

# The truth about relative vs. absolute motion control systems

Chad Lucien, Hillcrest Labs, [www.hillcrestlabs.com](http://www.hillcrestlabs.com)

*A debate is brewing between the implementation of 'Relative' and 'Absolute' motion control for next generation Smart TV user interfaces—and there are three key reasons why Relative has the upper hand*



Smart TV features are beginning to transform the TV into an entertainment hub. Whether functionality is native to the TV or via a connected set-top box, many Smart TV systems utilize motion and pointing to control myriad features and functions. Motion control provides cursor, point-and-click, and tilt-based controls, mimicking the control system of a computer mouse or smartphone touchscreen. It therefore allows for instant familiarity for the user, despite broad and novel TV functionality beyond the capabilities of traditional multi-button remote controls. However, as with any emerging technology, there is debate between alternate systems for implementation of motion. For example, in 3D TV, there are active vs. passive systems. Similarly, in motion control systems, there are relative vs. absolute systems.

A relative system is similar to a computer mouse or track-pad. Motion is mapped and translated into cursor movement on the screen, but the precise motion of the mouse does not correspond exactly to movement on the screen, as scale and speed of movement can be adjusted. In addition, in a relative system the cursor can be 'bounded' by the screen edges which do not allow the cursor to go across them. This is in contrast to an absolute pointing system (i.e. camera-based motion systems), where the angle and position of the motion remote directly translates to on screen cursor position, and when the device is pointing off-screen, it is not visible.

Multiple studies have contributed to the debate with similar conclusions. An authoritative study from the University of Maryland, entitled "Comparison of Relative Versus Absolute Pointing Devices" (K Norman, University of Maryland, 2010), sums up the conclusion well: "although absolute pointing would seem to

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Published on Electronic Component News (<http://www.ecnmag.com>)

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have intuitive advantages over relative pointing, both performance data and user preferences favor relative pointing.”

Here are three key reasons why this and other studies have found relative pointing to be the ideal option for Smart TV control:

## **1. More relaxing user experiences**

A relative control system does not require users to point directly at the screen. A dynamic virtual screen is created by the remote control. This virtual screen is not visible and is constantly adjusting to the user based on gain settings, impacts of a bounded cursor meeting the edge of the screen, the user’s response to any system latency, and more. Relative pointing is almost always combined with an RF system which has no line of sight requirement (such as Bluetooth, RF4CE, or WiFi direct). The combination of relative pointing’s dynamic virtual screen and RF system allows for a more relaxed, lean-back user experience when using a remote to control a TV as the user can control the TV whether lying down, sitting, standing, or reclining.



## **2. Greater comfort and flexibility**

Relative systems can be scaled to move the cursor at different rates, customized by the user. Therefore, small motions can provide precise control across the entire screen, regardless of screen size. This results in less fatigue and is more comfortable than larger movements necessitated by an absolute system where the control will have to be moved the entire length and width of the screen. As relative pointing systems have matured a number of other features have been developed that further decrease the strain and fatigue associated which is often reported by users of absolute pointing systems. These features include intelligent motion stabilization which has the dual impact of identifying and eliminating natural hand tremors from the cursor and ignoring inadvertent motion caused by button clicks when a remote is held in the air, with no surface to press against. These are not possible on true absolute systems, and reduce the amount of work and strain that a

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user feels.

### **3. Increased accuracy**

The University of Maryland user study mentioned earlier found that relative pointing systems increased user's accuracy when making point and click selections. Depending on the specific test the relative pointing system had between 50% and 75% fewer user errors than a camera based absolute pointing system. This was especially pronounced when large distances were travelled between targets, important to consider when the average screen size of Smart TVs is increasing.

In conclusion, while absolute pointing is not without value—particularly in the context of playing certain categories of video games on the TV—the advantages of relative motion control outweigh those of absolute. As more TV companies and set-top box manufacturers integrate motion, relative pointing, like that used by LG Electronics and TCL, is likely to be more broadly adopted, thus winning the Smart TV format war.

### **About the author**

Chad Lucien is responsible for Hillcrest Labs' worldwide sales, marketing and business development activities. Since joining Hillcrest in 2004, Chad has held a variety of executive level positions encompassing corporate strategy, business development, and general management of the Freespace motion product line. During his tenure, he has licensed Freespace solutions to global consumer electronics companies, developed a wide variety of strategic partnerships, and led numerous product launches in the Freespace product line. Chad has over 15 years of experience in corporate strategy, business development, venture consulting, and investment banking. Prior to Hillcrest, Chad held leadership positions at an interactive TV startup, a venture consulting company, and an investment bank. Chad earned a bachelor of science in commerce with distinction from the University of Virginia, with concentrations in finance and marketing.

### **Source URL (retrieved on 01/28/2015 - 11:36am):**

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