

**GESTURE RECOGNITION METHOD AND  
INTERACTIVE INPUT SYSTEM EMPLOYING  
SAME**

FIELD OF THE INVENTION

**[0001]** The present invention relates generally to gesture recognition and in particular, to a gesture recognition method and to an interactive input system employing the same.

BACKGROUND OF THE INVENTION

**[0002]** Interactive input systems that allow users to inject input (e.g. digital ink, mouse events etc.) into an application program using an active pointer (e.g. a pointer that emits light, sound or other signal), a passive pointer (e.g. a finger, cylinder or other object) or other suitable input device such as for example, a mouse or trackball, are well known. These interactive input systems include but are not limited to: touch systems comprising touch panels employing analog resistive or machine vision technology to register pointer input such as those disclosed in U.S. Pat. Nos. 5,448,263; 6,141,000; 6,337,681; 6,747,636; 6,803,906; 7,232,986; 7,236,162; and 7,274,356 and in U.S. Patent Application Publication No. 2004/0179001 assigned to SMART Technologies ULC of Calgary, Alberta, Canada, assignee of the subject application, the contents of which are incorporated by reference; touch systems comprising touch panels employing electromagnetic, capacitive, acoustic or other technologies to register pointer input; tablet personal computers (PCs); touch-enabled laptop PCs; personal digital assistants (PDAs); and other similar devices.

**[0003]** Gesture recognition methods employed by interactive input systems have been considered. For example, U.S. Pat. No. 7,411,575 to Hill et al. and assigned to SMART Technologies ULC, the contents of which are incorporated by reference, discloses a gesture recognition method employed by a machine vision interactive input system. During the method, multiple pointers in close proximity to a touch surface are detected to determine if the multiple pointers are being used to perform a known gesture. When the multiple pointers are being used to perform a known gesture, a command associated with the gesture is executed. Specifically, pointer data is examined to detect the existence of multiple pointers in captured images and then the nature of the multiple pointers is examined to determine if a known gesture has been performed, such as for example a right-click gesture, a scroll gesture, a rotate gesture etc. When a known gesture has been performed, a command event is generated that is associated with the determined gesture and the command event is conveyed to the active application program being executed by a computer.

**[0004]** U.S. Pat. No. 7,176,904 to Satoh discloses a touch panel with a display screen. An optical reflection film is provided on three sides of the display screen and reflects light towards two optical units aligned to look across the touch panel. A coordinate control section detects when a pointer has touched on the panel and generates a signal according to the detected point. The coordinate control section generates a coordinate signal that shows coordinates of a touched point, when one point touch on the panel has been detected. When simultaneous touches of two or more points on the panel have been detected, the coordinate control section generates a control signal that shows a control set in advance corresponding to the number of touched points.

**[0005]** U.S. Patent Application Publication Nos. 2008/0180404; 2008/0180405; and 2008/018406 to Han disclose methods and systems for interfacing with multi-point input devices that employ techniques for controlling displayed images including 2D and 3D image translation, scale/zoom, rotation control and globe axis tilt control. Various control techniques employ three or more simultaneous inputs, changes in characteristics of the inputs and pressure sensing.

**[0006]** In interactive input systems that employ rear projection devices to present images on the input surfaces of the interactive input systems (such as rear projection displays, liquid crystal display (LCD) devices, plasma televisions, etc.), multiple pointers from more than one user that are brought into contact with the input surfaces are difficult to locate and track, especially in interactive input systems employing only two imaging devices. For example, in interactive input systems employing two imaging devices, when multiple pointers are being tracked, the triangulation solutions for the pointers include actual pointer locations and imaginary pointer locations resulting in pointer ambiguity issues if the pointers do not carry markings that enable the pointers to be readily differentiated. The ambiguity issues become very complex when recognizing gestures made using multiple pointers.

**[0007]** Therefore, it is an object of the present invention to provide a novel gesture recognition method and a novel interactive input system employing the method.

SUMMARY OF THE INVENTION

**[0008]** Accordingly, in one aspect there is provided a gesture recognition method comprising capturing images looking generally across an input region, processing the images to identify at least two clusters of touch points associated with at least two pointers within the input region, recognizing a gesture based on motion of the clusters of touch points, and updating a display in accordance with the recognized gesture.

**[0009]** According to another aspect there is provided an interactive input system comprising an input surface, at least one imaging sensor having a field of view looking generally across the input surface, and processing structure communicating with said at least one imaging sensor, said processing structure being configured to analyze image data acquired by said at least one imaging sensor to determine the location of a cluster of touch points associated with at least two pointers in contact with the input surface, to recognize successive clusters of touch points representing a gesture based on the relative positions of the clusters of touch points and to execute a command associated with said gesture.

**[0010]** According to another aspect there is provided a gesture recognition method comprising capturing images looking at an input surface, processing the images to identify at least two clusters of touch points associated with at least two pointers, recognizing a gesture based on motion of the clusters of touch points, and updating a display in accordance with the gesture.

**[0011]** According to yet another aspect there is provided an interactive input system comprising an input surface, at least one imaging sensor having a field of view looking at the input surface, and processing structure communicating with said at least one imaging sensor, said processing structure being configured to analyze image data acquired by said at least one imaging sensor to determine the location of a cluster of touch points associated with at least two pointers in contact with the input surface, to recognize successive clusters of touch points