

SURFACE COMPUTING – AN INTEGRATED APPROACH

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Abstract— Surface computing is the term used for a specialized Computer GUI in which traditional GUI elements are replaced by intuitive, everyday usable objects. Instead of interacting through a keyboard and mouse, the user interacts directly with a touch-sensitive screen. Microsoft Surface is a Multi-touch product from Microsoft used in the field of Information Technology. The Surface Computer is developed as a software and hardware combination technology. It allows a user, or multiple users, to manipulate digital content by the use of natural motions, hand gestures, or physical objects touch. It can be illustrated that the Surface computer more closely replicates the familiar hands-on experience of everyday object manipulation. Multiple users, at once can interact with the machine by touching or dragging their fingertips and objects such as paintbrushes across the screen, or by placing and moving tagged objects on the Surface.

Keywords- Bluetooth antennas, DLP, diffuser, 2D tags, GUI.

I. INTRODUCTION

In our day to day activities we come across many situations where we use a product with multi touch to perform various tasks. Microsoft Surface is the recent Multi-touch product from Microsoft which is developed using software and hardware combination technology. Minority Report says that it meets the kitchen table in the new Surface from Microsoft. It Claims that Surface computing is "as significant as the move from DOS to GUI", they now produce a tabletop device with an integrated 30-inch screen and five cameras to enable multi touch access to music, photos, the web, and more.

A Surface Computer isn't simply a regular PC with a touch interface. Surface Computer features a touch interface, but it doesn't use a touch screen, instead it makes use of five separate cameras that are used to record the motion on the table's Surface.

The Cameras are used so that each one can have a small field of view that translates into better resolution and speed (measured in pixels/second) in performance, than a single camera with an exceptionally wide-angle view of the table Surface. In addition to recognizing finger movements, the Surface Computer can also identify physical objects in motion. It is proved that when a diner sets down a Juice glass, for example, the table can automatically offer additional Juice choices tailored to the dinner being eaten.

Key attributes of Surface computing

- **Direct interaction**

The various users can actually "grab" digital information with their hands with the help of touch and interact with content through touch and gesture, without the use of a mouse or keyboard.

- **Multi-touch contact**

It refers to the ability to have multiple contact points with an interface, unlike with a mouse, where there is only one cursor.

- **Multi-user experience**

The horizontal form factor makes it easy for several people to gather around the Surface computers together, providing a collaborative, face-to-face Surface computing experience

▪ Object recognition

It refers to the device's ability to recognize the presence and orientation of tagged objects placed on top of it .The technology allows non-digital objects to communicate through touch.

II. REVIEW OF RELEVANT LITERATURE

The basic product idea for Surface was initially conceptualized in 2001 by Steven Bathiche of Microsoft Hardware and Andy Wilson of Microsoft Research. In October 2001, D J Kurlander, Michael Kim, Joel Dehlin, Bathiche and Wilson formed a virtual team to bring the idea into picture to the next stage of development.

In 2003, this team presented this idea to the Microsoft Chairman Bills Gates in a group review. The team developed some applications, including pinball a photo browser and a video puzzle all at once. Over the next year itself, Microsoft built more than 85 early prototypes for Surface. The final hardware design was finally completed in 2005. On April 17, 2008 AT&T became the first retail location to launch the Surface Computer.

III. PROPOSED ARCHITECTURE

The architecture consists of four main components

- a. Screen - It is the top layer and works as a diffuser .It diffuses illumination. Display is clearly visible at any angle.
- b. Infrared- which is an 850-nm-LED is aimed at the screen. When the Surface is touched the light gets reflected back. It will be picked up by 5 infrared cameras simultaneously.
- c. A Central Processing Unit, which has the following features:
 - Core2Duo Processor.
 - 2GB of RAM.
 - 256MB of Graphics card.
 - Wi-Fi.
 - Bluetooth antennas.

The software platform runs on custom version of Windows Vista.

- d. Projector- which is a DLP (Digital Light Processing) engine used for projection of data

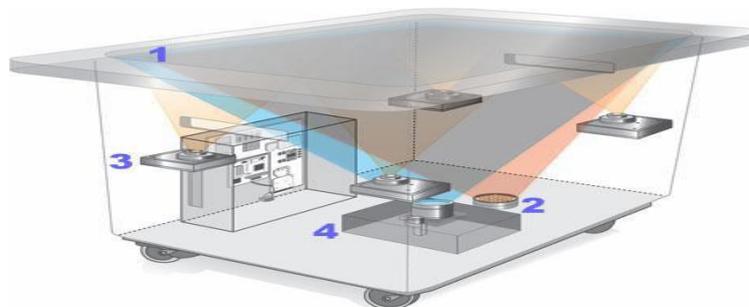


Fig. 3.1 Architecture of a Surface Computer

IV. IMPLEMENTATION

The technology of Surface computing allows non-digital objects to be used as input devices. This concept is made possible by the fact that, in using cameras for input, the system does not rely on restrictive properties required for conventional touch screen or touchpad devices such as the capacitance, electrical resistance, or temperature. The computer's "vision" is created by a near-infrared, 850-nanometer-wavelength Light Emitting Diode (LED) light source aimed at the Surface. When any object touches the tabletop, the light is reflected to multiple infrared cameras which allow it to sense, and react

to items touching the table top. The Surface computer uses cameras to sense objects, hand gestures and touch. This user input is then processed and displayed accordingly using rear projections. More Specifically the Surface uses a rear projection system which displays an image onto the underside of a thin diffuser. An image processing system, used in the Surface computer, processes the camera images to detect fingers, custom tags and other objects such as paint brushes etc when touching the display. The objects recognized with this system are reported to applications running in the computer so that they can react and respond to object shapes, 2D tags, movement and touch.

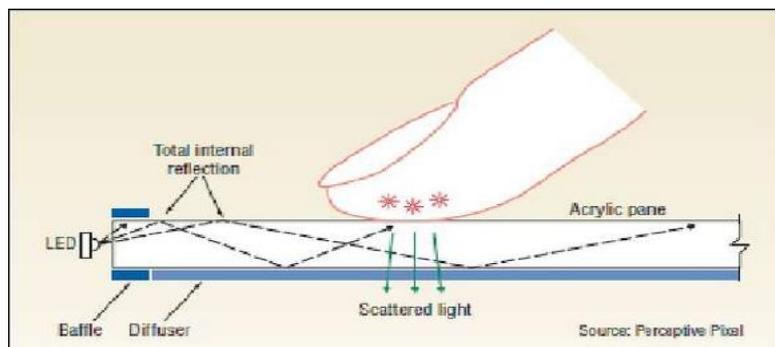


Fig 4.1 Scattering of light on the Surface

V. CONCLUSION

Microsoft Surface is the future of computer Technology. Surface Computing brings to life a whole new way to interact with information that engages the touch senses, improves collaboration and empowers Information Technology customers. It takes the existing computer technology and presents it in a new way. It is not a simple touch screen, but more of a touch -move-slide- grab-resize-and-place-objects-on-top-of-screen and this indeed opens up new possibilities that were not there before. By utilizing the best combination of connected software, services and hardware we develop Surface computers that push computing boundaries, deliver new experiences that break down barriers between users and technology.

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