

SEVENTH SENSE TECHNOLOGY

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Abstract: *Seventh* Sense Technology is a technology used for the human electronic interaction using natural hand gestures. The hand gestures can be used to control any micro controller based devices or robots at distant places using Zigbee or GSM Module or satellite transceiver .The “Seventh Sense Technology” is easy to implement with reduced implementation cost and it opens a wide area of research for the next generation and a greater development in almost all areas of current interest. Seventh Sense Technology uses the Sixth Sense Technology and its advancements to control the autonomous robots or any microcontroller based devices on human will. Currently autonomous robots or any microcontroller based devices are designed for a single purpose, but with this technology robots and those devices can be made to achieve multidimensional purposes. Even the costlier sensors can be replaced with the low cost night vision cameras. It opens a way to control robots or any microcontroller based devices at any distance with natural hand gestures of human beings. It is going to be a greater field of research that also paves a lot of attention in this current world of technology.

Keywords: Seventh Sense; Sixth Sense/WUW; Computer Vision; Wireless Communication; Robotics

I. INTRODUCTION

WHICH ARE THE SEVEN SENSES?



Fig1:Seven senses

- Sight(Visual System)
- Smell(Olfactory System)
- Taste(Gustatory)
- Movement(Vestibular System)
- Hearing(Auditory System)
- Touch(Tactile System)
- Body Awareness(Proprioception system)

Seventh Sense technology is a human electronic interaction with the incorporation of the sixth sense technology [1][7] to control the autonomous robots or micro controlled devices with the aid of simple hand gestures[2] . Robots are the main area of interest in the current scenario. Robots do things or moves according to a stored program flashed in its micro controller. For a path or edge detection autonomous robots, we usually use the infrared sensors or color identification sensors. But by using this seventh sense technology we can eliminate the use of sensors and do the same works with more ease and less complexities.

Seventh Sense technology can be used in a system to recognize and percept real world objects and does actions as desired by human beings. Seventh Sense technology connects us to the physical and digital world by giving us a way of interaction with this information through natural hand gestures to give instructions to the robots or other microcontroller based devices placed at distant places. Also Bluetooth device and laser projectors could be used to enhance Seventh Sense .

Seventh Sense means a state where humans are capable of forecasting the things and making an alteration or an effect somewhere he is not virtually present. Humans make decision from the five senses and that decision making can be made using technology through artificial Intelligence . Similarly GSM module or Satellite transceivers can be used according to the need of communication range. Therefore seventh sense eventually transmits the sixth sense data to devices at remote places. Sixth Sense Technology bridges up digital and intangible information out into the tangible world, and allowing human beings to interact with this information through natural hand gestures . An Autonomous robot is particularly used in fields such as space missions, medical treatments, entertainment, and house hold management. This technology can be applied to any micro controlled devices such as automobiles, washing machine, cars etc. Most of the devices in the world have the micro controller embedded in it. Some modern car factory robots are "autonomous" and having strict confined movement in their working environment. One important aspect of robots is that it can be used on underwater, on land, in the underground, air, or at space.

In Sixth Sense Technology helps in bridging this gap by giving out the digital information on tangible world and giving us the Opportunity to interact with this information using out natural hand gestures. It can be used in colleges, supermarkets, schools, map navigator etc. Augmented reality is the concept which makes a bridge between physical world and digital world. Augmented reality joins virtual world with the real world, also the fictitious (not true/real) world can be experienced. The concept of augmented reality can be combined with sixth sense in order to have better gadgets that make us machine free. This Sixth Sense device was developed by Pranav Mistry, a Ph. D student at Fluid Interfaces Group at the MIT Media Lab.

Applications that demonstrate or shows the usefulness, viability and flexibility of the system acting as the computer and your connection to the cloud and all the information Stored on the web. The Sixth Sense recognizes the objects around you, displaying information automatically and letting you access it in any way you want and in the simplest way possible. The sixth sense prototype is made using very common and easily available equipment's like projector, a mirror, mobile components, camera.

Due to the rapid increase of number of industrial or domestic systems that must be controlled it is clear that new methods of control are needed. Gesture recognition is important for developing alternative human-computer interaction modalities that enables humans to interface with machine in a more natural way. There are many types of gesture researches like body gesture, finger point movement ,etc. Hand gesture recognition based man-machine interface is being developed strongly in recent years. In earlier study we used a date gloves with microcontroller and connected with the device through a wire. Static and dynamic hand gestures were used also in the research, but hand static gestures (postures) were the most dominant part of research regarding gesture Control system. An autonomous robot can acquire knowledge from surrounding for accomplishing its tasks or adapting to changing surroundings. These autonomous robots are used in different areas of technologies in different ways. This technology also paves a new way to cure Cancer and other diseases, by injecting nano robots once into human body, it further prevents the reoccurrence of those diseases during the life time.

II. LITERATURE REVIEW

- Seventh Sense's technology is based on work done in the labs of MIT professor Bob Langer and Harvard University professor R. Rox Anderson, in 2007.
- The next president needs to reads The seventh sense, starting on morning of November 9th. Joshua Ramo's latest book is a fascinating guide to the way the world is changing"-Malcolm Gladwell , author Malcolm of David and Goliath .
- Hasan[5] applied multivariate Gaussian distribution to recognize hand gestures using non geometric features.
- Hasan[3] applied scaled normalization for gesture recognition based on brightness factor matching.
- Review of The seventh sense: Power, fortune and survival in the Age of Networks by Joshua Copper Ramo, Little , Brown and company, 2016.
- There are several related works for the proposed system. Most of the works had been done to reduce the human efforts to make things done digitally. Mainly seventh sense technology uses the sixth sense advancements and robotics.
- Robotics advancements are of less importance when considered to the sixth sense advancements. Sixth sense is itself supported by the related techniques such as the following:
 - Gesture Recognition
 - Computer Vision
 - Radio Frequency Identification
 - Augmented Reality

III.Architecture

3.1 Seventh Sense Technology With Autonomous Robot

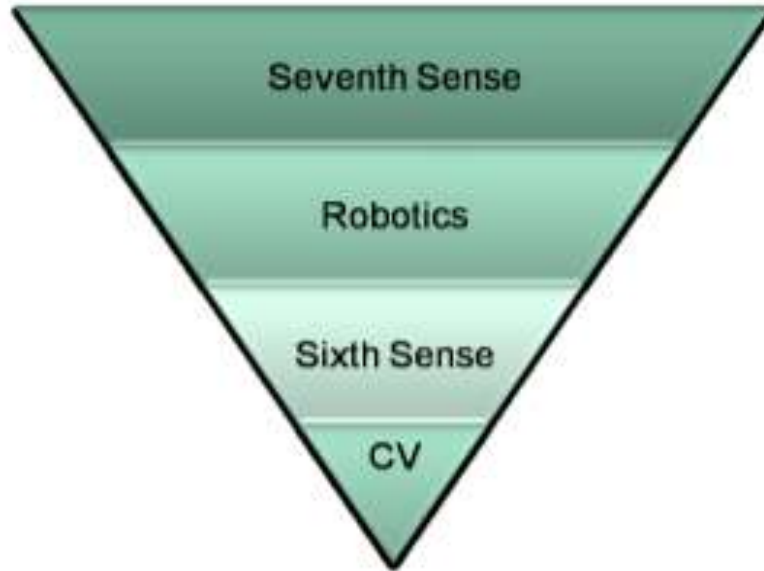


Fig 2: Seventh Sense Flow Diagram

From the Fig.3.1 we can describe technology as a technology built upon Robotics and Advanced Sixth Sense Technology on the basis of Computer Vision. We will find more details of the advancements of sixth sense and the details of an autonomous robot.



Fig 3: Seventh Sense Demo Robot

3.1.1 Working Of Normal Autonomous Robots



Fig 4: While Following Line Robot Encounters Obstacle

Autonomous Robot is built using the IR based Line Detecting Module or any other sensor modules. The modules are connected to robots so as to detect the needed parameter early and take proper action in time. The distance between the sensors is maintained greater than the width of the autonomous robot considering the turning radius wheels. Line follower robot is a machine which follows a line, either a black line or white line. Line follower actually senses the line and run over it.

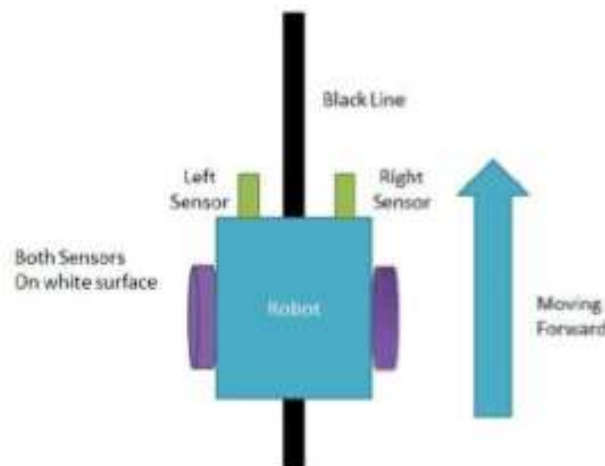


Fig 5: When Both Left & Right Sensors White Line Then Robot Move Forward

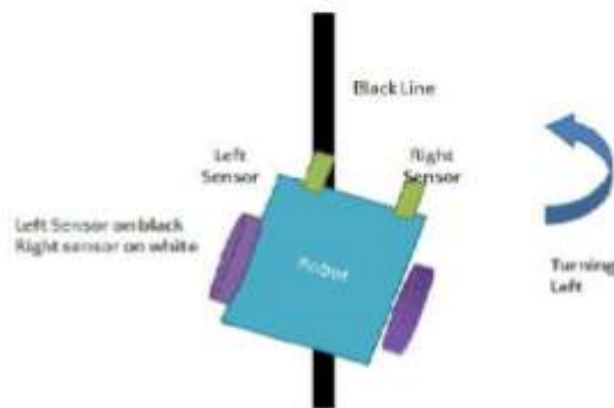


Fig 6: If Left Sensor Comes On Black Line Then Robot Turn Left Side.

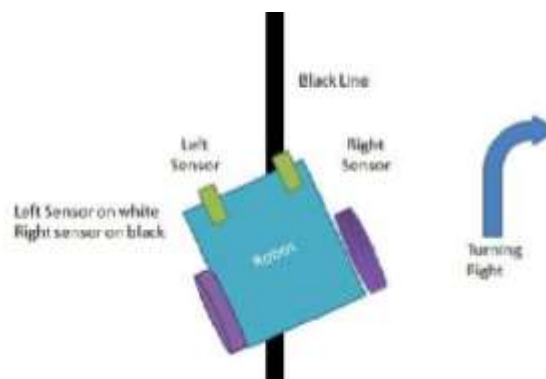


Fig 7: If Right Sensor Sense Black Line Then Robot Turn Right Side Until Both Sensor Comes At White Surface .When White Surface Comes Robot Starts moving on forward again. And if no line detected robot will stop.

The main features are the following:

- When the surface is detected, the IR module gives high pulse to the controller.
- When the edge is detected, the IR module does not reflect light thus giving a low pulse to the controller.

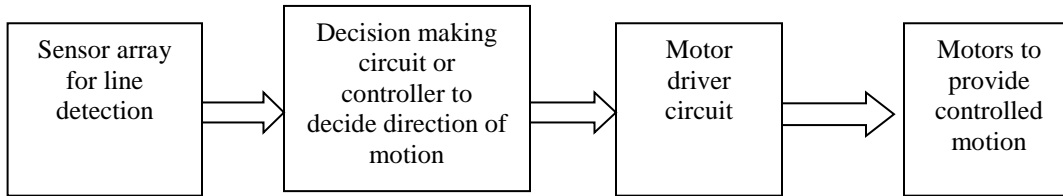


Fig 8: Block Diagram of Working of Autonomous Robot

An array of sensor may be used to detect the needed parameter. Based on the status of sensors, special circuit or controller decides the criteria and also the required direction or action is carried out. . Motor driver is used to ON/OFF the LEFT/RIGHT motors of the robot to provide desired motion. See the values and decision making of movement from Table 3.1.1 for an autonomous line follower robot.

Table 1: Sensor Value And Corresponding Movement Of Line Follower Autonomous Robot

LEFT SENSOR	RIGHT SENSOR	MOVEMENT
ON	ON	FORWARD
OFF	ON	BACKWARD; DELAY; RIGHT TURN; DELAY;
ON	OFF	BACKWARD; DELAY; LEFT TURN; DELAY;
OFF	OFF	BACKWARD; DELAY; RIGHT TURN; DELAY;

3.2 Design of Seventh Sense Technology

Design of the seventh sense can be broadly classified into three components. First component is the seventh sense technology based hardware, and second component is related to computer vision and the third related to robotics. The following are brief descriptions of each component:

- Hardware Components Of Seventh Sense Technology
- Computer vision
- Component Of Robot

3.2.1 Hardware Components of Seventh Sense Technology

- Camera
- Projector

- Mobile Computing Device
- Micro controlled Device Or Robots With Wireless Camera
- ZIGBEE, GSM And Satellite Module

1) Camera

Camera is basically used to capture the scene where the user is passed is looking at. The stream of video captured by the camera is passed to mobile computing device or laptops, which does the appropriate compute vision computation. The functions of the camera are:

- Obtain user's different gestures and movements of hands
- Obtain the scene in front and objects the user is interacting with, for performing various actions.

2) Projector

The one of the key output device of the Seventh Sense is projector. The projector visually augments physical objects, on walls and on surfaces, where the user is interacting. It also projects graphical user interfaces and digital information. Projector provided by the mobile computing device can be used to project the content. The important functions of the projector have been listed below:

- Augments related information from the system
- Projects graphical user interface

3) Mobile Computing Device

The Seventh Sense system uses a mobile computing device in user's pocket as the processing device or a laptop at user's desktop.

4) Micro controlled Device Or Robots With Wireless Camera

Any micro controlled device which can accept the serial communication data which is being transmitted from mobile computing device. According to the serial requests, the device does the functions by a program which is being embedded in the microcontroller. Additionally the micro controlled device is enhanced with wireless camera for getting information from surrounding and sends the information to the transmitter. According to that information the user can decide which action to be performed next.

5) Zigbee, GSM & Satellite Transceiver Module

IEEE 802.15.4 is basis for low rate transmission and that is the basis for Zigbee and it can be used for communications under 100 meter range or for extended versions of a range of 1000 meters. For more coverage of communication GSM module can be used. For very large range the use of satellite transceivers can be used. For the prototype implementation Zigbee has being used. The Functioning of the seventh sense pendant is given below. The operator side is equipped with a mobile device or laptop with a camera for tracking the hand gestures and a projector for projecting the details to a surface. The transmitter side connects with remotely placed robots or micro controlled devices like cars, washing machine, etc. with the help of the Zigbee, GSM or Satellite transceivers for communication. The receiver side is equipped with software embedded in the microcontroller and the other Zigbee, GSM or satellite transceiver for effective communication.

3.2.3 Computer Vision

- Computer vision is the science and technology of machines. It concern with the theory behind artificial systems that extract information from image. Computer vision is an interdisciplinary field that deals with how computers can be made for gaining high-level understanding from digital images or video[4][6].
- Computer vision concern with the automatic extraction analysis and understanding of useful information from single image or sequence of images.
- Computer vision tasks include methods for acquiring, processing, analyzing and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information e.g.in the forms of decisions[8].

3.2.3 Component of Robots

Any robots are made of basic elements such as:

- Sensors
- Controller
- Actuator

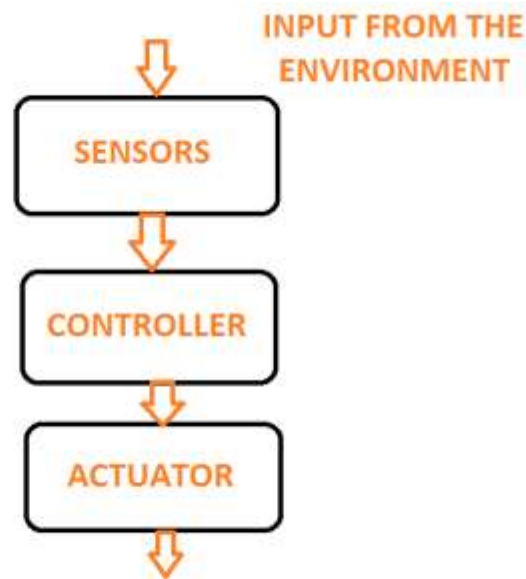


Fig 9: Block Diagram of Robotic Component

The sensor part senses the path and detects the objects or colors depending on the sensor type, which then sends the signals to the controller part to determine which activity should robot take and it sends that corresponding signals to the actuators to rotate the wheels or move the arms.

3.3 Software Implementation Of Seventh Sense Technology

To develop an application based on seventh sense technology one can use:

- Languages used are Java, Open CV, Java C
- Image processing Software used is Mat lab
- Embedded programming in Embedded use

3.4 Seventh Sense Bio-systems TAP 20™ Painless Blood Draw Device



Fig 3.4.1: Seventh Sense Bio-systems TAP 20™ Painless Blood Draw Device

- **What is it?**

TAP^{is} a TAP (Touch Activated Phlebotomy) device that serves as an alternative to intravenous blood collection.

- One-touch process
- Approximately 5cm in diameter
- Can hold up to 20 micro litere

• **How does it work?**

Rather than traditional needles, the device uses 16 micro- needles.

- Device adheres to skin(forearm region)
- ‘Tap’ allows micro-needles to penetrate uppermost layers of skin, collecting capillary blood through channels into an internal reservoir.
- After 2 minutes, process is complete and device is removed(a mark resembling a mosquito bite will remain)
- Samples can be tested on location, or sent to a lab.

• **Benefits:**

- Designed to increase patient compliance by reducing anxiety and discomfort traditionally associated with blood collection.
- Portable
- Efficient: holds large enough sample to allow for wide range of diagnostic Tests.
- Safe testing of HIV and other infectious diseases.

• **Result:**

- In 2011, Seventh Sense Bio-systems received the Edison Gold Medal Award.
- Received a\$3.8 million grant from the Bill & Melinda Gates Foundation.
- TAP 100™(holding up to 100 micro-liters) is in the works.

IV.ADVANTAGES

- Gain information from surrounding with the help of sensors.
- Battery life is more
- Does things without human assistance.
- Long life and accuracy.

V.APPLICATION

One of the applications of the seventh sense prototype are the following:

- Gesture based robotic control
- Gesture based selfie pictures and group fie pictures
- Gesture based Presentation Slide control
- Gesture based mouse control

VI. CONCLUSION

Seventh sense technology analyzes the gestures and it displays information automatically and allowing us to do actions at distant places at our own will. It allows us to interact with the information via natural hand gestures. This seven sense can be extended to Nano robotics and can find different diseases and cure at will, especially cancer.

In simple, we move robotics with the help of using our sense or natural hand gestures .If we insert sensor in robot we can detect the object or sense move the robot

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