components of the device **100** may exchange signals (e.g., code instructions and data) with each other via a system bus **120** as shown in FIG. **1**A. In some embodiments, the device **100** may include a network interface **116**, configured to allow the device to exchange signals with other devices over a network. Furthermore, the hand-held device **100** may include one or more sensors **118**. Such sensors may include, e.g., an inertial sensor such as an accelerometer or tilt sensor, an optical sensor, an acoustic sensor such as a microphone or microphone array. The sensors may generate inputs to the program instructions **110** that reflect the environment in which the hand-held device operates.

[0035] In embodiments of the invention the tactile pixel driver instructions **114** may be configured to control whether a given tactile pixel is in the first position or the second position, e.g., whether pixel is up or down, based on state of the touch screen **102**. The state of the tactile pixels may thereby be made to respond to what is being represented by images displayed on the touch screen (e.g., game events, in the case of a hand-held game device). By way of example, an array of tactile pixels **104** that surrounds the touch screen **102** could produce the tactile equivalent of a digital chaser light display effect in response to game events, by selectively changing particular tactile pixels from the "up" to down in sequence.

[0036] In addition, according to certain embodiments of the invention, the tactile pixel driver instructions **114** may dynamically configure which functions will be performed when particular tactile pixels or groups of tactile pixels are pressed. By way of example, FIG. **2** illustrates a method **200** for operating a hand-held device of the types shown in FIG. **1**A through FIG. **1**D. As indicated at **202** user input may be tracked with the touch screen **102**. The touch screen may track entries made by a user's finger or a stylus in close proximity to or pressing against the touch screen. At **204** a state of the touch screen is determined. The state of the touch screen is generally a reflection of images that are displayed on the touch screen and inputs received with the touch screen. As an example, the device **100** may be configured as a video game device. In such a case, the state of the touch screen **102** may reflect a state of the game or events occurring within the context of a game. The state may be determined by comparing the image displayed on the touch screen and inputs received from the touch screen to a corresponding list of know images and inputs corresponding to known states.

[0037] In other embodiments the change of state may be triggered by a change of state of some other device that is in communication with the hand-held device. For example, if the device **100** is configured to operate as a mobile phone, e.g., a cell phone, the tactile pixels **104** may change state when a call to or from another remote device begins or ends.

[0038] By way of example, as indicated at **206**, the inputs may optionally be compared to known inputs made with the touch screen that correspond to predetermined gestures. For example, drawing an "X" with the finger on the touch screen may correspond to some particular command within the context of execution of the program instructions **110**. Gesture recognition may be implemented in any of a number of ways. Examples of gesture recognition are described, e.g., in commonly assigned U.S. Provisional Patent Application 61/020,669 to Thomas Miller IV, entitled GESTURE CATALOGING AND RECOGNITION, filed Jan. 11, 2008, which is incorporated herein by reference.

[0039] As indicated at **208** a state of one or more of the tactile pixels **104** may be changed in response to detection of a predetermined state of the display. By way of example, certain selected tactile pixels may be set in the "up" state and others may be set in the "down" state if a particular predetermined state is detected. In certain embodiments, selected tactile pixels may be activated to act as input buttons for execution of portions of the program instructions **110**.

[0040] By way of example, as depicted in FIG. **3**, when the state of the touch screen **102** is such that a command region **126** is displayed one or more particular tactile pixels **104** proximate the command region **126** may be activated. In the activated state, the particular tactile pixels **104** proximate the command region **126** may be in an "up" position, where they can easily felt by a user and where they can act as buttons. The particular tactile pixel may be mapped to an input for a particular command corresponding to the command displayed in the command region. When this state is detected, the state of the tactile pixels **104** may change by selectively actuating one or more particular tactile pixels **104** proximate the command region **126** shown on the touch screen such that the one or more particular tactile pixels **104** can be felt by a user and configuring the particular pixels to act as a button to execute the command with the hand-held device **100**. In some embodiments the tactile pixel driver instructions **114** may be configured to vibrate one or more particular tactile pixels to draw the user's attention to them. Vibration of the tactile pixels could be used guide the fingers toward command region **126**. The tactile pixels could be configured to vibrate in response to images displayed on or inputs received from the touch screen **102**. For example, certain tactile pixels may vibrate with greater amplitude when scrolling is close to an end point. Alternatively, the frequency of tactile pixel vibration may be tied to a state of a gesture made with the finger on the touch pad **102**.

[0041] For some touch screens it is sometimes hard to tell where the edge of screen is located. In certain embodiments of the invention, the tactile pixels **104** may be used as a guide to the location of the edge of the screen. For example, as shown in FIG. **4**, changing the state of the tactile pixels **104** may include selectively actuating one or more particular pixels **104** such that they can be felt by a user and configuring the particular pixels **104** to act as a scroll wheel for the hand-held device **100**. The predetermined state may be one in which a scroll bar **128** is displayed on the touch screen **102**. Selected tactile pixels **104** proximate the scroll bare **128** may be in a raised state for use as scroll wheel. The user may operate the selected tactile pixels **104**, e.g., by stroking them in sequence with the thumb or index finger. The tactile pixel driver **114** may be configured to associate pressing the selected tactile pixels **104** in a particular sequence as scrolling instruction. A particular image displayed with the touch screen may be scrolled as a result.

[0042] In yet another example, as shown in FIG. **5**, changing the state of the tactile pixels **104** may include using selected tactile pixels **104** to mark and endpoint for scrolling. Particular tactile pixels **104** at the corner of the touch screen **102** may be actuated to the "up" state when the endpoint of scrolling is reached. The raised tactile pixels **104** may provide a tactile cue to the user that the end of scrolling has been reached.

[0043] In some embodiments, the change of state of the tactile pixels **104** may be triggered by a change of state of one or more of the sensors **118**. By way of example, the configu-