

second of the desired typematic finger's touchdown, and typematic will also not start until the typematic finger has a continued to touch the surface for at least half a second after the others lifted off the surface. If these stringent conditions are not met, the keypress element will not start typematic and will eventually be deleted through either tap timeout **782** when the finger lifts off or through tap timeout **796**) if another touches down after it.

[**0292**] Step **804** simply sets a flag which will indicate to decision diamond **798** during future scan cycles that typematic has already started for the element. Upon typematic initialization, step **810** sends out the key symbol for the first time to the host interface communication queue, along with any modifier symbols being held down by the opposite hand. Step **812** records the time the key symbol is sent for future reference by decision diamond **808**. Processing then returns to step **770** to await the next proximity image scan.

[**0293**] Until the finger lifts off or another taps asynchronously, processing will pass through decision diamond **798** to check whether the key symbol should be sent again. Step **806** computes the symbol repeat interval dynamically to be inversely proportional to finger proximity. Thus the key will repeat faster as the finger is pressed on the surface harder or a larger part of the fingertip touches the surface. This also reduces the chance that the user will cause more repeats than intended since as finger proximity begins to drop during liftoff the repeat interval becomes much longer. Decision diamond **808** checks whether the dynamic repeat interval since the last typematic symbol send has elapsed, and if necessary sends the symbol again in **810** and updates the typematic send time stamp **812**.

[**0294**] It is desirable to let the users rest the other fingers back onto the surface after typematic has initiated **804** and while typematic continues, but the user must do so without tapping. Decision diamond **805** causes typematic to be canceled and the typematic element deleted **778** if the user asynchronously taps another finger on the surface as if trying to hit another key. If this does not occur, decision diamond **182** will eventually cause deletion of the typematic element when its finger lifts off.

[**0295**] The typing recognition process described above thus allows the multi-touch surface to ergonomically emulate both the typing and hand resting capabilities of a standard mechanical keyboard. Crisp taps or impulsive presses on the surface generate key symbols as soon as the finger is released or decision diamond **792** verifies the impulse has peaked, ensuring prompt feedback to the user. Fingers intended to rest on the surface generate no keys as long as they are members of a synchronized finger press or release subset or are placed on the surface gently and remain there along with other fingers for a second or two. Once resting, fingers can be lifted and tapped or impulsively pressed on the surface to generate key symbols without having to lift other resting fingers. Typematic is initiated either by impulsively pressing and maintaining distinguishable force on a key, or by holding a finger on a key while other fingers on the hand are lifted. Glancing motions of single fingers as they tap key regions are easily tolerated since most cursor manipulation must be initiated by synchronized slides of two or more fingers.

[**0296**] Other embodiments of the invention will be apparent to those skilled in the art from consideration of the

specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

What is claimed is:

1. A method for associating into paths one or more surface contacts from successive proximity images, the successive proximity images including a current proximity image and one or more prior proximity images, the method comprising:

generating one or more predicted paths by predicting from the one or more prior proximity images current positions of the one or more surface contacts;

finding for each surface contact in the current proximity image a closest predicted path;

finding for each predicted path a closest surface contact, the closest surface contact having a centroid closest to the predicted path; and

pairing each surface contact with its closest predicted path if the surface contact is also the closest surface contact to the predicted path.

2. A method for associating into paths one or more surface contacts from successive proximity images, the successive proximity images including a current proximity image and one or more prior proximity images, the method comprising:

generating one or more predicted paths by predicting from the one or more prior proximity images current positions of the one or more surface contacts;

finding for each surface contact in the current proximity image a closest predicted path;

finding for each predicted path a closest surface contact, the closest surface contact having a centroid closest to the predicted path and within a path-dependent tracking radius of the predicted path; and

pairing each surface contact with its closest predicted path if the surface contact is also the closest surface contact to the predicted path and if the centroid of the closest surface contact is within the path-dependent tracking radius of the predicted path.

3. The method of claim 1 or 2 further comprising:

starting new paths for unpaired surface contacts.

4. The method of claim 3 further comprising:

deactivating unpaired predicted paths.

5. The method of claim 1 or 2 further comprising:

deactivating unpaired predicted paths.

6. The method of claim 1 or 2 further comprising:

updating path parameters for each of the one or more predicted paths from one or more measured parameters of the surface contact paired with each predicted path.

7. The method of claim 6 further comprising:

starting new paths for unpaired surface contacts.

8. The method of claim 7 further comprising:

deactivating unpaired predicted paths.

9. The method of claim 6 further comprising:

deactivating unpaired predicted paths.

10. The method of claim 1 or 2 wherein generating one or more predicted paths by predicting from the one or more