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Intuition (A Wearable Gesture Control)

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Abstract: Intuition is a wearable gestural interface that augments the physical world around us with digital information and allows the users to use natural hand gestures to interact with that information. By using a camera and a tiny projector mounted in a pendant like wearable device. 'Intuition' sees what you see and visually augments any surfaces or objects we are interacting with. It projects information onto surfaces, walls, and physical objects around us, and lets us interact with the projected information through natural hand gestures, arm movements, or our interaction with the object itself. 'Intuition' attempts to free information from its confines by seamlessly integrating it with reality, and thus making the entire world your computer.

Index Terms— Camera, Gesture, Gesture Control, Projection, Projector.

I. INTRODUCTION

The Intuition prototype is comprised of a pocket projector, a mirror and a camera. The hardware components are coupled in a pendant like mobile wearable device. Both the projector and the camera are connected to the mobile computing device in the user's pocket. The projector projects visual information enabling surfaces, walls and physical objects around us to be used as interfaces; while the camera recognizes and tracks user's hand gestures and physical objects using computer-vision based techniques. The software program processes the video stream data captured by the camera and tracks the locations of the colored markers (visual tracking fiducials) at the tip of the user's fingers using simple computer-vision techniques. The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces. The maximum number of tracked fingers is only constrained by the number of unique fiducials, thus Intuition also supports multi-touch and multi-user interaction.

II. REQUIREMENTS

A. Hardware

- Mobile Computing Device(Smart Phone or Laptop)
- Webcam
- Projector
- Microphone
- Mirror
- Colour markers (Red, Yellow, Blue & Green)

B. Software

- Direct X
- Visual studios
- Adobe Flash player (active X)
- MS Outlook

III. HARDWARE IMPLEMENTATION

A. Webcam

The camera is the key input device of the Intuition system. The camera acts as a digital eye of the system. It basically captures the scene the user is looking at. The video stream captured by the camera is passed to mobile computing device which does the appropriate computer vision computation. The major functions of the camera can be listed as:



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- Captures user's hand movements and gestures (used in reorganization of user gestures)
- Captures the scene in front and objects the user is interacting with (used in object reorganization and tracking)
- Takes a photo of the scene in front when the user performs a 'framing' gesture
- Captures the scene of projected interface (used to correct the alignment, placement and look and feel of the projected interface components)

Product: Logitech c525 HD webcam

B. Projector

The projector is the key output device of the Intuition system. The projector visually augments surfaces, walls and physical objects the user is interacting with by projecting digital information and graphical user interfaces. The mobile computing device provides the projector with the content to be projected. The projector unit used in prototype runs on a rechargeable battery. The major functions of the projector can be listed as:

- Projects graphical user interface of the selected application onto surfaces or walls in front
- Augments the physical objects the user interacting with by projecting just-in-time and related information from the Internet

Products: either **laser** (AAXA, Microvision) or **L.E.D** (3M MPro110) projectors.

C. Mirror

The mirror reflects the projection coming out from the projector and thus helps in projecting onto the desired locations on walls or surfaces. The user manually can change the tilt of the mirror to change the location of the projection. For example in application where the user wants the projection to go on the ground instead of the surface in front, he can change the tilt of the mirror to change the projection. Thus, the mirror in the Intuition helps in overcoming the limitation of the limited projection space of the projector.

Product: Any 1"x1" first surface mirror

D. Microphone

It is required when using a paper as a computing interface. When the user wants to use a sheet of paper as an interactive surface, he or she clips the microphone to the paper. The microphone attached this way captures the sound signals of user's touching the paper. This data is passed to computing device for processing. Later, combined with the tracking information about user's finger, the system is able to identify precise touch events on the paper. Here, the sound signal captured by the microphone provides time information whereas the camera performs tracking.

Note: Microphone is required when it is not inbuilt in Webcam.

E. Mobile computing device

The Intuition system uses a mobile computing device in user's pocket as the processing device. The software program enabling all the features of the system runs on this computing device. This device can be a mobile phone or a small laptop computer. The camera, the projector and the microphone are connected to this device using wired or wireless connection. The mobile computing device is also connected to the Internet via 3G network or wireless connection.

Product: Any Windows computer

IV. ASSEMBLY

Now that we have all these pieces, we need a way to combine them. We use *Lego strips* to form the base. The projector, camera, and mirror assembly can be directly put onto this base. We can also use Velcro to combine the products.

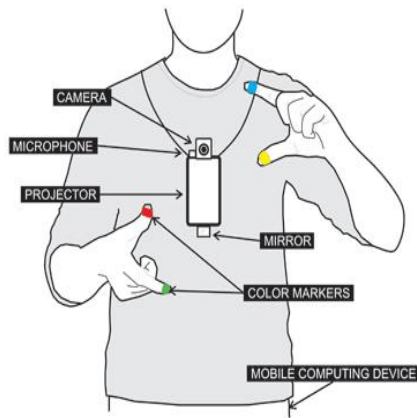


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V. APPLICATIONS

The Intuition prototype contains a number of demonstration applications.



Augmented Reality Newspaper



Play Youtube Videos on news Paper

- The map application lets the user to navigate a map displayed on a nearby surface using hand gestures to zoom and pan.
- The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index finger.
- Intuition also implements Augmented reality; projecting information onto objects the user interacts with. For example a paper newspaper can be augmented with projected dynamic live information.



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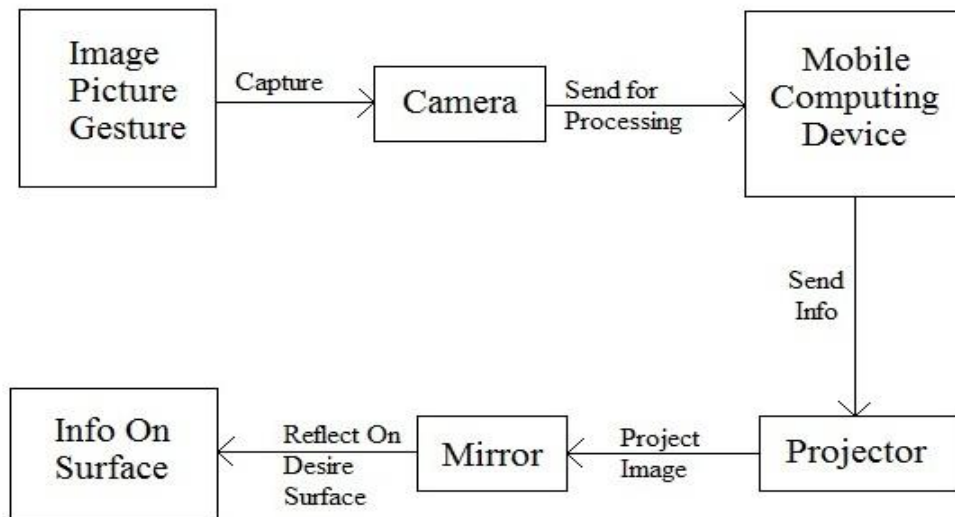
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VI. HOW IT WORKS

- The hardware components are coupled in a pendant like mobile wearable device.
- Both projector and camera are connected to mobile computing device in the user's pocket.
- The projector projects visual information enabling surfaces, walls and physical objects around us to be used as interfaces; while the camera recognizes and tracks user's hand gestures and physical objects using computer-vision based techniques.
- The software program processes the video stream data captured by the camera and tracks the locations of the colored markers at the tip of the user's fingers using simple computer-vision techniques.
- The movements and arrangements of these fiducials are interpreted into gestures that act as interaction instructions for the projected application interfaces.
- The maximum number of tracked fingers is only constrained by the number of unique fiducials, thus Intuition also supports multi-touch and multi-user interaction.



Working of Intuition device

Step-wise view:

1. Camera captures the image of the object in view and tracks the user's hand gestures.
2. There are colour markers placed at the tip of user's finger. Marking the user's fingers with red, yellow green and blue colored tape helps the webcam to recognize the hand gestures.
3. The movements and arrangement of these markers are interpreted into gestures that act as an interaction instruction for the projected application interfaces.
4. Information is sent to the Mobile Computing Device (Smart Phone) for processing.
5. The Mobile Computing Device (Smart Phone) searches the web and interprets the hand gestures with help of the colored markers placed at the finger tips.
6. The information that is interpreted through the Device can be projected into any surface.
7. The mirror reflects the image on to a desired surface.
8. Thus, digital information is freed from its confines and placed in the physical world.



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VII. TECHNOLOGY USED IN INTUITION

A. Gesture Recognition

It is a technology which interprets human gestures with the help of mathematical algorithms. Gesture recognition technique basically focuses on the emotion recognition from the face and hand gesture recognition. The technique enables humans to interact with computers in a more direct way without using any external interfacing devices. It can provide a much better alternative to text user interfaces and graphical user interface which requires the need of a keyboard or mouse to interact with the computer. An interface which solely depends on the gestures requires precise hand pose tracking. In the early versions of gesture recognition process special type of hand gloves which provide information about hand position orientation and flux of the fingers. In the Intuition devices, colored bands are used for this purpose. Once hand pose has been captured the gestures can be recognized using different techniques. Neural network approaches or statistical templates are the commonly used techniques used for the recognition purposes. These techniques have high accuracy usually showing accuracy of more than 95%.

Gestures

The software recognizes three kinds of gestures:

➤ **Multi-Touch Gestures:**

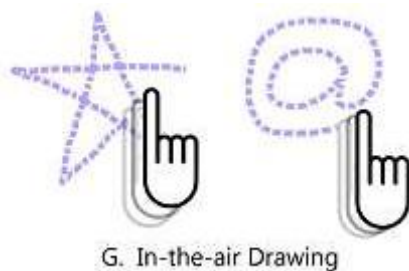
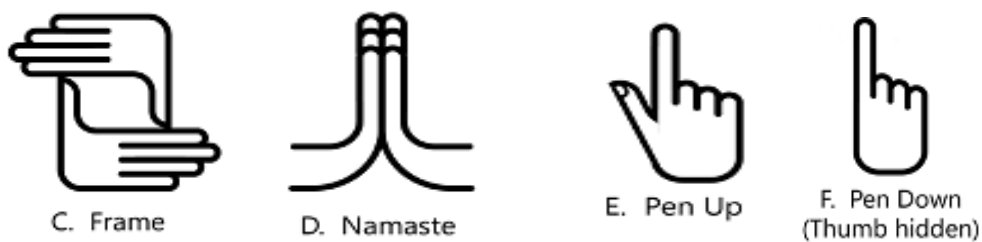
Like the ones we see in the iphone-where we touch the screen and make the map move by pinching and dragging.

➤ **Freehand Gestures:**

Like when you take a picture or Namaste gesture to start the projection on the wall.

➤ **ICONIC Gestures:**

Drawing a icon in the air. Like, whenever we draw a star, shows us the weather details. When we draw a magnifying glass, shows us the map.





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B. Computer Vision

Computer vision is the technology in which machines are able to interpret/extract necessary information from an image. Computer vision technology includes various fields like image processing, image analysis and machine vision. It includes certain aspect of artificial intelligence techniques like pattern recognition. The machines which implement computer vision techniques require image sensors which detect electromagnetic radiation which are usually in the form of ultraviolet rays or light rays. The computer vision technique basically includes four processes:-

1. **Recognition:** One of the main task of computer vision technique is to determine whether the particular object contain the useful data or not.
2. **Motion Analysis:** Motion analysis includes several tasks related to estimation of motion where an image sequence is processed continuously to detect the velocity at each point of the image or in the 3D scene.
3. **Scene Reconstruction:** Computer vision technique employs several methods to recreate a 3D image from the available images of a scene.
4. **Image Restoration:** The main aim of this step is to remove noise from a given image. The simplest method involves using simple filters like low pass or median filters. In order to get better quality images more complex methods like In painting are used.

VIII. SUMMARY AND DIFFERENCES FROM OTHERS

- Portable
- Inexpensive
- Multi-sensory
- Connectedness between the world and information

IX. CONCLUSION AND FUTURE OF THIS PROJECT

- The device will be available to the common public with less cost without the custom made PC.
- This technology will create a revolution; it will not only make our world digital but also make it simple.
- It will remove the tedious task of carrying our laptops or any other devices which are very heavy.
- Instead, we have to do is just wear the device which is a pendant shaped.
- It's light and easy to carry and easy access to any information. Nowadays, various modifications are in progress to make out a 3-D interface with the help of this device.
- Also, Defense Companies are ready to buy it for defense purposes.
- The device is been modified to detect noise frequency so that when the device clip is attached to a paper it detect your finger place by a simple touch and the vibration of sound created on the paper.

REFERENCES

- [1] <http://code.google.com/p/sixthsense/wiki/Software>.
- [2] <http://code.google.com/p/sixthsense/wiki/Hardware>.
- [3] <http://code.google.com/p/sixthsense/wiki/Links>.
- [4] <http://code.google.com/p/sixthsense/wiki/Contribute>.
- [5] <http://www.technologyreview.com/tr35/profile.aspx?TRID=816>.
- [6] <http://www.youthkiawaaz.com/2010/06/pranav-mistry-%E2%80%93-innovator-of-sixth-sense-technology%E2%80%93-technology-that-makes-sense/>.
- [7] <http://www.surfindia.com/celebrities/pranav-mistry.html>.
- [8] <http://www.surfindia.com/celebrities/pranav-mistry.html>.
- [9] http://www.speakers.co.uk/our-speakers/profile/pranav_mistry.



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[10] <http://thesaurus.com/browse/sixth+sense>.

[11] <http://www.merriam-webster.com/thesaurus/sixth%20sense>

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