SIXTH SENSE TECHNOLOGY FOR INTERACTIVE PRESENTATION

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Abstract-

In this paper, a real-time system that utilizes hand gestures to interactively control the presentation is proposed. The system employs a thermal camera for robust human body segmentation to handle the complex background and varying illumination posed by the projector. A fast and robust hand localization algorithm is proposed, with which the head, torso, and arm are sequentially localized.   Hand trajectories are segmented and recognized as gestures for interactions. A dual-step calibration algorithm is utilized to map the interaction regions between the thermal camera and the projected contents by integrating a Web camera. Experiments show that the system has a high recognition rate for hand gestures, and corresponding interactions can be performed correctly.

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1. Introduction

This chapter introduces the general definition of gesture and Human Computer Interaction. The brief history of gesture recognition process and the advantages of hand gesture are also presented here. Along with the description the chapter briefly outlays the literature survey of HCI implementations. Finally, the main objective or purpose of this project is described here for properly understanding the aim. Gesture is one of the most natural and expressive ways of communications between human and computer in virtual reality system. As an example of such kind of system, The Soft Remote Control System has been developed by HWRS-ERC in KAIST. This system is a vision based hand gesture recognition system for controlling home applications such as television, lamp and curtain. With the emergence of new applications like virtual reality system in image processing and machine vision, it is necessary to have more perfect interfaces than mouse and keyboard for Human Computer Interaction (HCI). To cope with this problem, varieties of tools have been presented to interact with computers. Hand gesture recognition is one of the proper methods for this purpose. Hand gesture is one of the important methods of non-verbal communication for human beings for its freedom in movement and so much more expressive may than any other body parts. Hand gesture recognition has a number of potential applications in human computer interaction, machine vision, virtual reality system, machine control in industry and so on.

       Human are themselves intelligent machines are very accurate at calculations even at very high speed. None of human or machine is perfect. If human can get task done by machine then combination of human machine will be more perfect and efficient. Human machine interaction plays vital role in enabling human to command or interact with machine. Conventionally keyboard or mouse is being used as mode of input. But here he is proposing gestures formed by various color markers as mode of input. So without need of any physical hardware in hand we can interact with machine with the help of just color markers placed on fingers.

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2. Conceptual understanding of system

2.1 Block diagram explanation:
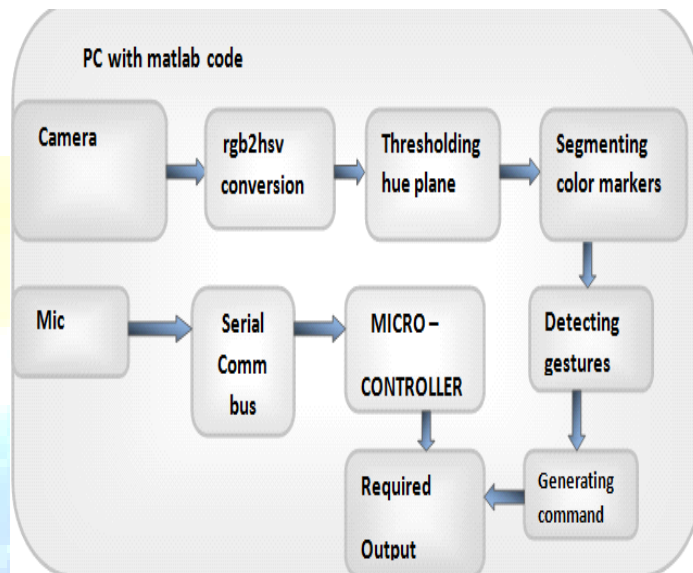
Here we are using USB webcam with 640 by 480 resolution as source of input. Matlab code will trigger the camera and will capture the photo. This photo will be converted from RGB into HSV color space. Hue plane of HSV color space contains all the color information. So by putting some predefined thresholds we can segment some particular colors and in turn color markers form scene. Centroids of these color markers are detected and depending upon their presence and arrangement gesture is recognized. Depending upon gesture, command will be picked up from look up table and will be fed to virtual keyboard, mouse driver. Virtual mouse driver will execute the command and will move the cursor physically. Another input is taken from the mic which would be connected to a plane surface such as paper. The vibrations caused by sliding any other material on that paper would produce an electrical signal which after amplification will be sent to the microcontroller. The camera after recognizing the above pattern will display it on the screen. Hence making it convenient for the user to highlight the page or presentation and make it more interactive.
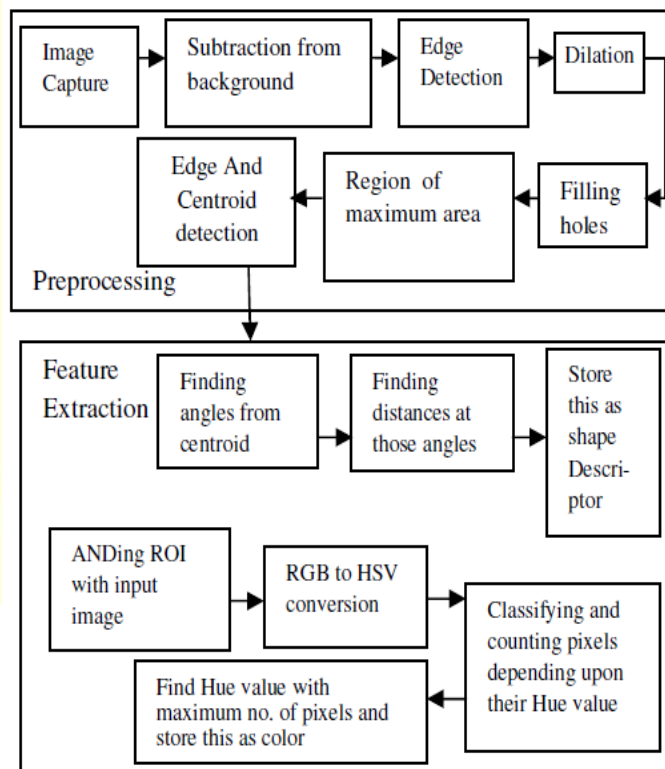
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2.2 Flowchart

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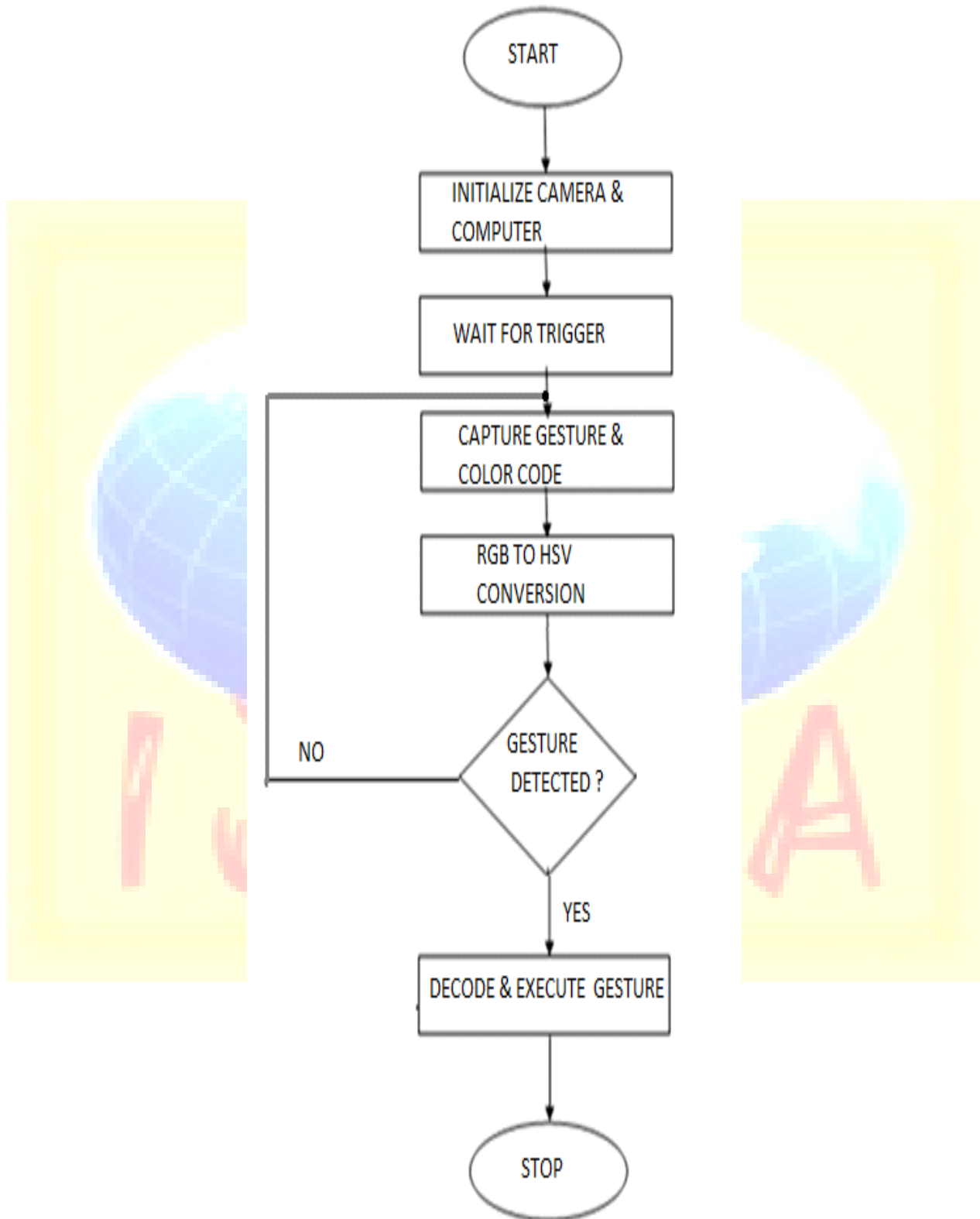
2.3 Algorithm

Algorithm for Gesture recognition :-

- Start
- Initialize camera and computer
- Wait for the trigger
- Capture gesture with color code
- RGB to HSV conversion
- Decode gesture and color code
- Execute Operation
- Stop
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2.4 Block diagram of Image Processing Software

When an object is observed from far distance, its peripheral shape and its color are the prominent feature which distinguishes it from background and other objects. So while

extracting features of the object for identification, its peripheral shape and color are considered, instead of other features like texture and other minute details. The complete algorithm for this prototypic system is implemented in Matlab7.2 software using Image Processing Toolbox.

2.5 Preprocessing
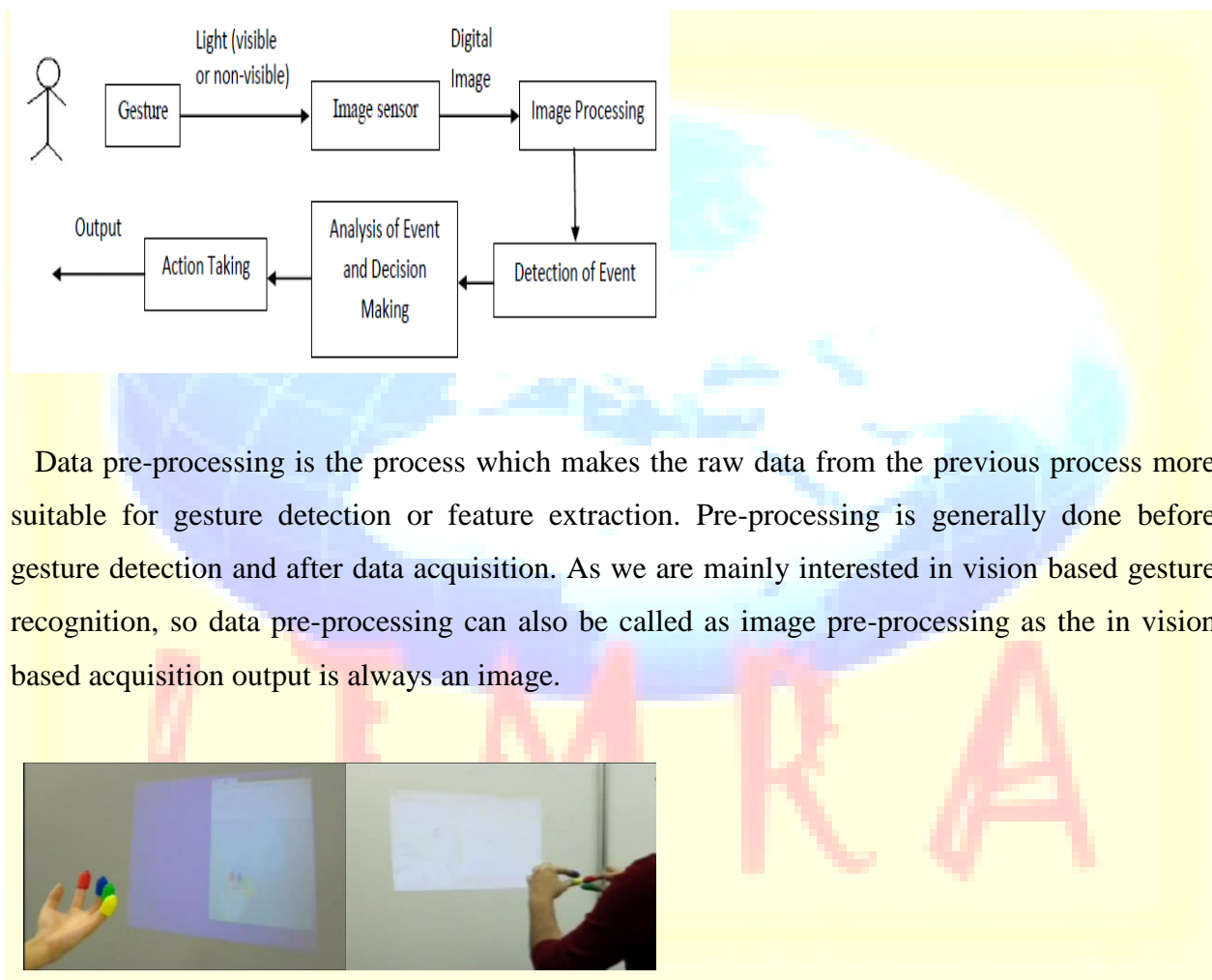
Data pre-processing is the process which makes the raw data from the previous process more suitable for gesture detection or feature extraction. Pre-processing is generally done before gesture detection and after data acquisition. As we are mainly interested in vision based gesture recognition, so data pre-processing can also be called as image pre-processing as the in vision based acquisition output is always an image.

2.6 Hue, saturation and value :-

HSV transforms standard RGB (Red, Green, Blue) color space into a new color space comprised of Hue, Saturation and Intensity (Value).

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- The Hue component can be thought of as the actual color of the object. That is, if you looked at some object what color would it seem to you?

- Saturation is a measure of purity. Whereas Hue would say that an object is green, Saturation would tell us how green it actually is.

- Intensity, which is also referred more accurately as value tells us how light the color is.

3. Hardware and Software requirements

3.1 Hardware Requirements

- **Webcam**
- **Projector**
- **Mic**
- **Microcontroller**

3.2 Software Requirements

- MATLAB: Programming and creating a platform for giving presentation.
- FLASH MAGIC: Loading the source code to the microcontroller.
- PROTEUS: Designing the PCB layout.

4. Application

Viewing Map   Taking Pictures   Drawing Application

Making Calls   Interacting with physical objects   Getting Information
• Product information
• Book Information
• Flight Updates

Four colored cursors are controlled by four fingers wearing different colored markers in real time. The projector displays video feedback to the user on a vertical wall.

- The projector displaying a map on the wall, and the user controlling it using zoom and pan gestures.

- The user can make a frame gesture to instruct the camera take a picture. It is hinted that the photo will be automatically cropped to remove the user's hands.

- A number pad is projected onto the user's palm, and the user can dial a phone number by touching his palm with a finger. It was hinted that the system is able to pin point the location of the palm. It was also hinted the camera and projector are able to adjust themselves for surfaces that are not horizontal.

- The system is able to recognize individual pages of a book and display annotation by the user's friend. This demo also hinted the system's ability to handle tilted surface.

- The system is able to recognize newspaper articles and project the most recent video on the news event on a blank region of the newspaper.

- The system is able to recognize a boarding pass and display related information such as flight delay and gate change.

5. Future scope

- To get rid of color markers.
- To incorporate camera and projector inside the mobile.
- To have 3D gesture tracking.
- To make Sixth Sense work as fifth sense for disabled persons.
- Thermal infrared camera can be used to get colored images depending upon temperatures of various objects of the scene.
- Intrusion of multiple gestures has to be considered.

6. Advantages

- Cost Effective.
- Portable
- Data access directly from the machines in real time.
- Mind map the idea anywhere:.

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25

- Open Source Software.
- System is reliable.
- System provides a natural and convenient interaction interface for presentations.
- No need to access pc or laptop for commanding it.
- Simple gesture made will be recognized by the system.

7. Conclusion

In this study, we design a hand gesture based presentation system by integrating a projector with a Web camera; this system provides a natural and convenient interaction interface for presentations. Quantitative experimental results show that the system performs efficiently. The Web camera is only used for calibration, but additional information could be extracted for interaction, such as the shape of the hand.

8. References

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26