

Sixth Sense Junior

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Abstract

The Research paper deals with the several facet of image processing like color detection and some applications of it. It will enable you to make gestures with the help of RGBY colors. The colors are detected on the basis of a property named centroid. On the basis of the coordinates of the centroid, apply distance algorithm and get the distance. By varying the distance between the fingers, different gestures can be made which can perform various operations of today's digital world and also be applied to the industries.

Keywords: *MATLAB, Sixth Sense, Augmented Reality, Gesture Recognition, Arduino, GUI*

1. Introduction

Since ages, our five natural senses that are eye, nose, ear, tongue, touch have helped us in perceiving information and feeding it to the brain in the simplest way possible. Whenever we observe something around us, the raw information is perceived by our senses and sent to brain for processing which helps us in decision making and choosing the right actions. But contrary as the technology is advancing, the world is getting smarter and so the five senses sometimes fail to process the information, data and knowledge, which is widely available to us. Science and technology are a blessing to mankind because in early days, the electronic gadgets used to be huge and not so portable but thanks to the advancement of electronics, the size of the gadgets have significantly reduced that nowadays they fit in pockets and are easily portable. But somewhere or the other, the natural interactions have lost their significance in the modern age. So, 'Sixth Sense Junior' bridges the gap between the modern digital world and archaic human interactions and thus making the entire world at your fingertips. On my visit to IIT Bombay, Pranav Mistry was talking about a technology known as Sixth Sense Technology. The talk was altogether focused on fusing the digital world with the physical world. And then decided to take it as my project for the minor but he used open CV and we transformed it into MATLAB, which we have studied earlier. As it is computers and devices are getting smart day by day so the 'Sixth Sense Technology' will make them even more smarter by integrating the ability to sense different feelings accumulated from the surroundings and process the information more effectively. Sixth Sense is a "gesture based" device that blends the physical world with digital information. Furthermore, let individuals use common hand signals to interface with that data. A human robot hand is also introduced which enhances computers and other digital devices for people's enjoyment of the physical world and also allows them to do their work more efficiently [1]. In today's time, we carry our smartphone wherever we go as it provides us functionalities like calling, capturing photos, recording videos, surfing internet but for all that we require to take out our phones and click on the respective applications but now with Sixth Sense, we just need to make simple gestures and rest is processed automatically. Sixth Sense will allow us to interact with our world like never before.

Currently, we interact with our devices on a one to one basis but with this new technology, we can interact with the things on a whole new level along with the interaction with people simultaneously.

It is an idea which has been implemented with the help of technology and it enables us to go beyond our imagination and to make the world more connected and reliable. It can also be said that to connect the real world with the digital world. The involvement of the virtual reality in the hypothetical model gives it a new way to overcome the world's latest technologies. People take choices subsequent to getting inputs from the faculties. Yet, the data we gather aren't sufficient to bring about the right choices. In any case, the data which could help settling on a decent choice is generally accessible on web. In spite of the fact that the data can be accumulated by interfacing gadgets like PCs and mobiles however they are limited to the screen and there is no immediate communication between the unmistakable physical world and elusive advanced world. This intuition innovation gives us the flexibility of communicating with the advanced world with hand motions. This innovation has a wide application in the field of counterfeit consciousness. This strategy can help in blend of bots that will have the capacity to connect with people.

2. Sixth Sense Technology

A. Sixth Sense Technology

Sixth Sense started as an assortment of wearable advances including headworn, neckworn, wristworn, and so forth., including the neckworn projector and camera framework created by Media Lab understudy Steve Mann. Mann initially alluded to these wearable innovations as "Engineered Synesthesia of the Sixth Sense". In the 1990s and mid 2000s, Mann utilized this anticipate as a showing illustration, and taught a few hundred understudies how to assemble the neckworn SixthSense framework, as a component of the undergrad showing educational modules at University of Toronto. In the 1990s the early aremac did vector design as opposed to raster illustrations, yet a raster representation rendition in light of a scaled down wearable micro mirror projector was created in 2001, which could extend onto the wearer's hands, different articles, or the floor or ground before the wearer, so it could work with hand signals or foot motions. Sometimes in experimental terms is characterized as Extra Sensory Perception or in short ESP. The information received is neither taken from any experiences from the past nor gained through any of the five senses. Sixth Sense helps in easy integration of tech and online information in daily life. Some information is really hectic for our basic five senses to interpret. So, at this point Sixth Sense finds it utility [1].

It takes an alternate way to deal with processing and tries to make the advanced part of our lives more instinctive, intelligent and, most importantly, more normal. We shouldn't need to consider it independently. It's a considerable measure of complex innovation pressed into a basic compact gadget. When we get network, we can get moment, significant visual data anticipated on any item we get or cooperate with the innovation is for the most part in view of hand-increased reality and motion acknowledgment PC vision based calculation and so forth. In this way, get a container of grain and your gadget will extend whether it suits your inclinations. A percentage of the advancements that uses this are Radio Recurrence Distinguishing proof, motion gaming, washing machine [4].

B. Augmented Reality

Expanded reality is a live immediate or backhanded perspective of a physical, true environment whose components are increased by PC created tangible information, for example, sound, video, design or GPS information. It is identified with a more broad idea called interceded reality, in which a perspective of the truth is altered (conceivably even decreased as opposed to increase) by a PC. Thus, the innovation capacities by improving

one's present view of reality. By complexity, virtual reality replaces this present reality with a mimicked one. Expansion is expectedly continuously and in semantic connection with natural components, for example, sports scores on TV amid a match. With the assistance of cutting edge AR innovation (*e.g.* including PC vision and item acknowledgment) the data about the encompassing certifiable of the client gets to be intuitive and digitally manipulative. Data about the earth and its items is overlaid on this present reality. This data can be virtual or genuine, *e.g.* seeing other genuine detected or measured data, for example, electromagnetic radio waves overlaid in definite arrangement with where they really are in space.

The arrival of this type of technology named Augmented reality (AR) is a great contribution to Sixth Sense which is a term for a live immediate or backhanded perspective of a physical genuine environment whose components are enlarged by virtual PC produced symbolism. It is identified with a more broad idea called interceded reality in which the perspective of the truth is changed (perhaps even decreased instead of increased) by the PC. The growth is customarily progressively and in logic connection with ecological components [1].

Augmented Reality is utilized by Sixth sense technology that uses idea to super, forces advanced data on the physical world. Through the assistance of cutting edge AR innovation (*e.g.* including PC vision and item) the data about encompassing certifiable of the client reaches to be intuitive and digitally usable. Some of the articles and simulated data can be avoided and recovered as the data above genuine perspective. The fundamental equipment parts for this technology are: presentation, tracking, gadgets with input, and PC. Mixture of capable CPU, camera, accelerometers, GPS and strong state compass are frequently present in latest edge Cell phone that make them renowned.

C. Gesture Recognition

Motion acknowledgment is a subject in software field and local innovation with the aim of deciphering human motions by means of various calculations. Signals can start from any substantial movement, however ordinarily begins from the face or hand. Current centers in the field incorporate feeling acknowledgment from the face and hand signal acknowledgment. Numerous methodologies have been made utilizing cameras and PC vision calculations to decipher communication through signing.

Motions can reside in separation or involve outside articles. We can use it in many ways like when waving, calling, fend off, and sometimes it becomes more prominent for the people who does not have the advantage of speaking. It helps the needy persons in the best possible way involving all sorts of actions. Availability of large number of signals which are defined universally which include moving of the objects, touching them, changing their shape and size and activating them for further operations like controlling. [3].

In some days, it will become the most important parameter for those who cannot have verbal communication, along these lines fabricating a wealthier span in the middle of machines and people than primitive content client interfaces or even GUIs (graphical client interfaces), which is still very far from buttons and mouse. Sixth sense enables people to interact with the most interesting machine (HMI) and it has the quality of non-cooperating with other gadgets. Signals can also be used to speak with PC but sometimes it also leads to miscommunication.

3. Algorithm

As shown in Figure 1, we used Euclidean distance method in MATLAB, which enables us to overcome the problem of not detecting the coordinates in the every region defined in front of the camera. In this we used the concept of centroid for detecting the coordinates of the different colors like red, green, blue and yellow. The detection of Centroid can be

done with the help of region props, a pre-defined function in MATLAB. Once the centroid is detected, then we find the distance between the different colors [6].

D1= distance between the red and green.

D2= distance between the red and blue.

D3= distance between the red and yellow.

D4= distance between the yellow and blue.

We calculated the maximum and minimum distances between the colors and defined them in that region. So whenever user comes in that region, it detects the particular color and the gesture associated with it and performs various operations:

- a) Capture the image.
- b) Starting of the tutorial to guide the users and to tell them how to use the device.
- c) Start the video.
- d) Video recording
- e) Image capturing involves various functions like save, adjust brightness, and reset *etc.* which we have done through graphical user interface.
- f) Video recording also involves saving option.
- g) Images we have captured can further be viewed on a separate window.
- h) Recorded videos can also be seen and played accordingly.

Our hardware, a robotic arm works in the way that it detects the color through color detection and then performs various functions. It can hold the object and then with the help of hand movement, it can transfer the object to other place by rotating the arm with the help of motors.

The hardware is controlled with the help of Arduino and several motors attached to the robotic hand through a motor driving board, which is required to drive several high torque motors [5].

4. Implementation

The Sixth Sense has several applications, which defines its usefulness, compatibility, pleasure to use, suitability and various other things which makes our life simple and easy and especially for making the life of disabled persons easy and comfortable. Some of them are listed below:

Compact - One of the principle focal points of the intuition gadgets is its little size and convenience. It can be effectively conveyed with no trouble. The model of the intuition is composed in a manner that it gives more significance to the convenience variable. Every one of the gadgets is light in weight and the advanced cell can without much of a stretch fit into the client's pocket.

Savvy the expense acquired for the development of the intuition proto sort is peaceful low. It was produced using parts gathered together from regular gadgets. The intuition gadgets have not been made in huge scale for business reason. Once that happens it's verging on sure that the gadget will cost much lower than the present cost. Sixth Sense likewise gives the wearer a chance to attract the air, as though making a long-introduction photo, moving a finger (or light source or other item).

A paper seeing application gives the client a chance to explore a sheet of paper, shown utilizing paper-bowing signals. A drawing application gives the client a chance to draw on any surface by following the fingertip developments of the client's pointer.

A zooming motion works by boxing a scene with two editing "L" shapes and pulling the hands separated or drawing them nearer together. A xylophone motion permits the wearer to utilize any surface as a musical instrument by executing an idioscopic Natural User Interface. Sixth Sense can perceive pages of a book and play back live video directions or points of interest or case as though they were attached to the paper as a foldable showcase.

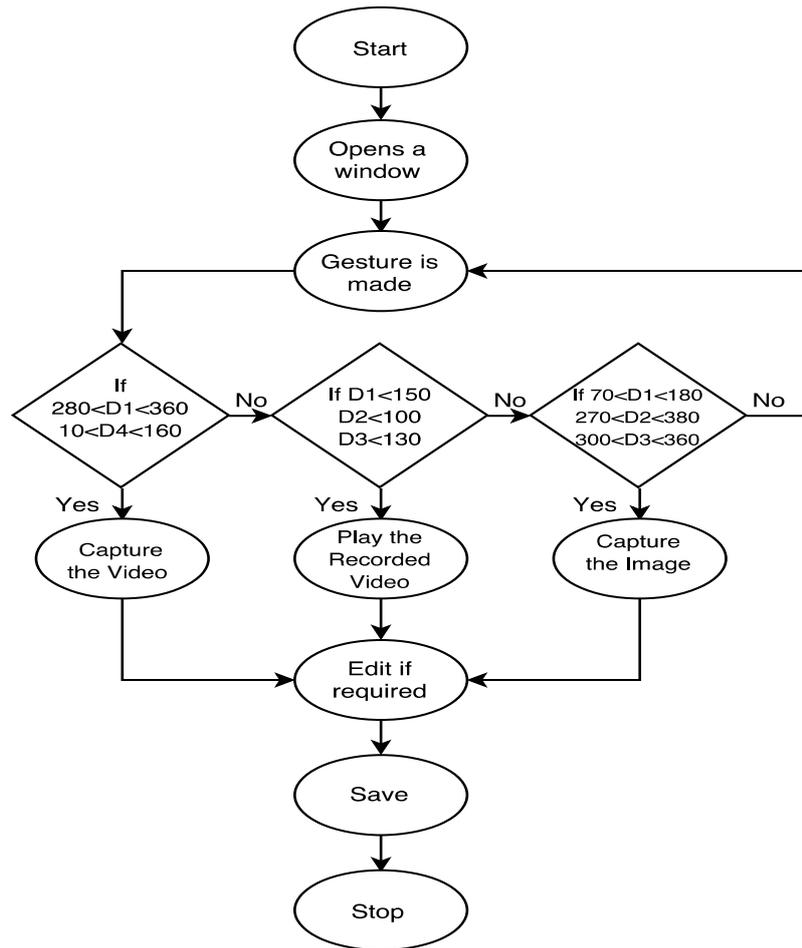


Figure 1. Algorithm of the Gestures

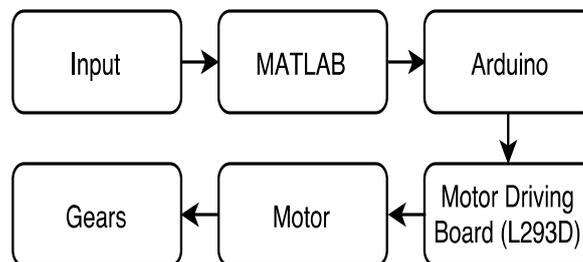


Figure 2. Block Diagram of the System

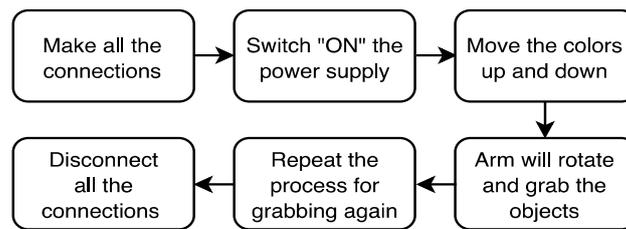


Figure 3. Working of the System

One use of Sixth Sense was Computer Supported Collaborative Living, *e.g.* telepresence, and remote communication with others. One case of this was Tele-pointer in which a Natural User Interface was produced utilizing a second projector and camera. Different applications included connection with a wearable PC (without one or more remote gatherings). Sixth Sense executed different applications, for example, processing the span of items, or question on articles, done utilizing a scope and get or "hug" motion. For instance, coming to with open arms towards a tree gives a lookup of the tree and endeavors to perceive the bark on the tree, or endeavors to utilize a B-code identifier on the tree.

A paper seeing application gives the client a chance to explore a sheet of paper, shown utilizing paper-bowing signals. A drawing application gives the client a chance to draw on any surface by following the fingertip developments of the client's pointer. A zooming motion works by boxing a scene with two editing "L" shapes and pulling the hands separated or drawing them nearer together. A xylophone motion permits the wearer to utilize any surface as a musical instrument by executing an idioscopic Natural User Interface. Sixth Sense can perceive pages of a book and play back live video directions or points of interest or case as though they were attached to the paper as a foldable showcase.

5. Results

Initially when we start the software, a window appears in which we have to make different gestures for different works. The GUI window, which appears after the gesture is made, is shown below. It contains different components like spare, reset, high contrast, dark scale and brilliance of the picture. The hues utilized as a part of making the signals are Red, Green, Blue and Yellow (RGBY). The gestures which have been made for different purposes like capturing a image, video recording, play the recorded video, view the captured image by using above algorithm and the hardware which works on the same principle with the equipment's like Arduino, Motor driving board, Motors, Gears *etc.* used in it are shown below. The hardware is implemented on wooden blocks which give an orientation as a robotic hand and it also works like it.



Figure 4. GUI Window



Figure 5. Record a Video



Figure 6. Play the Recorded Video



Figure 7. View the Captured Video

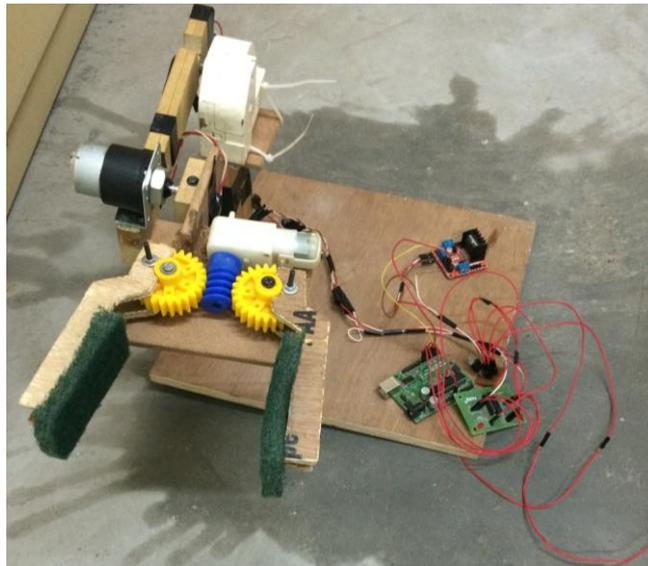


Figure 8. Hardware Implementation of the System (Robotic Hand)

6. Conclusion

The Sixth Sense device enables us to perform various functions like capturing the images, recording the video, play the recorded video, edit the images captured and then saving them. It can even perform different work in the industries, which includes large work labor. It has actually made our life easy and comfortable. The involvement of the colored fingertips can easily be replaced by the most advancing technology in the future, which makes this device more reliable and handy.

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