

- [0058] 8. A detector, which comprise a plurality of sensor pads and at least two multiplexers arranged in series to lower capacitance loading of the sensor pads.
- [0059] 9. A detector, which comprises a plurality of sensor pads and a synchronous demodulator arranged to be connected as a tracking filter to track the frequency of a capacitance-measuring signal from one to another of the sensor pads, e.g. during a scan thereof.
- [0060] 10. A detector, which comprises means to improve the selectivity of capacitances taken into account to determine touch detection.
- [0061] 11. A detector, which comprises a multiplexer and a buffer and means adapted to connect part of the multiplexer other than its channels to an output of the buffer.
- [0062] 12. A detector, wherein said multiplexer part comprises power supply rails of the multiplexer.
- [0063] 13. A detector, wherein said multiplexer part comprises a control port of the multiplexer.
- [0064] 14. A detector, wherein said multiplexer part comprises a chip substrate of the multiplexer.
- [0065] 15. A detector, which comprises a sensor pad, a shield for the sensor pad and means to apply a frequency signal to the sensor pad for touch detection and apply to the shield a signal of substantially the same frequency, amplitude, phase and shape as the said frequency signal.
- [0066] 16. A detector, wherein the shield signal applying means are adapted not to control the d.c. level of the signal applied to the shield.
- [0067] 17. A detector, which comprises a sensor pad and means to charge the sensor pad and measure its charging rate.
- [0068] 18. A detector, wherein the charging and measuring means are adapted to charge the sensor pad with a constant current for a fixed time and measure the voltage achieved.
- [0069] 19. A detector, which comprises means to recognise a time profile of capacitance change indicative of a touch to be detected.
- [0070] 20. A detector, which comprises means to detect a snap effect in a time profile of capacitance change indicative of a touch to be detected.
- [0071] 21. A detector, which comprises means to enhance a time profile of capacitance change indicative of a touch to be detected.
- [0072] 22. A detector, wherein said enhancing means comprise means adapted to enhance a snap portion of said profile.
- [0073] 23. A detector, wherein said enhancing means comprise means adapted to correct a base line of said profile.
- [0074] 24. A detector, wherein said enhancing means comprise means adapted to correct the maximum amplitude of said profile.
- [0075] 25. A detector, which comprises means to provide an adaptive pattern match to a time profile of capacitance change indicative of a touch to be detected.
- [0076] 26. A detector, which comprises sensor pads and means which, upon the occurrence of signals indicative of touch detection from a plurality of the sensor pads, produce a signal indicative of a touch position among the sensor pads.
- [0077] 27. A detector, which comprises means for serially scanning said sensor pads to obtain said signals indicative of touch detection.
- [0078] 28. A detector, which comprises means for normalising said signals indicative of touch detection and adding the normalised signals to obtain said signal indicative of a touch position.
- [0079] 29. A detector, which comprises means for palm rejection.
- [0080] 30. A detector, which comprises means for interpolation from an array of activated sensor elements to determine a mean position of touch.
- [0081] 31. A detector, wherein the interpolation means are effectively self-calibrating.
- [0082] 32. A detector, wherein the interpolation means are adapted to effect interpolation by a geometrical method.
- [0083] The words “sensor” and “detector” are used interchangeably herein.
- [0084] According to an aspect of the invention a controller is connected to a number of pads or capacitive sensing zones by way of buffered multiplexer chips and, shielded connectors and cables. The buffered multiplexer chips can be cascaded in series or wired in parallel and are driven from a level translator which can in its simplest form comprise a resistor and capacitor network but should preferably comprise active elements. This ensures that the base voltage on (the voltage first applied in a halfwave to) a sensor pad is also applied to its shield and various parts (e.g. power supply rails, control port, chip substrate) of its associated multiplexer/s. The signals derived from this electronic scanning array are then further processed by a signal processor incorporating a microprocessor. The improvements made which constitute this invention relate to obtaining and processing the signal both in the analogue and digital domains which allow more reliable touch detection.
- [0085] With prior keypads, each comprising an array of sensor pads, each sensor pad is capable of detecting the proximity of a finger in a continuously increasing manner, starting from say one inch (2 cm) away all the way up to contact. For use as a keypad we currently set a simple “threshold level” so that when the finger is closer than a certain point a key-press is indicated. However, we also can use the detailed information from several sensor areas simultaneously to “interpolate” the position of a finger in two or three dimensions to a much finer resolution than, say, a 4x4 sensor pad matrix in a keypad. This is done in a digital manner but could be done in an analogue manner.
- [0086] There are a number of sensor array patterns which lend themselves to providing the opportunity to interpolate additional resolution between sensor pads. These fall into three main categories.