Since the user's precision has increased, the handheld device will be able to recognize when the user attempts to input these additional gestures. As indicated above, providing additional gestures for input by a user may also increase the number of functions that the user is able to command through gesture input, since each gesture may be mapped to command a different function.

[0159] Handheld devices in particular embodiments may also allow users to set and vary noise thresholds of the device. Noise thresholds are the magnitude of motion of the device that must be detected in order to be considered intended motion input (e.g., an intended gesture) of the user. For example, if noise thresholds are set low, then minimal motion of the device may be considered by the device as motion input. However, if noise thresholds are set high, then greater movement of the device would be required before the motion is considered intended input from the user. If, for example, a user is travelling in a car on a bumpy road, the user may desired to set the noise threshold higher so that when the device moves as a result of bumps in the road then such movement may not be considered by the device to be intended motion input.

[0160] In particular embodiments, noise thresholds may automatically change at the device based on a modeled environment. For example, if a device determines that the environment comprises traveling in a car, then the device may automatically increase the noise threshold so that minimal movements resulting from the car will not register as user-intended motion.

[0161] **FIG. 23** is a flowchart **370** illustrating a gesture recognition process utilizing a number of features described herein, in accordance with a particular embodiment. At step **372**, raw motion data of a particular gesture movement is received. The raw motion data is processed at step **374** where the actual motion of the device is determined. Such processing may include various filtering techniques and fusion of data from multiple detection or sensing components. At step **376**, the actual motion is mapped to a gesture. Mapping the actual motion to a gesture may include accessing a user settings database **378**, which may include user data **379** comprising, for example, user precision and noise characteristics or thresholds, user-created gestures and any other user-specific data or information including user identities **381**. User-specific information may be important, for example, because different users of the handheld device may have different settings and motion input characteristics. For example, an older user may have less precision than a younger user when inputting gestures such that the older person may have fewer gestures available. Moreover, a more experienced user may have more device functionality available through gesture input.

[0162] User settings database **378** may also include environmental model information **380** which may factor in determining the gesture applicable at the time. As discussed above, through environmental modeling, the device can internally represent its environment and the effect that environment is likely to have on gesture recognition. For example, if the user is on a train, then the device may automatically raise the noise threshold level. The device may also reduce the precision required, depending upon how crowded the gesture space is near the gesture under consideration. Mapping the actual motion to a gesture may also include accessing gesture database **382**.

[0163] At step **384**, the gesture is mapped to a function for the device. This step may include accessing a function mapping database **386** which may include correlation between gestures and functions. Different users may have different mappings of gestures to functions and different user-created functions. Thus, function mapping database **386** may also include user-specific mapping instructions or characteristics, user-created functions (e.g., macros and/or phone numbers) and any other function information which may be applicable to mapping a particular gesture to one or more functions. In some embodiments, gestures may be mapped to individual keystrokes. User identities **381** may also be accessed in this step. In addition, device context information **388** may also be accessed and utilized in mapping the gesture, which may include environmental model information **389**, application in focus information **390** and device state information **391**, such as time and date information, location information, battery condition and mode information (e.g., silent mode). At steps **392**, the device performs the appropriately-mapped one or more function(s), such as Function **1** at step **392***a*, Function **2** at step **392***b* or Function **3** at step **392***c*.

[0164] As discussed above, in particular embodiments handheld device **10** may comprise a cellular phone with many of the capabilities described herein. For example, cellular phones with motion input capabilities may use motion input to flatten menus as discussed above. The cellular phone may detect device states and environments, such as free fall or the cellular phone being face down or face up to map to behaviors such as mute, speaker phone and power-off. Other detection of device states may include detecting that the phone is being held to disengage mute or speakerphone states. The cellular phone may utilize gestures to control dialing (e.g., through gestural speed dial) or to lock/unlock a keypad of the device. For example, the device may be moved in a clockwise circle to dial home, a counterclockwise circle to dial work and in the shape of a heart to dial a significant other. Users may also be able to program the cellular phone to customized gestural mappings.

[0165] In particular embodiments handheld device **10** may comprise a digital camera utilizing motion input for at least some of the functions described herein. For example, digital cameras with motion input capabilities may use motion input to flatten menus as discussed above. Motion may also be used to allow a user to zoom in (and back out) on still photos or video to examine it more closely for smoother and more intuitive functionality. Motion may be used to zoom in and out of a number of thumbnails of photographs or video clips so that it is easy to select one or more to review. Virtual desktops may be used to review many thumbnails of many digital photos or video clips or to review many digital photos or video clips by translating the camera or using gestural input. Gestures and simple motions may be used alone or in combination with other interface mechanisms to modify various settings on digital still and video cameras, such as flash settings, type of focus and light sensing mode. Moreover, free fall may be detected to induce the camera to protect itself in some way from damage in an impending collision. Such protection may include dropping power from some or all parts of the camera, closing the lens cover and retracting the lens.