Gesture Recognition Utilizing a 3-Axis Motion-Enabled Device

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There are currently many different types of inexpensive input devices available to consumers, each of which excels at performing a specific type of task. For instance, mice provide accurate pointing; keyboards are useful for rapid input of characters, and touch pads offer a compact means for mobile device input. However situations arise wherein these devices are awkward to use and do not fully utilize the abilities of the user. One situation where this occurs is when attempting to recognize 2-dimensional gestures in 3-dimensional space. One device that is preferable to many in this area is the Wii remote, which contains accelerometers to track movement in 3-dimensional space. Current methods for interpreting gestures performed with this device require that the user train the gesture in advance. However, situations may arise wherein training the system is inconvenient or impossible. To address this issue, we have investigated a method of recognizing 2-dimensional gestures with the Wii remote device without requiring that the user train the gesture in advance.

Acceleration data was gathered from the Wii remote as the user made gestures. Gestures were recognized based upon vertical and horizontal movements made by the user. In order to make our system more independent of the size and speed of the gesture the user made, we utilized an adaptive analysis method based upon the size and speed of the motions within the gesture. Because our system is designed to be independent of the speed and size of the gesture, we have predefined a set of gestures that are each composed of a set of accelerations and decelerations within our gesture library to be compared to the gestures we are examining. As a result, it is a simple task to add any gesture consisting of a sequence of vertical and horizontal movements to the set of gestures to be recognized. The initial results of our experiment showed that gestures can be accurately recognized at a rate of up to 74% for first-time users when utilizing the adaptive analysis method.

Also, there are currently a couple of restrictions imposed by our system that are likely amendable in the future. Firstly, our system does not currently detect changes in orientation of the Wii remote. As a result, we instead assume that the user holds the Wii remote level throughout the gesture. Also, our system cannot currently detect diagonal movement, which results in gestures being limited to sequences of vertical and horizontal movements.