

Surface Computing

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Abstract

This research looks at the work of surface computing. Surface computing is the term for the use of a specialized computer GUI in which traditional GUI elements are replaced by intuitive, real world objects. Instead of a keyboard and mouse, the user interacts directly with a touch-sensitive screen. Surface computer is able to recognize physical objects. This research includes the basic features, history, applications, advantages, disadvantages, working and structure of surface computing. Various papers based on this have been studied and an overview has been presented here.

I. Introduction

A surface computer is a computer that interacts with the user through the surface of an ordinary object, rather than through a monitor and keyboard. Surface computing is the term for the use of a specialized computer GUI in which traditional GUI elements are replaced by intuitive, everyday objects. Instead of a keyboard and mouse, the user interacts directly with a touch-sensitive screen. It has been said that this more closely replicates the familiar hands-on experience of everyday object manipulation. With Surface, Microsoft has established a new branch of computer technology known as surface computing. The goal of surface computing is to recognize touch and objects on the screen's surface and to interact with those objects seamlessly. If you're using a surface computer, you shouldn't need a mouse, keyboard or even a USB port connected to the device.



II. History

2001: Microsoft researchers Steve Bathiche and Andy Wilson developed idea of interactive table that could understand the manipulation of physical Objects.

Oct 2001: DJ kurlander, Michal Kim, Joel Dehiin, Bathiche and Wilson formed a virtual team to bring idea to the next stage of development.

2003: jSL prototype model named Ti which is based on IKEA table.

2005: Tub-prototype was designed.

Surface computer was announced on May 29, 2007 at D5 conference. Preliminary launch was on April 17, 2008. The latest version is Microsoft Surface 2.0

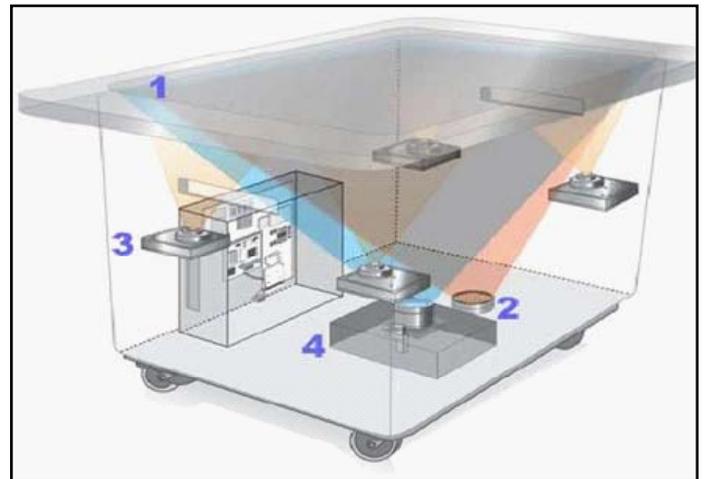
III. Attributes

There are 4 attributes.

1. Direct interaction: means that, we can interact with the Surface by using our fingers. No other input device is needed to give input which provides a natural interface effect.
2. Multi-touch: Surface computing recognizes many points of contact simultaneously; surface has been optimized to respond 52 touches at a time.
3. Multi-user: The horizontal form factor makes it easy for several people together around surface computers together, providing a collaborative, face to face computing experience.
4. Object recognition: Users can place physical objects on the surface to trigger different types of digital responses, including the transfer of digital content. Object recognition is done in the surface by using special bar codes called Domino tags.

IV. Structure

It consists of 4 parts-



1. Screen: A diffuser turns the Surface's acrylic table top into a large horizontal multitouch screen, capable of processing multiple inputs from multiple users. The Surface can also recognize objects by their shapes or by reading coded tags.
2. Infrared: Surface's 'machine vision' operates in the near-infrared spectrum, using an 850-nanometer-wavelength LED light source aimed at the screen. When objects touch the table top, the light reflects back and is picked up by infrared cameras.
3. CPU: Surface uses many of the same components found in everyday desktop computers. Wireless communication with devices on the surface is handled using Wi-Fi and Bluetooth antennas.
4. Projector: Microsoft's Surface uses the DLP (Digital Light Processing) light engine found in many rear projection DTV's.

The cameras can read nearly infinite number of simultaneous touches and are limited only by processing power.

V. Surface Hardware

- 40-inch (1-meter) LCD screen
 - 4-inch (10.2-centimeter) unit depth/thickness for easier horizontal mounting
 - 2.9 GHz 64-bit AMD Athlon X2 dual core processor
 - 1 GB AMD Radeon HD graphics processor
 - 4 GB DDR3 RAM
 - 320 GB hard drive
 - Wired (1 GB Ethernet) and wireless (802.11 and Bluetooth) network hardware
 - Physical connectors include HDMI, stereo RCA, USB and SD card
 - Embedded 64-bit Windows 7 Professional operating system
 - Corning Gorilla Glass to protect the surface
 - Recognition for more than 50 simultaneous touch points
- We've just looked at the Surface hardware.

VI. Surface software

First, all the Surface software runs in what's called the Surface Shell. In operating systems, a shell is a process used to run and manage a group of related sub processes. Likewise, the Surface Shell is the main process that can make use of the Surface hardware functions. The initial interaction most users have with the Microsoft Surface is with the Surface Shell running some application that entices you to touch the screen. The default application for this is a virtual pond of water that ripples when you touch it. When you touch the Surface Shell, access points appear in each corner of the screen. You can touch any access point closest to you to open the launcher. Since the Surface software works in a 360-degree rotation, use the access point closest to your right hand to orient the launcher so it's facing you. The launcher presents all the Surface software installed on that unit. Since it's common for a business to develop its own Surface applications, software developers must package and install those applications to the Surface Shell before they will appear in the launcher. The launcher is a carousel of Surface applications that rotates similar to the Cover Flow viewing option in the Mac OS X Finder or in iTunes. You can spin the carousel by swiping your hand back and forth across the screen. When the application you want to use is centred on the carousel, you merely touch that app image to launch it. If you want to exit the launcher and return to the previous screen, you can touch one of the access points still waiting for you in the corners of the screen.

VII. Working

Surface computing implements a Natural User Interface (NUI), which lets you interact in ways that what comes naturally to you. A NUI is driven by the direct touch of the user or object it's interacting with rather than separate input devices connected to the computer. The Surface has implemented its NUI with a combination of hardware and software all packed inside a single device. The Surface 1.0 hardware features a series of cameras that sense a user's touch or other objects placed on the table top. The Surface software processes the data from those cameras and then responds as appropriate for the application you're currently using. Surface shows the resulting interaction on its display, which is actually a projection of the screen from underneath the table top.

VIII. Surface Hand Motions

- Touching -- To select an object, just touch it on the screen.
- Dragging -- Most applications allow you to drag an object across the screen by touching it and dragging your hand along the surface. You can also scroll through menus with a dragging action.
- Scaling -- Some objects can be scaled by touching them at two points and dragging those two points closer or farther away. You could make a photo large, for example, by touching diagonal corners with opposite hands, then moving your hands away from each other.
- Turning -- If an application allows you to turn an object, you'll do this by touching it at two or more points and dragging it in a circular motion along the surface.
- Flicking -- When you want to set something aside, you can quickly swipe across the surface of the object as if pushing a piece of paper. Surface will detect the momentum you put behind the swipe and move the object to the side of the screen where it's still accessible, yet out of your way.

IX. Architecture

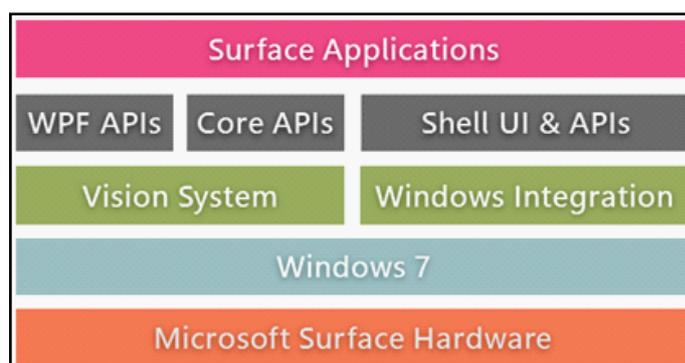
Microsoft Surface is a hardware and software platform for developing multi-input, touch-enabled applications. Designers and developers can use this platform to create rich and visually appealing applications that offer a new user experience in which users use only their hands and various objects to manipulate and interact with the applications. A Surface application should be natural and intuitive and should show little or no resemblance to a traditional Microsoft Windows or Web application. In fact, a user should not know that there is a computer in a device made for Surface. The Surface development platform integrates several features and complex hardware and software technologies. To create effective Surface applications, you should understand the architecture of the development platform.

A. Windows 7

Surface runs on the Windows 7 operating system. Windows 7 provides all the administrative, security, directory, and other Windows functionality (Bluetooth, Wi-Fi, and so on) of the device made for Surface. Developers and administrators who are working on a device made for Surface have full access to Windows functionality (in Windows mode). However, when users interact with Surface applications on a device made for Surface, the Windows user interface is completely suppressed (in Surface mode).

B. Hardware

The hardware of a device made for Surface includes a high definition, touch-sensitive display surface, and a computer that



is running Windows 7. The hardware can capture physical points of touch, on or close to the screen, at 60 frames per second.

C. Vision System

The vision system software processes the video data that the hardware captures, and converts the raw video into data that you can access through Surface SDK APIs. On devices made for Surface, a combination of a dedicated processor and touch-sensing technology sends data to your application through the Presentation layer and Core layer APIs.

D. Presentation and Core Layers

The Surface Software Development Kit (SDK) informs applications when touch points appear on the interactive surface device over the application window. As users touch the interactive surface and move around, the Surface SDK notifies applications so that applications can update their user interfaces. For each touch point, applications can determine the position, orientation, bounding box, and central ellipse. For touch points that are made with tagged objects (which have tags printed on the bottom of the objects), applications can also determine the tag value. The Surface SDK exposes two sets of APIs: the Presentation layer and the Core layer. You can use only one layer when you are developing a Surface application:

The Presentation layer integrates with Windows Presentation Foundation (WPF) and includes a suite of Surface-enabled controls. You can use the Core layer with almost any user interface framework, including XNA 4.0.

E. Surface Shell

Surface Shell is the component that manages applications, windows, orientation, and user sessions; it also provides other functionality. Every Surface application must integrate with Surface Shell.

F. Surface and Windows Integration

The integration between Surface and the Windows operating system provides system-wide functionality on top of the Windows operating system. You must use this functionality to support unique aspects of the Surface experience, such as managing user sessions, switching between the Windows user interface (Windows mode) and the user experience (Surface mode), monitoring critical Surface processes, and handling critical failures.

X. Advantages:

- Can handle multiple users at the same time.
- No wires or USB ports is required.
- Instant download/upload of photos.
- Users have more control of technology i.e. ordering food or manipulating photos fast.
- Time saving by eliminating more processes.

XI. Disadvantages:

- Not portable and very expensive (\$ 12,000-\$15,000).
- Need for dim lighting to avoid washing out the screen.
- Poor Accuracy- Fat fingers are not as accurate as a mouse or stylus.
- Objects needs to be tagged.

XII. Applications:

Digital photo handling with finger tips, Instantly compares while shopping, Interaction with digital content by share, drag and drop, digital images, Surface Restaurant, Quickly browse through play list entries dragging favourite song to the current track, Easy to take complex shopping decisions.

XIII. Future Scope

Computer scientists hope to incorporate this kind of technology in peoples' daily lives. Future goals are to surround people with intelligent surfaces-look up recipes on kitchen counter or table, control TV with coffee table, etc. As form factors continue to evolve, surface computing will be in any number of environments schools, businesses, homes and in any number of form factors.

XIV. Conclusion

Microsoft Surface is the future of computers. Microsoft Surface breaks down the traditional barriers between people and technology. Surface takes existing technology to and presents it in a new way. It is not simply a touch screen, but more of a touch-grab-move-slide-resize-and-place-objects-on-top-of-screen, and this open up new possibilities that weren't before.

Earlier it was- 'A COMPUTER ON EVERY DESKTOP'

Now we say

'EVERY DESKTOP WILL BE A COMPUTER.'

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