

A Preliminary Study of Gestures for Human Computer Interaction (HCI)

Manjunath A E¹, Vijaya Kumar B P², Rajesh H³

Asst Prof, Computer Science, RVCE, Bangalore, India¹

Professor and Head, Information Science, MSRIT, Bangalore, India²

Student, Computer Networks, RVCE, Bangalore, India³

Abstract: Basically sixth sense is a power of perception seemingly independent of the five senses. This paper introduces about the sixth sense technology, Sixth sense is a wearable gestural interface, which provide freedom to interact with the digital world using hand gestures. Components of Sixth-Sense include projector, camera color markers, mirror & a mobile component. Sixth sense is all about interacting to the digital world in most efficient way. Sixth sense devices are very much different from the computers. This technology uses hand gestures to perform corresponding commands and accessing the operations from the mobile device which is connected to it, & action is projected to on any surface using the projector.

Keywords: Color Markers, Mobile component, Camera, Gestures, Recognition, Hand Tracking, Radio Frequency.

1. INTRODUCTION

Even after millions of years we use our five natural senses to sense the things, which include eyes, ears, nose, tongue mind and body to perceive information about those things which in turn helps us to take decisions and perform particular actions. But the information which we gather from our five senses is not sufficient, the data and information which we get these from online. Even though computing devices allows us to carry anywhere any time which helping us to connect to the information what we demand, but still there is no interaction between the digital devices and the physical world. Sixth sense bridges this gap between the digital world and physical world. This allows us to interact with the digital world with our gestures.

The first sixth sense technology was implemented with neck worn projector and with a camera system. This work is also carried by Indian researchers. Sixth-Sense is termed as Wear your world (WUW). This technology has a wide application in the field of artificial intelligence. This methodology can aid in synthesis of bots that will be able to interact with humans. This technology enables people to interact in the digital world as if they are interacting in the real world. The Sixth-Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system.

2. LITERATURE SURVEY

Sixth-Sense uses technologies like augmented reality, computer vision, Hand Tracking, Gesture recognition, & Radio frequency.

Augmented Reality: Augmented reality is a view of physical related objects, whose images are supplemented by computer generated images. Sound, Video or graphics. It's a type of image which aims to duplicate the real time object in to a picture in a computer. An augmented reality provides a view to the user which is the combination of real time object viewed by the user and the virtual image generated by the computer with some additional information about the particular image. The goal of the augmented reality is to generate a system which gives the exact view of the real scene in a computer generated virtual scene. Augmented reality can be used in education, architectural designing, manufacturing & automobile industries.

Computer Vision: Computer vision is a field which provides a detailed study of the image .This also includes capturing and analysis of the particular image obtained from the real world. In general computer vision provides a data from the real world which produces symbolic information. Computer vision is about extracting information from the images.

Hand Tracking: In hand tracking the most effective methods used is Tower tracking method, which can solve the basic problem in image processing. A tower is used to recognize the existence of some chosen features around it. So, the distribution of these towers in image and the features of the object involve the robustness and accuracy of the goal.

There are two kinds of the towers. The first kind is called the coarse tower & the second kind is called as fine towers.



Fig 1: Generation of coarse towers



Fig 2: Generation of Fine towers

Gesture Recognition: It is a technology which is used to identify human gestures with the help of mathematical algorithms. Gesture recognition recognizes the hand, tracks the hand movements & also provides information about hand position orientation and flux of the fingers.

Radio Frequency: is the wireless non-contact which uses radio-frequency electromagnetic fields to transfer data for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by and read at short ranges (a few meters) via magnetic fields (electromagnetic induction).

4. COMPONENTS

Sixth-sense components includes:

- 1) Camera
- 2) Colored markers
- 3) Projector
- 4) Mirror
- 5) Mobile component

4.1 Camera

The main objective of the camera is to capture the images and recognizes the hand movements, This is processed to the mobile component device for further processing.



Fig 3: Camera

4.2 Colored Markers

These colored markers are placed at the tip of the user fingers. This helps the webcam to identify the movement of hand and the gesture recognition.



Fig 4: Colored Markers

4.3 Projector

The Projector displays, which is gathered from a smart phone or any application device, on to any particular surface.



Fig 5: Projector

4.4 Mirror

The usage of a mirror is important as the projector dangles pointing downward from the neck. The mirror reflects the image on to a desire surface. Thus finally the digital image is viewed in the physical world.



Fig 6: Mirror

4.5 Mobile Component

Sixth-Sense consists of a web enabled mobile component. The component is web enabled because the data collected is processed to the mobile and in turn mobile uses the web to get the information. Either information is stored in the component or is displayed to the user through projector.



Fig 7: Mobile Component

5. SYSTEM ANALYSIS

Sixth-Sense technology works as Follows:

Webcam recognizes the hand gestures and capture the relevant information it may be either image or picture. Captured image is transferred to the mobile component for further processing. The web enabled mobile component gathers the information from the web. This is the information the user has requested. Projector receives the information from the mobile component & projects on to any particular surface or screen. The mirror helps in reflecting the image on to any particular surface.

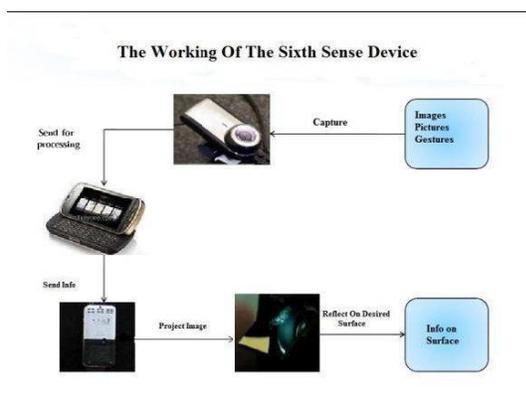


Fig 8: Working

6. APPLICATIONS

Sixth-Sense technology has a vast number of applications; some of the applications listed are:

6.1 Taking Pictures

With just the movement of hand gestures, user can take the pictures. Webcam recognizes the gesture & the framing to which the user is pointing to, this particular recognized frame will be stored in the mobile component. & can be displayed on to any particular surface by using projector.



Fig 9: Taking Pictures

6.2 Drawing Applications

The drawing application allows the user you to draw on any surface by tracking the fingertip movements of the user's index finger. The pictures that are drawn by the user can be stored and replaced on any other surface. The user can also shuffle through various pictures and drawing by using the hand gesture movements.



Fig 10: Drawing.

6.3 Making calls

The Sixth Sense device is used to project the keyboard into your palm and the user can make the calls using this virtual keyboard.



Fig 11: Making calls

6.4 Flight Details

Whenever a user wants to check the flights or an item in a store, the sixth-sense provides radio frequency which will scan the RID tag (like barcode, or QR code) & receive the relevant information. The information will be displayed on the surface.



Fig 12: Check Flight details

7. ADVANTAGES

- Sixth-Sense is a user friendly interface which integrates digital information with the physical world and its objects, making the entire world your computer.
- It uses hand gestures to interact with digital information, supports multi-touch and multi-user interaction.
- Data access directly from machine in real time. It is an open source, cost effective and we can mind map the idea anywhere.
- It is gesture-controlled wearable computing device that feeds our relevant information and turns any surface into an interactive display.
- It is portable and easy to carry as we can wear it in our neck.
- The device could be used by anyone without even a basic knowledge of a keyboard or mouse. There is no need to carry a camera anymore.
- If we are going for a holiday, then from now on it will be easy to capture photos by using mere fingers.

FUTURE ENHANCEMENTS

To remove the color markers, To build a compact and efficient computing device. To get rid of the pendant style wearable device. Applying this technology in all possible fields. To get a 3 dimensional gesture tracking system. To make sixth sense more effective so even it can be used for disabled person.

CONCLUSIONS

Sixth-sense recognizes & analyzes the objects around the user providing the required information automatically and allowing the user to access it in simplest way, this clearly makes sixth-sense as transparent user interface, and it is used for accessing information around user. If the sixth-sense is built up with compact and efficiently, it can be used in many applications.

REFERENCES

1. www.blendernation.com/sixth-sense-technology/
2. <http://gizmodo.com/5167790/sixth-sense-technology-may-change-how-we-look-at-the-world-forever>
3. *Processing*, IEEE Volume: 22, Issue:3, pp 57 – 64., May 2005
4. S. Sadhana Rao “Sixth Sense Technology” Proceedings of the International Conference on Communication and Computational Intelligence – 2010, Kongu Engineering College, Perundurai, Erode, T.N.,India.27 – 29 December,2010,pp.336-339.
5. Baudel, T. and Beaudouin-Lafon, M. (1993) Charade: Remote control of objects using free-hand gestures. In *Communications of the ACM*, July 1993, Vol. 36, No. 7, pp. 28-35.
6. Bolt, R. Put-That-There: Voice and gesture at the graphics interface. (1980) *Computer Graphics*. Vol. 14, no. 3 ACM SIGGRAPH. pp. 262-270.
7. D. J. Turman and D. Zelter, “Survey of glove-based input”, *IEEE Computer Graphics and Application* 14:30-39, 1994.
8. Freeman, W.T. & Weissman, C.D. (1994) Television Control by Hand Gestures. In 1st Intl. Conf. on Automatic Face and Gesture Recognition.
9. Kurtenbach, G. & Buxton, W. The Limits of Expert Performance Using Hierarchic Marking Menus. *Proceedings of CHI'94*, pp. 482-487.
10. Pook, S., Lecolinet, E., Vaysseix, G. & Barillot, E. (2000) Control Menus: Execution and Control in a Single Interactor. *CHI'2000 Extended Abstracts*, pp. 263-264.
11. Abowd, G.D. & Mynatt, E.D. (2000) Charting Past, Present, and future Research in Ubiquitous Computing. *ACM ToCHI*, Vol. 7, No. 1, pp. 29-5