trolling the position of window **12** by moving a single contact point (e.g., using a single finger f**1**). In particular, sliding one contact point from position A**1** to a different position A**2**, as schematically shown in FIG. **1**A, moves window **12** from the position shown in FIG. **1**A to the position shown in FIG. **1**B. However, as shown, the position of picture **14** remains stationary relative to the display device **10** and thus the actual image displayed when the window is at one position differs from the image displayed when the window is at a different position.

[0081] Stated differently, a first portion of an image is displayed within the window when the window is located at one position (e.g., see FIG. **1**A), and a second portion of that same image is displayed within the window when the window is at a different position (e.g., see FIG. **1**B). But the entire image (which usually is not displayed in its entirety) remains stationary relative to the display device and, thus, positions on the display device of the common portions of the above-mentioned first and second portions are the same.

[0082] The picture **14** shown in the exemplary figures is a well-recognized image of the Earth and is shown in the figures to facilitate an understanding of the various embodiments and features of the present invention. However, any picture or image, including text, may be displayed within the window.

[0083] As mentioned above, and with reference again to FIGS. **1**A and **1**B, it is seen that moving window **12** does not move the displayed image **14** relative to the display device **10**. Accordingly, the present invention is well-suited for mapping, editing and other useful graphical functions.

[0084] Window frame style **1** further includes controlling window **12** by using two points of contact (e.g., first and second fingers f**1** and f**2**), as illustrated in FIGS. **2**A and **2**B. In particular, employing two points of contact moves and uniformly scales window **12**. But, as with one finger control, picture **14** remains stationary relative to display device **10** during two-finger control. As shown in FIG. **2**A, finger f**1** slides from contact point B**1** to contact point B**2** while finger f**2** slides from contact point C**1** to contact point C**2**. Fingers f**1** and f**2** may move simultaneously with one another or in succession. As window **12** increases in size, the amount of image **14** that is displayed also increases, as shown in FIG. **2**B. Window rotation may also, optionally, be simultaneously controlled using fingers f**1** and f**2** (e.g., see FIGS. **3**D and **3**E discussed below). It is appreciated that while FIGS. **3**D and **3**E show two fingers disclosed on a single edge controlling window rotation, rotation may be implemented via multiple fingers disposed at different positions, such as on adjacent edges. Hence, two input points (e.g., two fingers) may be utilized to effect the position, scaling and rotation, that is, pan-zoom-rotate (or "PZR") of a window or, in other words, implement rotation, scale and translation ("RST") control of window **12** using two points of contact. In certain applications, it may be desirable to disable rotation so that the window edges are always axis-aligned, which may be the case for any of the embodiments and variations thereof described herein.

[0085] Three points of contact may control a window, in accordance with the present invention, by applying a "best effort" or "best fit" methodology to the manipulation of the window frame. In particular, the coordinates of a rectangular window frame are computed to best fit the dynamic positions of three (or more) fingers. As shown in the examples discussed below, three input points (e.g., three fingers) may be utilized to effect the position, non-uniform (i.e. anisotropic, axis-independent) scaling and rotation (i.e., a 5 degree of freedom (5 DOF) operation) of a window on a display based on a change from the initial positions of the points or based incrementally on changes in the positions of the points. In a particular implementation, two fingers disposed on one edge of the window, for example, the left edge, locks that edge to the positions of those two fingers, with a third finger disposed on an opposite edge to control that edge. Subsequently moving one or more fingers in turn enables the window to move, scale or rotate accordingly.

[0086] FIGS. **3**A-**3**C illustrate how the respective positions/lengths of window **12**'s edges may be controlled or, in other words, how the width and/or the height of window **12**, along with the window's position, may be controlled utilizing first, second and third fingers f**1**, f**2** and f**3**. Finger f**1** is disposed on a first window edge and fingers f**2** and f**3** are disposed on an opposite window edge to trigger 3-point of contact window control. The width of window **12** increases (or decreases) (or, stated differently, the position of the window's right edge moves) as finger f**1** moves horizontally. In FIG. **3**A, finger f**1** moves from contact point D**1** to contact point D**2**, thereby causing the right edge of window **12** to extend to contact point D**2**, as shown in FIG. **3**B. Moving horizontally fingers f**2** and f**3**, contacting the same window edge, similarly controls the horizontal position of that edge. In a variation, placement of two fingers on the same edge locks that edge in position, so that only the opposite edge moves horizontally when the finger contacting that edge (e.g., finger f**1**) moves horizontally. In another variation, the edge on which a single finger is contacting is locked in position, with the horizontal position of the opposite edge being controlled by the other two fingers.

[0087] Height control of the window and/or the vertical position of the window (i.e., the respective positions of the upper and lower edges) similarly is achieved, along with the variations mentioned above, by employing three contact points on the upper and lower edges of the window.

[0088] In a further variation, fingers f**2** and f**3**, contacting the same window edge as shown in FIG. **3**A, control the window's height (i.e., controls the distance between the edges not being contacted) as a function of the relative change in distance between those fingers. For example, sliding fingers f**2** and f**3** from their initial respective contact points E**1** and F**1** to respective contact points E**2** and F**2**, as shown in FIG. **3**A, causes the height of window frame **12** to increase in proportion to the proportional increase in the distance between the fingers f**2** and f**3**, such as shown in FIG. **3**C.

[0089] In a variation, the horizontal position of the window's left edge shown in the figures (i.e., the edge with two points of contact) is locked so that only window height is controlled by moving fingers f**2** and f**3**. In another variation, the second and third fingers control both the horizontal position of the edge being contacted and the relative distance between the adjacent edges (i.e., the upper and lower edges). Two points of contact on either the upper or lower window edges similarly controls the vertical position of that edge and/or the relative distance between the window's two side edges.

[0090] In accordance with the present invention, the window may be rotated as schematically illustrated in FIGS. **3**D and **3**E. As shown in FIG. **3**D, fingers f**2** and f**3** initially contact the same window edge thereby locking that edge of the window to the axis that extends through the contact posi-