International Journal of Engineering Research and Development
e-ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 11, Issue 09 (September 2015), PP.01-07

Gesture Gaming on the World Wide Web Using an Ordinary Web Camera

Sai Eshwar Prasad M[1], Sai Shankar Nag M[2]
[1]*Nokia Networks, India.*
[2]*Cognizant Technology Solutions, India.*

Abstract:- Gesture gaming is a method by which users having a laptop/pc/x-box play games using natural or bodily gestures. This paper presents a way of playing free flash games on the internet using an ordinary webcam with the help of open source technologies. Emphasis in human activity recognition is given on the pose estimation and the consistency in the pose of the player. These are estimated with the help of an ordinary web camera having different resolutions from VGA to 20mps. Our work involved giving a 10 second documentary to the user on how to play a particular game using gestures and what are the various kinds of gestures that can be performed in front of the system. The initial inputs of the RGB values for the gesture component is obtained by instructing the user to place his component in a red box in about 10 seconds after the short documentary before the game is finished. Later the system opens the concerned game on the internet on popular flash game sites like miniclip, games arcade, GameStop etc and loads the game clicking at various places and brings the state to a place where the user is to perform only gestures to start playing the game. At any point of time the user can call off the game by hitting the esc key and the program will release all of the controls and return to the desktop. It was noted that the results obtained using an ordinary webcam matched that of the Kinect and the users could relive the gaming experience of the free flash games on the net. Therefore effective in game advertising could also be achieved thus resulting in a disruptive growth to the advertising firms.

Keywords:- *Gesture gaming, Human Computer Interaction, Human Activity Recognition, Pose Estimation, Pose Consistency*

I. INTRODUCTION

Human Computer Interaction (HCI) involves the study, planning, and design of the interaction between people (users) and computers. It is often regarded as the intersection of computer science, behavioral sciences, design and several other fields of study. On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant. On the human side, communication theory, graphic and industrial design disciplines, linguistics, social, cognitive psychology, and human factors such as computer user satisfaction are relevant. HCI aims to improve the interactions between users and computers by making computers more usable and receptive to users' needs and interests in:

- methodologies and processes for designing interfaces
- methods for implementing interfaces
- techniques for evaluating and comparing interfaces
- developing new interfaces and interaction techniques
- developing descriptive and predictive models and theories of interaction

A long term goal of HCI [7] is to design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and the computer's understanding of the user's task.

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. A gesture is a form of non-verbal communication or non-vocal communication in which visible bodily actions communicate particular messages, either in place of, or in conjunction with, speech. Gestures include movement of the hands, face, or other parts of the body [8]. The movement of gestures can be used to interact with technology like computers, using touch or multi-touch popularized by the iPhone, physical movement detection and visual motion capture, used in video game consoles.

End-user development studies how ordinary users could routinely tailor applications to their tailor needs and use this power to invent new applications based on their understanding of their specific domains. With their domain knowledge of their own knowledge domains, users could increasingly be important sources of new applications at the expense of generic systems programmers.

[2] Embedded systems make the environment alive with little computations and automated processes, from computerized cooking appliances to lighting and plumbing fixtures to window blinds and automobile braking systems to greeting cards. Human interfaces to these embedded devices will in many cases be very different from those appropriate to workstations.

[1] A common staple of science fiction, augmented reality refers to the notion of layering relevant information into our vision of the world. Existing projects show real-time statistics to users performing difficult tasks, such as manufacturing. Future work might include augmenting our social interactions by providing additional information about those we converse with.

II. RELATED WORK

The Nintendo Wii has many advanced features compared to previous Nintendo consoles. For example, the primary wireless controller (the Wii Remote) can be used as a handheld pointing device and detects movement in three dimensions. [4] demonstrates the success of Wii over other gesture devices. The Wii Remote is the primary controller for the console. It uses a combination of built-in accelerometers and infrared detection to sense its position in 3D space when pointed at the LEDs in the Sensor Bar. This design allows users to control the game with physical gestures as well as button-presses.

Kinect [3] is a motion sensing input device by Microsoft for the Xbox 360 video game console and Windows PCs. Based around a webcam-style add-on peripheral for the Xbox 360 console, it enables users to control and interact with the Xbox 360 without the need to touch a game controller, through a natural user interface using gestures and spoken commands as in [6]. Kinect uses a depth aware camera to obtain the depth in images acquired in real time. It later computes the depth and feeds it into the Xbox or desktop where the computations are done and the game controls are done accordingly. Detailed information regarding the success of kinect in Human pose estimation can be found in [5].

Both of the powerful gesture devices today were found to have the problem of a high cost. Due to the cost the commercial success could not be achieved compared to the sales of an ordinary game. Here we are trying to introduce the gesture based interface to enable users to play such games without expensive devices and the use of devices already available with systems. Our model is focused on substituting a kinect and a Wii remote by just processing the current image from a webcam with the previous and next images for valuable input to the system regarding probable gestures so performed.

III. METHODOLOGY

Our work initially started off with developing the algorithms on matlab platform for various offline flash games with all image processing done at backend. Once developed these were tested by the team and by a common gamer for necessary changes. Here all of the image processing was done in matlab in the back end. A flash game will be opened simultaneously when the code is running and the user will be asked to place his hand in a particular area to take a snapshot of his palm. Once we have a clear photo of the users palm, hand or body which would perform natural gestures; we then track these in real time for changes amidst optical flow. Depending on the centroid, area, position, orientation etc the commands relevant to the same are issued by a virtual keyboard or the mouse. We can control the mouse and the keyboard programmatically using the robot class as has been demonstrated earlier by works like [7].

Once we had certain set of results and finished with the test cases we later developed a matlab code that opens a URL of a game and lets the user play a few similar games on the World Wide Web. The gaming framework is designed & developed in java using Eclipse Juno for various kinds of games ranging from shooting to boxing and racing to flying. Here we basically create a .EXE file from the .JAR file that we have obtained earlier during testing, install a few components related to gestures, camera, mouse and keyboard control [9] in the codes. Once we found it working in tact we also switched to the web component so that the URL can also be opened by the game for advanced games on the net.

In certain cases the user may want to move out of a game while playing the same. In order to have better user experience we installed 2 components. Firstly the one that provides a 10 second video documentary on the game and what are the various gestures that can be performed in the game and also the various components that can be treated by the system as traceable entities. This provides the user with some input whether to go ahead with the game or to choose some other game available among the various options. Once the user places his palm for instance in a red box appearing on the screen. The system automatically configures the RGB values of the users palm and using the kalman filter it obtains the various positions of the palm along with the area, centroid, etc. Now if the user has configured an incorrect input then the user would have the option to break out of the game using the esc key.

These .exe files are later hosted from a central server, upon which users can access the game by landing on the home page. The user will be asked to provide control of his webcam and to install a few components. Normally it is very difficult to control the mouse and the keyboard using a web browser as anyone would be able to incept a malicious content to the users falling into their webpage. Due to this reason the user will be asked to disable the firewall and windows defender and install certain java files. Once the user gives all of the permissions from the users system the image captured for the first time would be stored in the temporary files folder on the system and all of the image processing happens on the client side. Once the processing is done, programmatically the java API that resides the main game controls the mouse and the keyboard to make it perform several functions based on the gestures input, like mouse press and release, key press and release etc.
During the beginning, breaks, ending of the game from the server side the admin can introduce ads. Thus it results in effective delivery of the in game advertisements.

IV. RESULTS

It was noted that for games like boxing and bowling which involve just the movement of the hands, the accuracy was close to 95%. Figures (1-3) demonstrate some users playing a game of boxing and bowling. Here more emphasis is laid on the increase and decrease of the area, movement of the centroid, position in 3d space of just the palm

Fig. 1: Demonstrates the boxing game using hand gestures

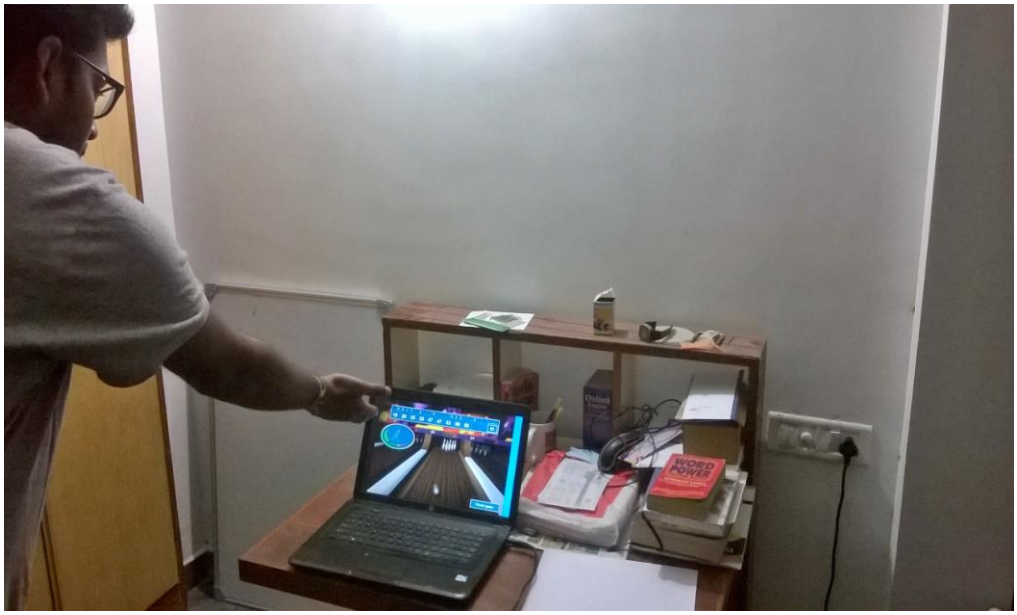

Fig. 2: Demonstrates bowling game using gestures

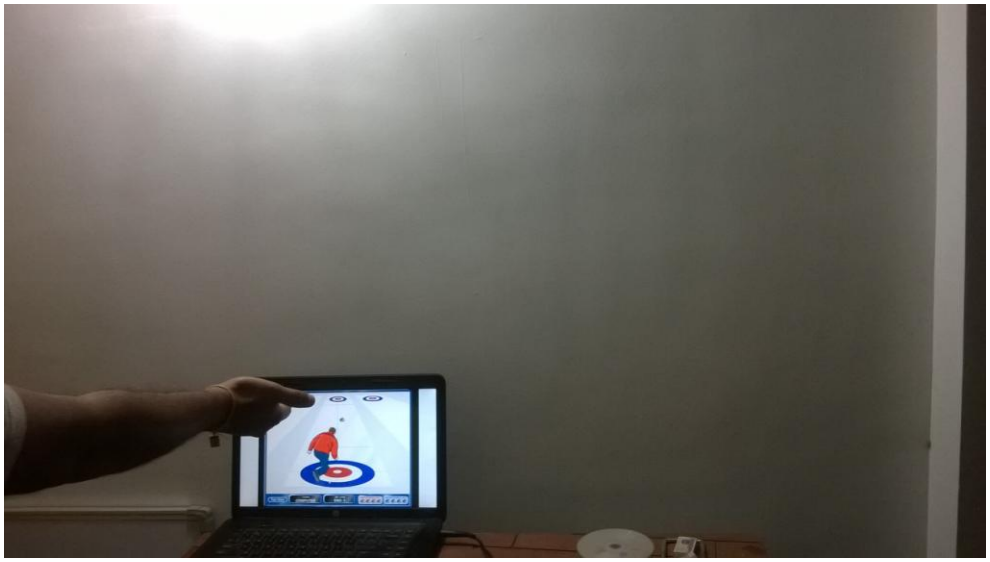

Fig. 3: Demonstrates curling game using gestures

Some games like skating and water surfing which involved more of a mouse based moves were easier to implement and control and the position was tracked close to 90% of the times. Users need not have to go out to skating stadium or skate on road; they could have a simulation of the same at their home and could get a more realistic feeling of skating. Figures (4) demonstrate the same.

Fig. 4: Demonstrates skating using bodily gestures

For games that involved racing like bike racing and car racing the objective was to track the skin mainly and other items that would change along with the skin. Though for car racing games users usually tend to imagine themselves under the steering wheel thereby playing a car racing game could prove a lot more robust than the bike racing game. For the game racing game on the other hand users tend to tilt besides moving their hands. Hence there is a strong necessity to track the pose of the user and how consistent the pose might be given a fixed interval of time. For bike racing in certain cases there is an immediate check with the on screen image if the bike is heading towards the center of the road or farther away from the center of the road. Depending on the same it would be easier to track the user's pose in real time. While the car racing works for about 90% of the times the bike racing on the other hand only worked accurately for 85% of the times. Figures (5) & (6) demonstrate the racing games using gestures.

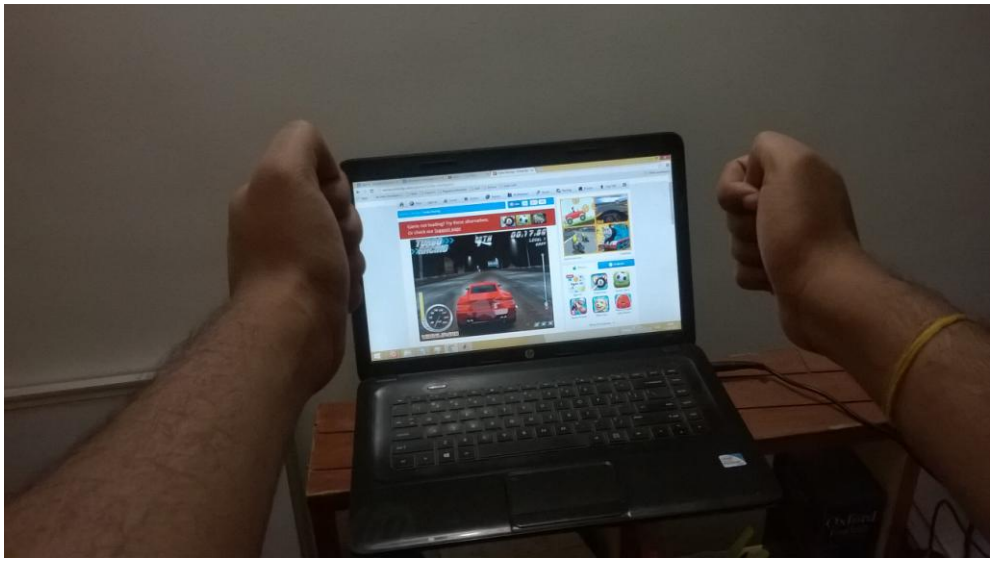

Fig. 5: Shows the user playing a car racing game

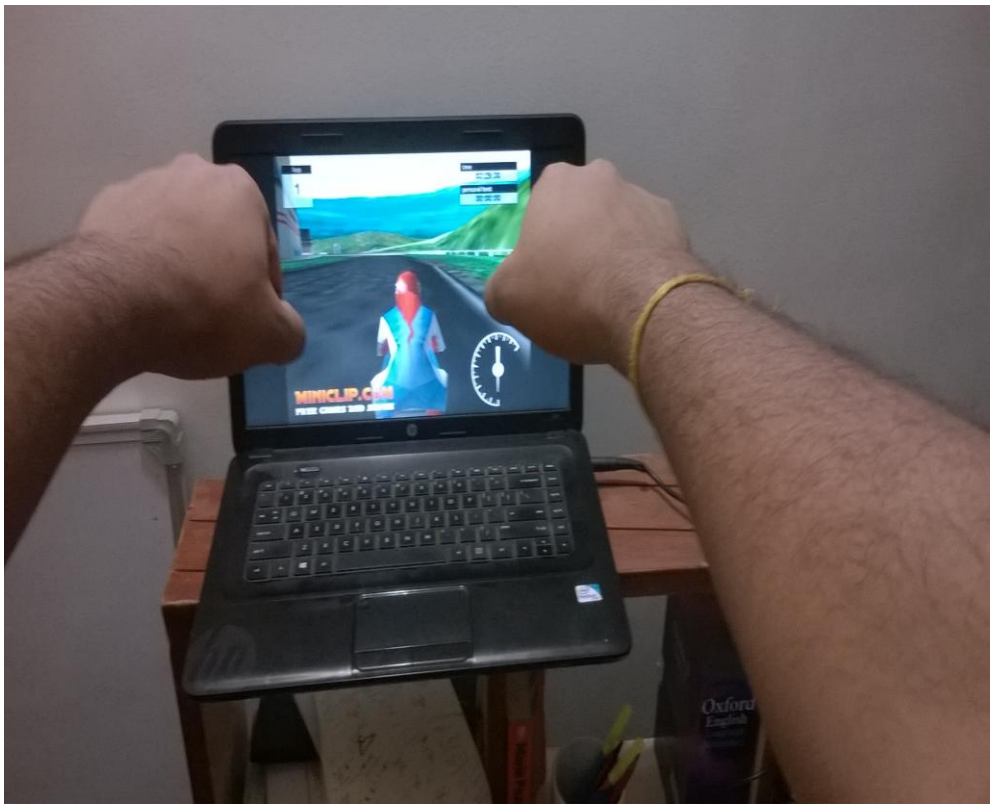

Fig. 6: Demonstrates the user playing a bike racing game

Shooting games have forever fascinated gamers around the world. Developing an interface to detect the tilt and pointing gestures of the hand is a very difficult task on an ordinary web camera. Here we basically employ a technique where both the fair and dark portions of the right hand is tracked. An increase in one area results in the decrease of the other area. The place where it is pointing to is basically determined by the skeletal model of the hand. Figure (7) demonstrate an sample shooting game played using gestures. The processor has to be really fast to determine the orientation angle, pointing position and shooting actions from the user. The results were close to 85%.

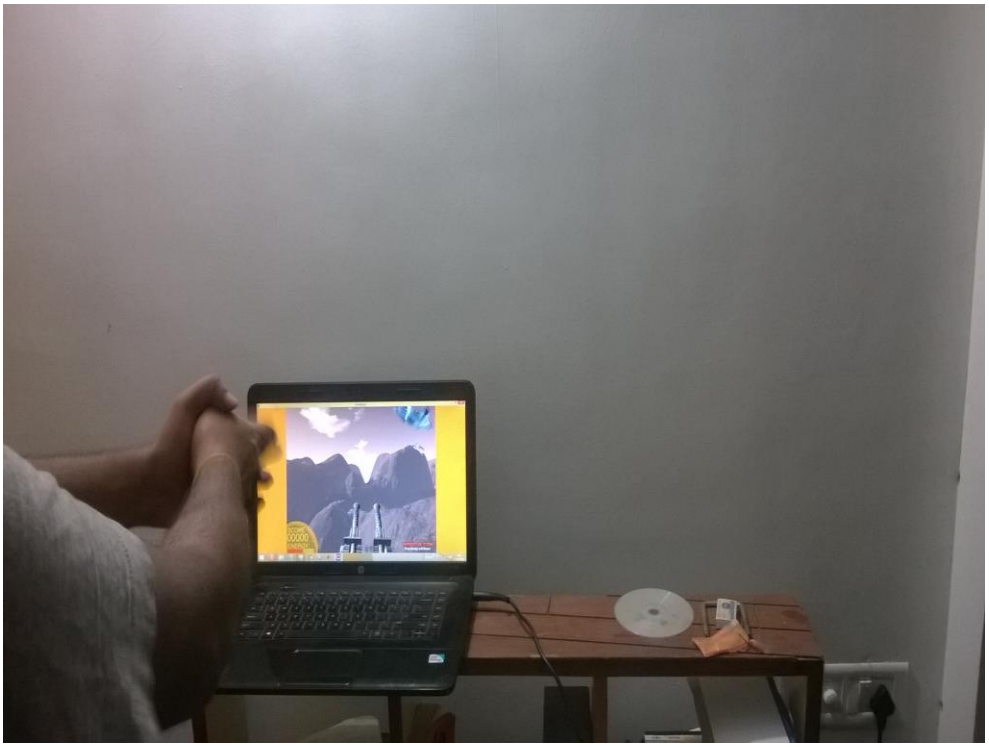

Fig. 7: Shows a gesture based shooting game

V. CONCLUSION & SCOPE FOR FURTHER WORK

So we have successfully developed gesture games which can be played by users using an ordinary web camera. This results in the disruptive demand for the old flash games which were earlier redundant and provides with a new beginning and methods for playing. The work thus enables people without any access to an expensive device like a kinect to play gesture games using an ordinary web camera. It also helps every user to relive the gaming experience and helps in the advertisers offering free flash games effective methods for the delivery of in game ads thereby increasing their revenue. The work developed here would be available to the public free of cost and almost anyone with a webcam and net connectivity from their desktops/pc can play gesture games.

There is a lot of scope for further development of the aforementioned work. The above work is only concerned towards windows operating system. In the future people can extend the work to IOS and Linux operating systems. These days almost everyone has a mobile phone with a back and front camera so efforts shall also be made to incorporate a platform that will enable mobile phone users also to play gesture games.

ACKNOWLEDGMENT

The authors express their sincere gratitude to Principal Dr. Venugopal K.R, University Visvesvaraya College of Engineering, Bangalore, for their constant support in completing this research work.

REFERENCES

[1]. INCREMENTAL AND RADICAL INNOVATION : DESIGN RESEARCH VERSUS TECHNOLOGY AND MEANING CHANGE, Donald A. Norman and Roberto Verganti, esigning Pleasurable Products and Interfaces conference in Milan, 2011

[2]. Jamie Shotton, Ross Girshick, Andrew Fitzgibbon, Toby Sharp, Mat Cook, Mark Finocchio, Richard Moore, Pushmeet Kohli, Antonio Criminisi, Alex Kipman, and Andrew Blake, Efficient Human Pose Estimation from Single Depth Images, in Trans. PAMI, IEEE, 2012

[3]. http://en.wikipedia.org/wiki/Kinect

[4]. Pavlovic, V., Sharma, R. & Huang, T. (1997), "Visual interpretation of hand gestures for human-computer interaction: A review", IEEE Trans. Pattern Analysis and Machine Intelligence., July, 1997. Vol. 19(7), pp. 677 -695.

[5]. R. Cipolla and A. Pentland, Computer Vision for Human-Machine Interaction, Cambridge University Press, 1998,ISBN 978-0-521-62253-0

[6]. Ying Wu and Thomas S. Huang, "Vision-Based Gesture Recognition: A Review", In: Gesture-Based Communication in Human-Computer Interaction, Volume 1739 of Springer Lecture Notes in Computer Science, pages 103-115, 1999, ISBN 978-3-540-66935-7,doi:10.1007/3-540-46616-9

[7]. Alejandro Jaimesa and Nicu Sebe, Multimodal human–computer interaction: A survey, Computer Vision and Image Understanding Volume 108, Issues 1-2, October–November 2007, Pages 116-134 Special Issue on Vision for Human-Computer Interaction,doi:10.1016/j.cviu.2006.10.019

[8]. Dopertchouk, Oleg; "Recognition of Handwriting Gestures", gamedev.net, January 9, 2004 Chen, Shijie; "Gesture Recognition Techniques in Handwriting Recognition Application", Frontiers in Handwriting Recognition p 142-147 November 2010