A Mini-Project Report on

# Gesture Recognition for Immersive Gaming

Submitted in fulfilment of Mini-Project (ITM605) of

Semester VI

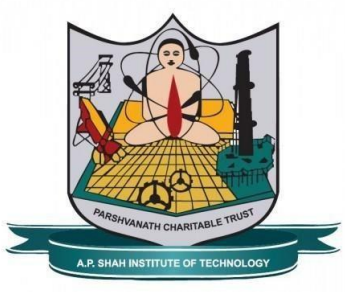
in

Information Technology

By

Divyam Singh (17204007)
Prathamesh Khandare (17204005)
Shahbaz Shaikh (17204018)

Guide – Ganesh Gourshete




Department of Branch Name
A.P. Shah Institute of Technology
G.B.Road,Kasarvadavli, Thane(W), Mumbai-400615
UNIVERSITY OF MUMBAI
2018-2019

CERTIFICATE

This is to certify that

Mr./Ms._____ Student ID _____

Mr./Ms._____ Student ID _____

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has completed all the specified work for submission in Mini-Project (ITM605) of Semester VI, as laid down by University of Mumbai in satisfactory manner within the premises of Institute during the academic year 2018-19.

Prof. Ganesh Gourshete
Guide

Prof. Kiran Deshpande
Head Department of Information Technology

Dr. Uttam D.Kolekar
Principal

External Examiner(s)

1.

2.

Place: A.P.Shah Institute of Technology, Thane

Date:

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We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic with honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Divyam Singh
(17204007)

Prathamesh Khandare
(17204005)

Shahbaz Shaikh
(17204018)

Date:

## Abstract

Over the recent years, Computer Vision has started to play a significant role in Human Computer Interaction. With the development of information technology in our society, we can expect that computer systems will be embedded into our environment. These environments will impose needs for new types of human-computer-interaction, with interfaces that are natural and easy to use. The ability to interact with computerized equipment without need for special external equipment is attractive. With efficient use of available resources, it is possible to track motion of human hand and fingers in real time using a simple web camera. The aim of this project is to enhance the level of immersion in computer games by creating an application that will allow users to interact with the game only using their hands. The proposed application will enable the user to play computer games without the need of either a keyboard or a mouse or any other expensive input devices. The users can play games through various gestures done using only their hands. This is the main background of the project. Therefore, the project aims in replacing the traditional mouse and touch pads with human hand (fingers) to interact with games.

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# Introduction

Games are primarily played on computer system using various input devices of which keyboard and mouse are the most often used. While using these devices, it is just tapping the keys which make changes in the game accordingly.

There also exist other input devices which actually translate a user's body movement in to actions in the game (Example Kinect). This makes the playing experience better and makes the user connected to the game. But these devices are expensive and not every gamer can afford it. An alternative to playing games through traditional input devices is using gestures that system can understand. Hence this topic, "Gesture Recognition for Immersive Gaming" comprises of using Gestures for playing games.

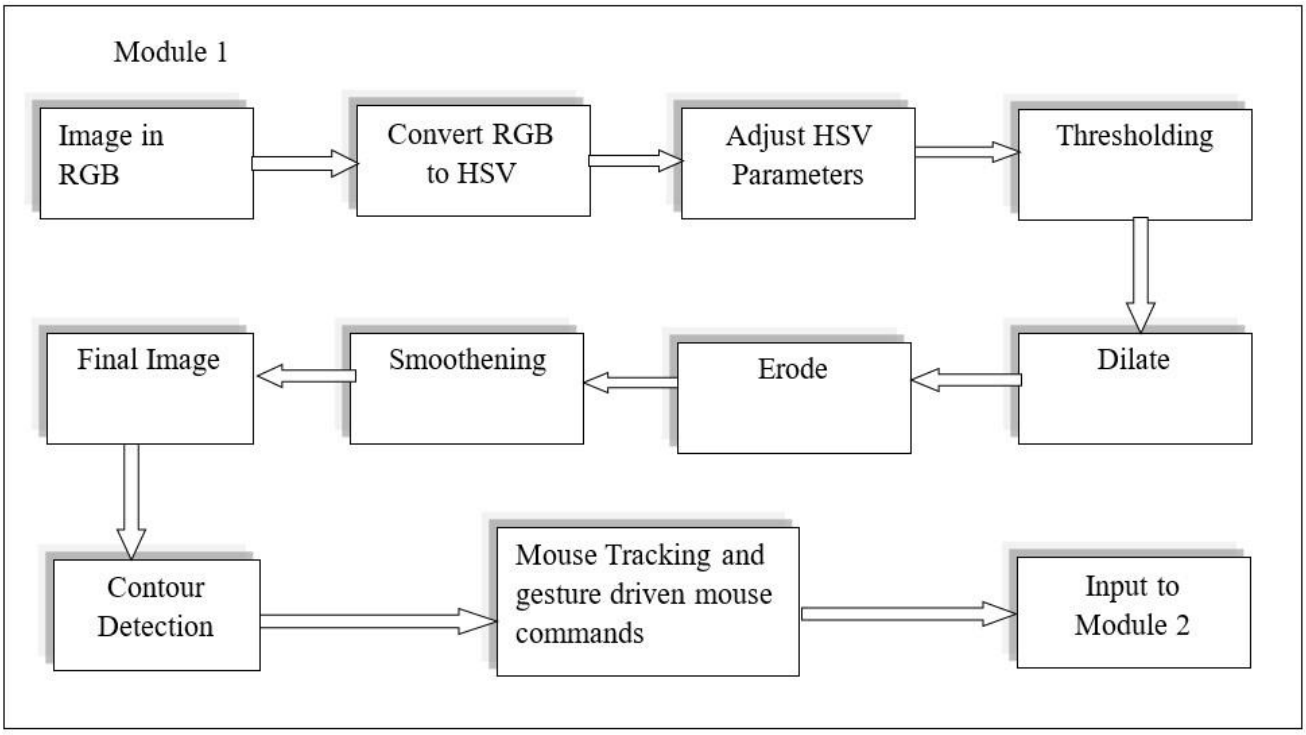
The Aim of this project is to make a low-cost alternative to the existing systems that users can use on their computers without any hassle. The project will cover games that can be played by mouse or keyboard on any computer system .

# Literature Review

The Review of Literature focuses on techniques used for hand gesture recognition and the color spaces used while detecting different colors against the backgrounds.

- The survey done by Ibraheem, Noor A., et al in [1] provides a good knowledge about various color models used for color detection. It is a review paper for different color models used as well as the mathematical representation of each with their corresponding advantages and disadvantages along with their comparison and their suitable application area.
- An approach in [2] narrates skin detection in HSV color space. In order to detect skin from an RGB image it is first converted to HSV as it can be perceived closely as human colors. RGB to HSV conversion is done by using values ranging from 6 to 38 for H and mixtures of different filters to detect skin color.
- Image filtering algorithms are needed to filter out the noise which is the main focus of [3]. Filtering is required to reduce the noise and improve the visual quality of the image.
- The Adaptive boosting [4] for hand detection and haar classifier algorithm to train the classifier was implemented in a system. It used HSV color model for background subtraction & noise removal, convex hull algorithm for drawing contour around palm and fingertip detection.
- Boundary detection algorithm of an object was proposed by S.Satoshi, K.Abe in [5]. The algorithm finds a detailed boundary that includes object's outer border also known as 1component. It also consists of hole-border between the hole and the 1 –component surrounding it directly. This can be modified for detecting convex and concave parts (hulls) of the hand to detect the contours.

## Existing System



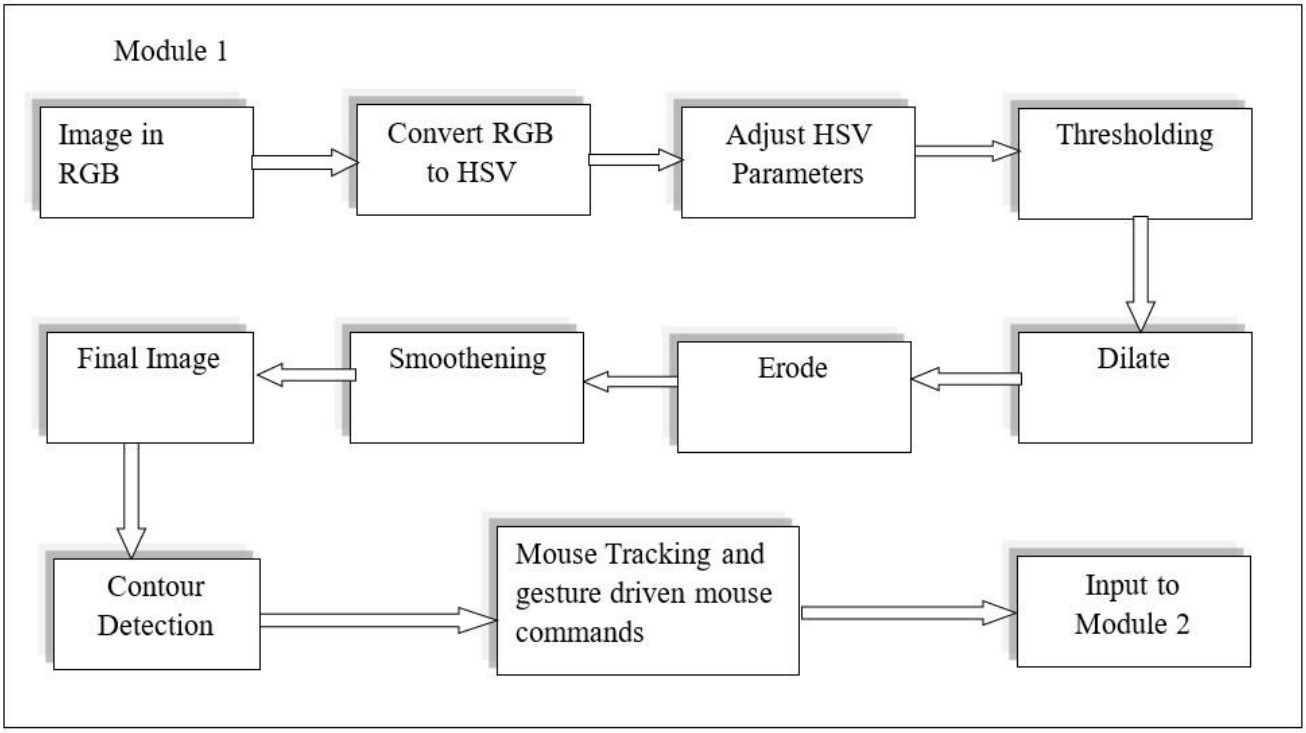
## Problem Definition

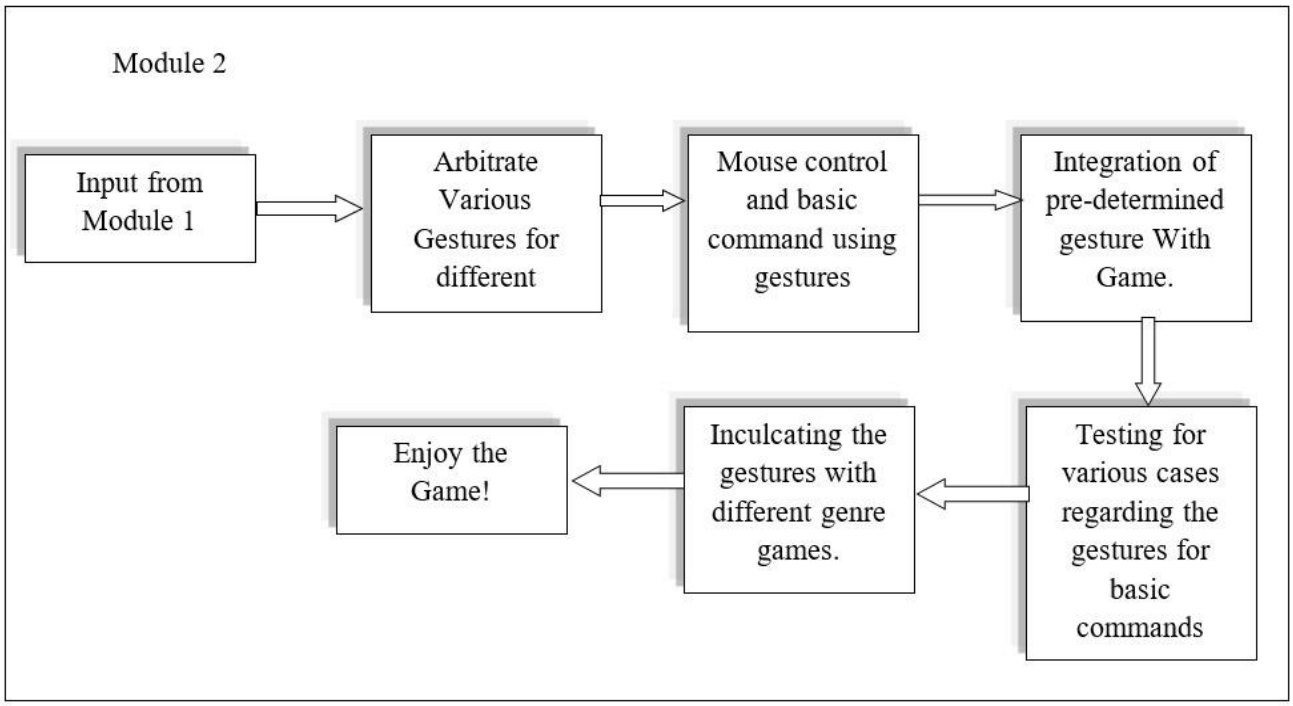
- The aim of this project is to enhance the level of immersion in computer games by creating an application that will allow users to interact with the game only using their hands.
- The proposed application will enable the user to play computer games with their fingers without the need of either a keyboard or a mouse. The application will have an option to tune various background parameters and morphological operations to subtract the environment from the Region of Interest (ROI).
- After Extracting the ROI, the contours will be detected and the inputs will be generated from the gesture and mapped to computer games.
- Thus, the user can use the applications in different environments because of the presence of various parameters that can eliminate the noise.
- Basically, Gesture Recognition for immersive gaming provides gamers an inexpensive platform to control high-end games with gestures.

## Objectives

- To develop interface for human-computer-interaction based on visual input captured by computer vision systems, and to integrate such interfaces to produce actions that replace traditional interfaces based on keyboards, mouse, remote controls, data gloves or speech.
- An approach narrates skin detection in HSV color space. In order to detect skin from an RGB image it is first converted to HSV as it can be perceived closely as human colors.
- Image filtering algorithms are needed to filter out the noise. Filtering is required to reduce the noise and improve the visual quality of the image.
- Boundary detection algorithm of an object.The algorithm finds a detailed boundary that includes object's outer border also known as 1-component.

## Proposed System



# Technology Stack

## Hardware Requirements

- Processor : 1 gigahertz (GHz) or faster 32-bit or 64-bit processor
- RAM : 1GB RAM (32-bit) or 2GB RAM (64bit)
- Hard Disk : 16 GB available hard disk space (32-bit) or 20 GB (64-bit) • Display Driver : DirectX 9 graphics device with WDDM 1.0 or higher driver.
- Web Camera : Capable of capturing true colors.
- Glove : Colored Glove

## Software Requirements

- Coding: C++/TensorFlow, OpenCV
- Operating System: Windows 7/8/8.1/10

## Conclusion

- Hand tracking is the main idea behind the implementation of gesture recognition using webcam. The report throws light on all the major aspects of gesture recognition including the concept of morphological operations like erode and dilate, background conversion and filtering.
- In this project, we have proposed a vision based hand gesture recognition using a simple system connected with a web camera. Minimum hardware is required to detect hand and counting number of fingers and translate the gestures into commands.
- People have been trying to use hands as an interface to computers. This application gives user an easy way to interact with computer games with only their hands.
- With more robust hand detection, this application can replace the mouse.

## References

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[4] G.R Manish, and P.K Kadbe. "Real time finger tracking and contour detection for gesture recognition using OpenCV" *Industrial Instrumentation and Control (ICIC), 2015 International Conference on*. IEEE, 2015.

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