where "Sound" can be a resulting sound value, "sound_base" can be a baseline sound value, "position[r]" can be a radial position of a capacitance sensor receiving an input event, and "K" can be a constant.

[0150] In this way, detected input events at a capacitance sensor array can be translated into sound values that can vary according to position, where such variation can be derived by a direct indexing like approach or by a calculation based on position.

[0151] While a system can detect input events according to one or more threshold values like the approach shown in FIG. **15**, in other embodiments input events can be detected based on rates of change in capacitance. When an object approaches or leaves a playing surface at a particular speed, a detected capacitance can change (e.g., suddenly drop or rise in capacitance). Such rate of change can be utilized to detect and/or categorize a given input event. One example of such an approach is shown in FIG. **23**.

[0152] FIG. **23** shows an approach in pseudocode that can detect input events based on change in capacitance. Capacitance sensors can be sampled for two time periods, t=0 and t=1 (section **2302**). A difference in capacitance for each capacitance sensor can be ascertained (section **2304**). Such a difference can represent a change in capacitance over the time period from time t=0 to time t=1. If a capacitance change in sampled time period is sufficiently large, the input event can be indicated as being a sound generating event (section **2306**).

[0153] In addition to determining whether an input event has been detected, rate of change values can also be used to determine qualities of an input. Thus, in the particular example of FIG. **23**, a value in array Ampl[i] corresponding to a detected input event Strike[i]=1, can determine the quality of the event. As but a few of the many possible examples, a capacitance rate of change value (e.g., Ampl[i]) can be used to control amplitude, duration, or decay profile of a corresponding sound output value, to name but a few examples.

[0154] For musical instruction applications, capacitance sensors can be used to provide feedback to an instrument player. That is, during instruction, an input event can detected and provided in a visual display, or the like. An example of such an arrangement is shown in FIG. **24**.

[0155] FIG. **24** shows a display system **2400** that includes a display **2402** and a display driver **2404**. A display driver **2404** can produce an image on display **2402** corresponding to an instrument according to any of the various embodiments. In the particular example shown, such an image is a representation of circular playing surface. A display driver **2404** can receive position information from a computation section (e.g., **1206**, **1306** or **1406**) and provide an indication when an input event is detected, and display the event on display **2402**.

[0156] Other embodiments directed to musical instruction or other applications can advantageously store input invents with the corresponding time at which such event occur. Such data can then be analyzed. As but two examples of the numerous possible analyses, input event and corresponding time data can be used to evaluate consistency between adjacent strikes (e.g., uniformity of beat) or rate of strikes (e.g., speed of drum roll). One very particular approach to acquiring such data is shown in FIG. **25**.

[0157] FIG. **25** is a pseudocode example showing the generation of an array "StrikeTimes" that includes a time for each successive strike in a recording period. In the very particular example shown, a recording period can start at t=0 and end at t=End. Within this recording period, a playing surface (or portion thereof) can be monitored for input events at sampling rate dictated by a sampling period "SamplePeriod". When an input event is detected, the number of the event and time at which it occurred is recorded in array StrikeTimes.

[0158] In this way, input events detected according to the various embodiments can be represented on a visual display, or recorded for analysis.

[0159] As noted above, while input events can indicate sound generating actions, such events can also indicate sound modification, or termination events. One particular example of such an arrangement will now be described with reference to FIGS. **2** and **26**.

[0160] FIG. **26** is a timing diagram showing a damping operation for percussion instrument **200** shown in FIG. **2**. FIG. **26** shows various waveforms: "Strike **204-0/1**", "Strike **204-2**", "AMPL", "DAMPi" and "SOUND".

[0161] "Strike **204-0/1**" can be a signal that is activated (goes high in this example) in response to an input event being detected on playing surfaces **204-0** or **204-1** of instrument **200**. "Strike **204-2**" can be a signal that is activated in response to an input event being detected on playing surface **204-2**. "AMPL" can be an amplitude value generated in response to an input event. As but two possible examples, a value AMPL can vary according to the rate of change in the capacitance, or can be based on the actual capacitance detected. "DAMPi" can be a signal that is activated when a damping event has been detected (described in more detail below). SOUND can be a sound value generated in response to an input event.

[0162] At time t**0**, a valid input event is detected in playing surface **204-0** and/or **204-1**, resulting in signal Strike **204-0/1** being activated. In addition, an amplitude value (in this case F**2**(hex)) can be generated corresponding to the event. In response to signal Strike **204-0/1** and value AMPL, value SOUND can be generated. As shown in the figure, SOUND has a predetermined decay profile, falling off in amplitude over time.

[0163] At time t**1**, another valid input event occurs, that results the same generated sound values. However, at time t**2**, input events are detected at playing surface **204-2** and **204-0** or **204-1**, at essentially the same time. Such an event can result in the activation of signal DAMPi. In response to signal DAMPi, a sound generated in response to a previous strike can be dampened. This is illustrated by the reduction in amplitude of value SOUND in response to the activation of signal DAMPi.

[0164] In this way, simultaneous inputs at different playing surfaces, or different sections of a same playing surface can be used to alter a sound value generated in response to a preceding input event.

[0165] Input events generated according to the various embodiments can be encoded into particular formats for use with digital music production and composition. One particular example of such an arrangement is shown in FIG. **27**.

[0166] FIG. **27** shows a digital music format encoding circuit **2700** according to one embodiment. An encoding circuit **2700** can include a transition detector **2702**, a timer input **2704**, one or more time latches **2706**, a note encoder section **2708**, and one or more note latches **2710**. A transition detector **2702** can receive sound activation values PAD1 to PADn. When a sound activation value transitions from one state to another, transition detector **2702** can change a corresponding digital on/off value (PAD1_ON/OFF to PADn_ON/OFF). In addition, a transition detector **2702** can activate a correspond-