

Myths of multitouch

Why two hands are not always better than one

BACKGROUND



1985

Adoption of the mouse began to take off in the mid 1980's. With the launch of Windows 1.0 and the Macintosh Plus the graphical user interface made its first appearance in mainstream computing.

1992

With the release of Windows 3.1 the GUI metaphor was now familiar to a large percentage of computer users. Mobile computing was becoming more affordable as smaller and lighter machines hit the market.

PDA's like the Apple Newton explored the possibility of pen input. It would be another few years before it became popular however.



1998

Virtually every computer on the market used a windowing metaphor including Windows 98 and Mac OS. Mobile computers continue to shrink in size while gaining in power.

The launch of 3COM's Palm Pilot introduced the hand held computer to the masses. Later devices would merge the PDA with the phone as the market for all-in-one devices developed.

2006

The Nintendo Wii is launched. Using motion based controls rather than the traditional gamepad it will introduce a new style of input to the living room.

The release of Garmin's nuvi line of GPS units brings touch to the car. Inexpensive and portable it becomes one of the most familiar sights in a car windshield. Using a basic touch interface it shows how inexpensive hardware has become.



2010

Portable computer devices are nearly ubiquitous as over 150,000,000 smartphone devices are sold on an annual basis including iPads and Android based systems. All support rich multitouch vocabularies such as swiping, pinching, and flicking.

Inexpensive alternative forms of input are also available. For under \$150 the Xbox Kinect requires no external input devices. The hardware can be connected via a USB port to any computer.



FACTS AND FICTION

× FICTION

Two hands can work twice as fast as one

Many people have a dominant and non-dominant hand. Fine grained movement is much easier with the dominant hand; achieving the same level of granularity with the off hand requires more concentration and skill.

Depending on the nature of the task a keyboard and mouse may be easier to use. The cost of switching context on a touch screen (to and from a keyboard for example) can hinder a user compared to two separate devices.

? IT DEPENDS

Parallel tasks are easier with two hands

The benefits of multitouch depend greatly on the nature of the task. Linear or highly serial tasks will see little benefit compared to those which can be broken down into more atomic steps. As the complexity increases so does the benefit of multiple sources of input. A balance needs to be struck as at some point the cognitive load may become overwhelming.

One distraction from the use of multiple fingers or hands is tracking the location of multiple contact points. If the workspace is too small the hands will block large sections of the display. If the workspace is too large then it becomes disorienting as the eyes no longer can follow the movement of both hands.

✓ FACT

Direct manipulation is faster than a keyboard and mouse

Studies suggest that the act of directly manipulating items with touch is faster than using a keyboard and mouse. Even when only one point of contact is made the ability to direct select and move items around the screen can improve the time to complete a task.

× FICTION

If the interface is "intuitive" and "easy to use" then people will figure it naturally

Good interfaces should be self revealing. Because there are fewer affordances it can be much more challenging for users to figure out what is and is not allowed. Eventually as they build a working mental model they might adjust but may not see features until they are shown them.

DESIGN SUGGESTIONS

Reuse existing conventions

Today's user base may be more familiar with multitouch gesturing just as computer users in the mid 1990s could be assumed to have some proficiency with the mouse. Understand the type of user who will be using your product. Using the latest and greatest technology might not be what you need if a more traditional approach will work instead. Rather than inventing a new vocabulary for an Android application look into using common gestures that are part of the operating system.

Size matters

If you are working on a four inch mobile device be aware that the amount of usable space is greatly limited. A finger occludes much more of the screen than a mouse pointer. On the other hand if you are working with a large table top or wall display factor in fatigue. Large movements can be very tiring as can holding the arms up for long periods of time.

Break down the nature of the tasks

Break down the tasks that the user will be completing to see how much benefit will be gained from trying to invent a new "better" type of experience. If the tasks themselves are simple or cannot be decomposed into smaller atomic tasks chances are that there will not be much benefit from trying to invent a rich gesturing vocabulary.

For example if the task requires lots of typing trying to replicate the experience of a keyboard and mouse makes sense. If the task is to organize pictures, categorize files, or manipulate digital representations then two hands may be more practical.

Provide good affordances

Develop the interface so that people have some expectation of what they can do just by appearance. Visual clues and metaphors can help someone familiarize themselves with the environment. Once they've adjusted they are less likely to need such assistance so consider controls that adjust to the level of the user.

Likewise good designs should be as hand neutral as possible. Whether person is left or right handed the application should be able to adapt. Design gestures that work well with one or two hands.

FURTHER READING

Want to learn more about the history of multitouch research? Here are a few resources from the past twenty-five years to get you started. All papers can be found within the ACM Digital Library at <http://portal.acm.org>.

Buxton, B. and Myers, B. (1986) A study in two-handed input. *Proceedings of the SIGCHI Conference on Human factors in computers*

Hinckley, K., Pausch R., et al (1998). Two handed virtual manipulation. *ACM Transactions on Computer Human Interaction*, 5(3), 260-302

Robert, J. Sibert L., et al (1994). Integrality and separability of input devices. *ACM Transactions on Computer Human Interaction*, 1(1), 3-26