within of the flexible display device. The flexible touch screen may be integrated with the flexible display device or it may be a separate component. The flexible touch screen may have the same substrate with the display or it may have its own. The flexible touch screen is configured to receive input from a user's touch and to send this information to the controller. In most cases, the flexible touch screen recognizes touches, the positions, and the magnitude of touches on its surface. The flexible touch screen reports the touches to the controller and then the controller interprets the touches in accordance with its programming.

[0025] In accordance with one embodiment, the flexible touch screen is capable of tracking multiple objects, which rest on, tap on, or move across the touch sensitive surface of the flexible touch screen at the same time. The multiple objects may for example correspond to fingers, palms, pen or any tool. Because the flexible touch screen is capable of tracking multiple objects, a user may perform several touch initiated tasks at the same time. For example, the user may select an item from a menu with one finger, while moving a cursor with another finger. In addition, a user may select an onscreen button with one finger while moving a scroll bar with another finger. Furthermore, the first object may be dragged with one finger while the second object may be dragged with another finger. Moreover, gesturing may be performed with more than one finger.

[0026] To elaborate, the flexible touch screen generally includes a sensing device configured to detect an object in close proximity thereto and/or the pressure exerted thereon. The sensor may be widely varied. In one particular embodiment, the sensor is divided into several independent and spatially distinct sensing points, nodes or regions that are positioned throughout the flexible touch screen. The sensors, which are typically hidden from view, are dispersed about the flexible touch screen with each sensor representing a different place within the flexible touch screen. The sensor may be placed in a grid or a pixel array where each pixilated sensor is capable of generating a signal at the same time. In the simplest case, a signal is produced each time when an object is positioned over a sensor. When an object is placed over multiple sensors or when the object is moved between or over multiple sensors, multiple signals are generated. For flexible property, the sensor may be make up of flexible materials.

[0027] The arrangement of the sensor may be widely varied. The quantity of sensor generally depends on the desired sensitivity, desired flexibility and the desired transparency of the touch screen. More sensors generally increase sensitivity, flexibility, but reduce transparency (vice versa) at the same time. With regards to arrangement, the sensors generally map the touch screen into a coordinate system such as a Cartesian coordinate system, a Polar coordinate system or some other coordinate systems. When a Cartesian coordinate system is used (as shown), the sensor typically correspond to x and y coordinates. When a Polar coordinate system is used, the sensing points typically correspond to radial (r) and angular coordinates ([theta]).

[0028] The flexible touch screen may include a sensing controller that acquires the data from the sensing device and that supplies the acquired data to the processor. Alternatively, the processor may include this functionality. In one embodiment, the sensing controller is configured to send raw signal data to the processor so that the processor processes the raw data. For example, the processor receives signal data from the sensing controller and then determines how those data to be used within the electronic device. The data may include the coordinates of each sensor and the pressure exerted on each sensor. In another embodiment, the sensor is configured to process the raw data itself. The sensing controller receive the pulses from the sensor and turns them into data understood by the processor. The sensing controller may perform filtering and/or conversion processes. Filtering processes are typically implemented to reduce congestion of data stream so that the processor will not overload with redundant or non-essential data. The conversion processes may be implemented to adjust the raw data before sending or reporting them to the processor **56**. The conversions may include determining the center point for each touch region (e.g., centroid).

[0029] The sensing controller may include a memory element for storing a touch screen program, which may control different aspects of the flexible touch screen. For example, the touch screen program may contain the type of value to output based on the sensor selected (e.g., coordinates). In fact, the sensing controller in connection with the touch screen program may use a predetermined communication protocol. As is generally, the communication protocols are a set of rules and procedures for exchanging data between two devices. Communication protocols typically transmit information in data blocks or packets that contain the data to be transmitted, the data required to direct the packet to its destination, and the data that corrects errors that occur along the way.

[0030] The sensing controller is generally composed by one or more microcontrollers, each of which monitors one or more sensors. The microcontrollers may, for example correspond to an integrated circuit (IC), which works with firmware to monitor the signals from the sensing device and to process the monitored signals and report to the processor.

[0031] In accordance with one embodiment, the sensing device is based on capacitance. As should be appreciated, whenever two electrically conductive members come close to each other without actually touching, their electric fields interact to form capacitance. In cases, the first electrically conductive member is a sensor and another electrically conductive member is an object such as a finger. As the object approaches the surface of the touch screen, a tiny capacitance forms between the object and the sensor in close proximity to the object. By detecting changes in capacitance at each of the sensor and noting the position of the sensor, the sensing controller can recognize multiple objects and determine the location, pressure, direction, speed and acceleration of the objects as they are moved across the touch screen. For example, the sensing controller can determine when and where each of the fingers and palm of one or more hands are touching as well as the pressure being exerted by the finger and palm of the hand(s) at the same time.

[0032] The simplicity of capacitance allows for a great deal of flexibility in design and construction of the sensing device. For example, the sensing device may be based on self capacitance or mutual capacitance. In self capacitance, each of the sensors is provided by an individual charged electrode. When an object approaches the surface of the touch screen, the object capacitively couples to those electrodes in close proximity to the object thereby attract charge away from the electrodes. The amount of charge in each of the electrodes is measured by the sensing controller to determine the positions of different touching objects. In mutual capacitance, the sensing device includes a two layer grid of spatially separated lines or wires. For the simplest case, the upper layer includes lines in rows while the lower layer includes lines in columns