[0023] FIG. **11** illustrates a user interface for selective gesture activation.

[0024] FIG. **12** illustrates exemplary computing devices.

[0025] Like reference numbers represent corresponding parts throughout.

DETAILED DESCRIPTION

[0026] According to one general implementation, and instead of selecting a control on a mobile device, a user may move the mobile device through a series of motions that define a gesture, in order to invoke certain functionality on the mobile device that is associated with that gesture. In doing so, functions may be implemented without requiring the use of physical buttons or user interface controls, allowing mobile devices to be made smaller and effecting increased accuracy in functionality selection.

[0027] Thus, a user interacts with a device, such as a mobile device, by performing a set of defined gestures. Because mobile devices may be small and held in a hand of a person, the user may perform a gesture while holding a mobile device. An enhanced approach is provided, in which a device may sense motion, recognize a gesture corresponding to the sensed motion, determine functionality of the device corresponding to the recognized gesture, and invoke the functionality.

[0028] As used herein throughout, a "gesture" is intended to refer to a form of non-verbal communication made with part of a human body, and is contrasted with verbal communication such as speech. For instance, a gesture may be defined by a movement, change or transformation between a first position, pose, or expression and a second pose, position or expression. Common gestures used in everyday discourse include for instance, an "air quote" gesture, a bowing gesture, a curtsey, a cheek-kiss, a finger or hand motion, a genuflection, a head bobble or movement, a high-five, a nod, a sad face, a raised fist, a salute, a thumbs-up motion, a pinching gesture, a hand or body twisting gesture, or a finger pointing gesture. A gesture may be detected using a camera, such as by analyzing an image of a user, using a tilt sensor, such as by detecting an angle that a user is holding or tilting a device, sensing motion of a device, or by any other approach. Gestures may be formed by performing a series of motions in a particular pattern or fashion.

[0029] A user may make a gesture (or "gesticulate") by changing a position of a body part (i.e. a waving motion), or a user may gesticulate without changing a position of a body part (i.e. by making a clenched fist gesture, or by holding a body part immobile for a period of time). Although the enhanced approach uses, as examples, hand and arm gestures, other types of gestures may also be used.

[0030] FIG. **1** is a contextual diagram demonstrating invocation of device functionality in response to gesture recognition. A user **102** creates a Z-shaped gesture in the air with a device **104** (i.e., the user **102** moves the device **104** in a rightward (from the reader's perspective) direction, then in a downward-and-leftward direction, and then in a second rightward direction generally parallel to the first rightward direction). Music or other audio is playing on the device **104**. The device **104**, which may be a mobile phone, audio player, or other device, may sense the motion of the user **102** (e.g., using a sensor), recognize a gesture corresponding to the sensed motion, determine functionality corresponding to the recognized gesture, and invoke the determined functionality.

[0031] For example, the device **104** may represent the movements of the user **102** as an input gesture pattern **106** shown here as a series of dots. The input gesture pattern **106** may be compared to gesture definitions included in a vocabulary stored on the device **104**. For example, a table **108** illustrates a vocabulary that includes gesture definitions for gestures **110***a-d,* representing the characters "Z", "O", "P", and "2", respectively. Fewer or more gesture definitions may also be defined.

[0032] A vocabulary may include boundaries, such as boundaries **112***a-d,* which are included in or otherwise associated with gesture definitions. For example, the "Z" character gesture **110***a* may be associated with the boundary **112***a,* the "O" character gesture **110***b* may be associated with the boundary **112***b,* the "P" character gesture **110***c* may be associated with the boundary **112***c,* and the "2" character gesture **110***d* may be associated with the boundary **112***d.* Boundaries (or templates) may define a normalized or standardized version of gesture, such that motions performed by the user are compared against the boundaries to determine whether a particular gesture is performed.

[0033] Although the boundaries are illustrated as visual boundaries, each gesture may be represented as a set of acceptable vectors, motions, or accelerations that define the gesture. Moreover, the gesture definitions may require that certain motions occur in certain directions, or require that motions that make up a gesture occur in a particular sequence.

[0034] An inputted gesture pattern performed by the user may be compared to each of a vocabulary's gesture definitions, to determine if the inputted gesture pattern may be included within the boundary of one or more vocabulary gestures. For example, the input gesture pattern **106** (i.e., the "Z"-shaped pattern) may be compared to each of the boundaries **112***a-d.* The input gesture pattern **106** does not fit inside the "O" shape of the boundary **112***b* or inside the "P" shape of the boundary **112***c.* However, the input gesture pattern **106** may fit inside the "Z" shape of the boundary **112***a* and inside the "2" shape of the boundary **112***d.* The gestures **110***a* and **110***d,* therefore, are identified as candidate gestures.

[0035] Since a performed gesture may be expected to fall into more than one boundary or definition, certain gestures in the vocabulary may be disabled (or deactivated) by a user or an application, to reduce computational expense in resolving conflicts and to increase accuracy. Thus, a vocabulary gesture may be either active or inactive. For example the table **108** shows that the "Z" character gesture **110***a,* the "O" character gesture **110***b,* and the "P" character gesture **110***c* are active, while the "2" character gesture **110***d* is inactive.

[0036] Gestures may be activated or deactivated on a per-device or per-application basis, and may be activated and deactivated by an end user, by a manufacturer and/or by an application developer. For efficiency of gesture recognition, one gesture in a set of similar gestures may be active while the other gestures in the set are inactive. For example, the "2" and "Z" characters are similar in shape, so only one of the associated gestures are active. Since only one of the candidate gestures **110***a* and **110***d* is active in this example, the "Z" character gesture **110***a* is recognized in response to the movement of the user **102**.

[0037] Device functions may be mapped to gestures, such that if a gesture is recognized, mapped functionality is invoked in response to the performance of the gesture. For example, the table **108** indicates that a "volume up" function **11 4**a is mapped to the "Z" character gesture **110***a,* a "read