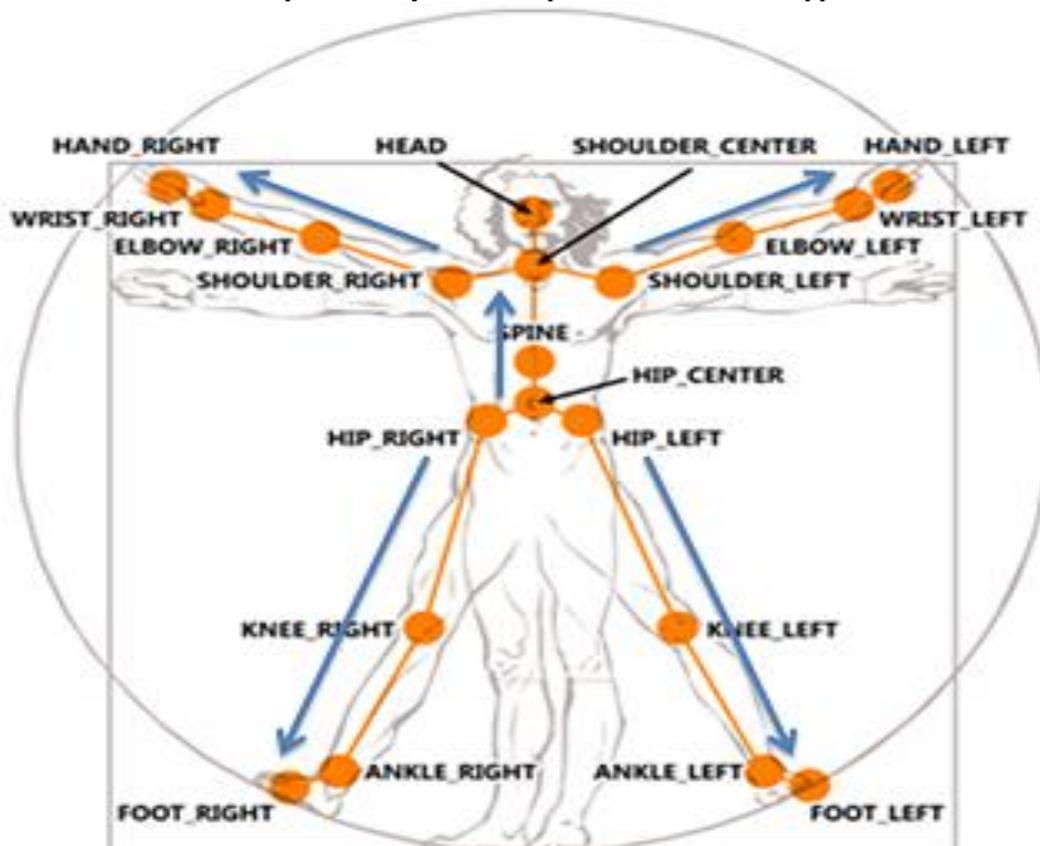
2. MATERIALS AND METHODS:

Usually human-desktop interaction involves usage of the keyboard and mouse which provides user with a full control over all the desktop features. Such interaction is usually happening in the following way: by moving the mouse, user controls the cursor movement on the screen. Mouse clicks are used to select objects like icons, windows and menu bars and activate different methods to perform on those objects like opening, closing, choosing, resizing so on.

The proposed interface targets to eliminate mouse. Previously one who was using mouse has to control the cursor movements by the right hand movements. However, through Kinect we provide the possibility to track the gestures. Therefore providing an alternative way to perform control actions corresponding to the mouse clicks in such a way that there is no need for mouse.

RELATED RESEARCH

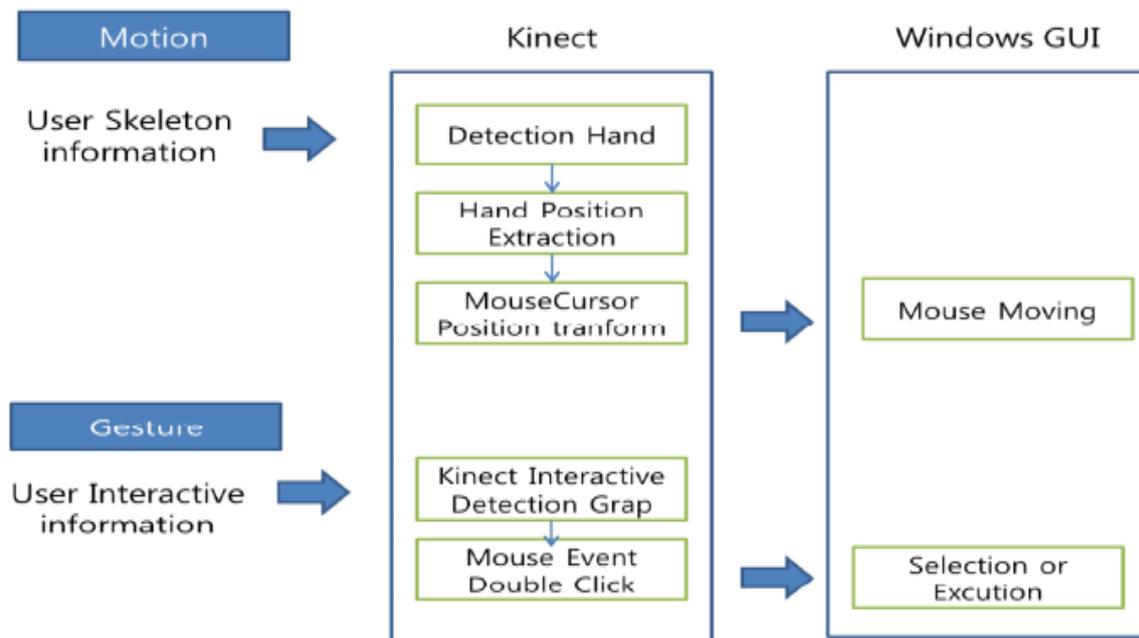
Various interfaces have attempted to use the kinect sensor as an input method for gesture, motion recognition. Some research used depth information and skeleton images to recognize human gestures and motion. Authors have also researched on how to use the coordinates of both hands by tracking hand motion and hand gesture in order to implement an interface. The Figure 2 shows the skeleton coordinates of both hands provided by Kinect depth sensor with the support of Kinect SDK.



The above figure shows the Skeletal images as provided by Kinect depth sensor

KINECT SENSOR BASED WINDOWS CONTROL INTERFACE

In this section we briefly discuss about our propose user interface for Windows Graphical User Interface (GUI) based on Kinect motion, gesture recognition. Kinect detects motion via the user's joints (or skeleton), from the retrieved information, the hand information is detected and extracted to the coordinates of the screen. The hand coordinates will be converted to the cursor coordinates of the Windows GUI to control the mouse cursor. The Kinect SDK supports the detection of "grab" interaction which corresponds to the double click action of the mouse in Windows GUI. The use of motion and gesture will enable the movement of the mouse such as mouse moving and selection.



The figure shows the motion and gesture interfaces

3. IMPLEMENTATION AND DISCUSSION:

In order to implement the new user Interface, Kinect SDK version 1.8 has been used with Visual Studio 2015 C# programming. The developed interface is tested under Windows 7 32-bit operating system and also a Windows 10 64-bit operating system. The Kinect sensor is connected to the pc which is installed with kinect SDK's and also supports .Net framework above 4. The application is run and the user stands in front of the Kinect sensor, after which the sensor detects the users joints and motion and accordingly moves the cursor on the screen.

Left Click

As Kinect recognizes the distance from your hand to the sensor, clicking is possible by moving your hand just a bit forward and then directly backwards. Just make a little motion, the sensor should recognize that and executes the click on the position where the mouse cursor was, when you started the motion.

Double Click

Double clicking works the same way like normal clicking. The difference to a normal click is that you have to move your hand just a bit more forward and backward.

Right Click

For a right click the motion is quite similar to the motion for the left click. Use your left hand and move it just a bit backward and then directly forward (instead forward and backward as at the left click).

Figure shows the mouse controls and the cursor movement on the screen

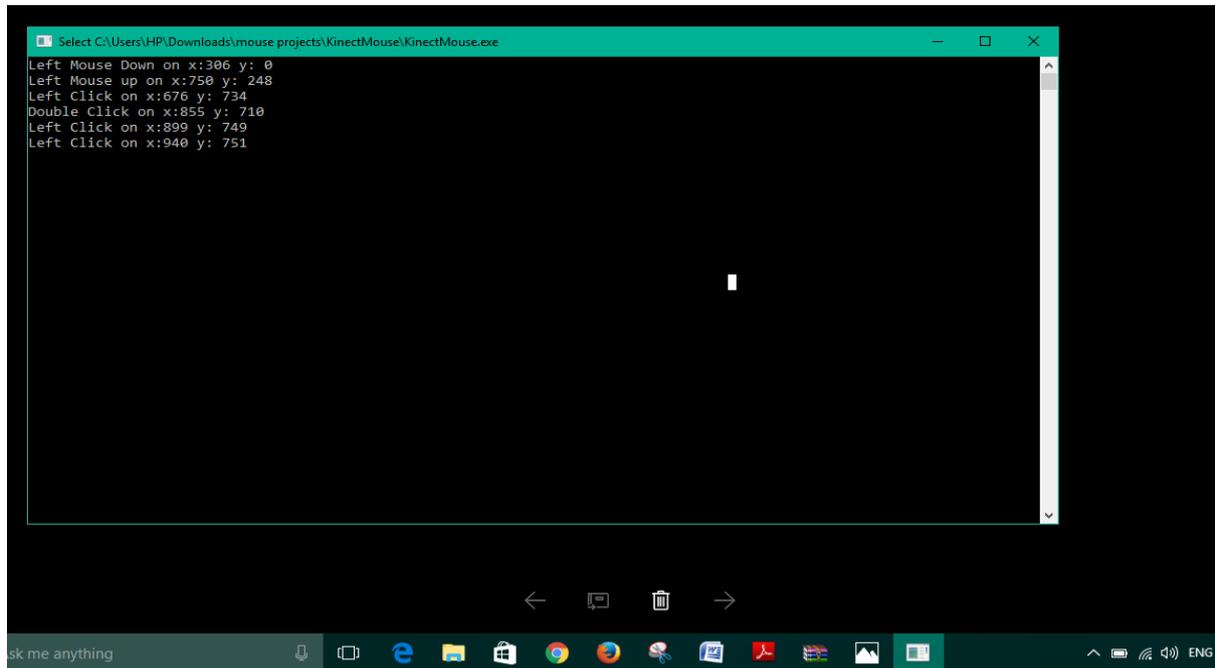
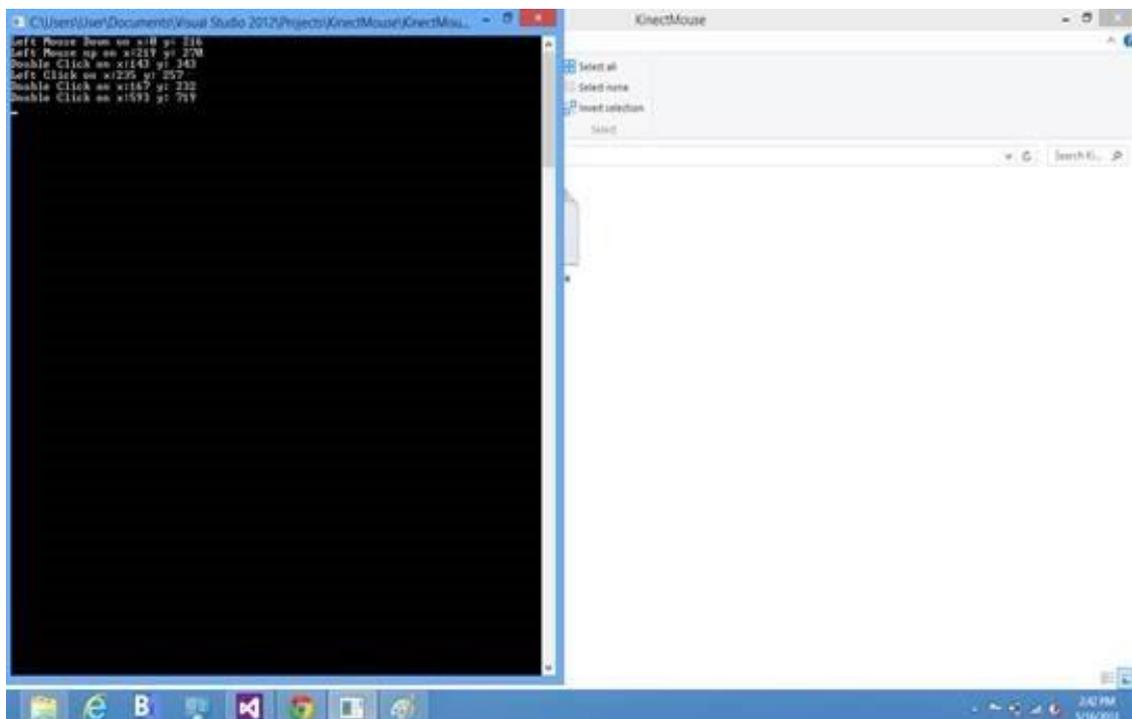


Figure shows the Cursor coordinates and what mouse action has been performed



4. CONCLUSION:

This study has used the Microsoft Kinect sensor with motion and gesture recognition to develop an interface to control the Windows operating system. This combination has not only replaced the traditional mouse so that users can easily control their systems with just the motion of their hands. However with some practice and thorough use the accuracy and speed of controlling the mouse with gestures can be increased.

5. ACKNOWLEDGEMENTS:

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