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# VIRTUAL GAME CONTROLLER USING REAL TIME IMAGE PROCESSING

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## Abstract

Using a web camera device, a system will be created where any object like pencil can be detected and can be converted to a game controller.

Without touching the computer, everything can be controlled inside it. It will give touch-screen approach to the devices without being touch enabled.

**Keywords:** Game; controller; image; convex-hull.

## Introduction

The present technology era has got us many advances in our daily lives. Whether it is your handheld device or your car, everything around you is starting to turn automatic. But as we see broadly, there are many people in this world who don't adapt technology either due to money problem or perhaps they don't want to.  This technology has a broad space for gamers and game developers as well.

We notice that, the gaming devices are getting very expensive these days and keeping that in mind, we build a system where a user can define his own new gaming controller which will use a PC's local camera to detect the device and convert it into a gaming controller. In this paper, we will see how an object can be detected in real time.

## Literature Review

In the domain of gaming, there have been systems that exist and perform similar task to that of ours but having some of the limitations like no custom game controller.

A.  Microsoft Kinect

One of the most famous techniques we have studied is about Microsoft Kinect, which was codenamed in development as Project Natal [1].

It is a motion sensing input device for gaming consoles like Xbox one and windows PC. It enables user to interact with their consoles or games without the need for a tangible game controller using gestures.

B.  Camera Mouse

Another technique developed at Boston College is Camera Mouse [2]. This project help disabled people to interact with computer either with their eyes or with anything they want. It works as a mouse controller replacement for windows computers to run about all applications [3].

C.  Hands free computing

It is a computer configuration where a user can interact with the computer without the use of hands. It has proven to be useful for both abled and disabled users. Many developed hands free computing devices include QuadJoy, Tetra Mouse, Smart Nav, Fast Track and Voice Finger[4][5][6]. It requires no physical connection with the console but works all wirelessly either with the help of web camera, a microphone or bluetooth.

**Proposed System**

In a practical scenario, while buying gaming console it is observed that the high-end gaming consoles often costs too much money. This cost can reduce to Zero if the controller becomes any daily object and be integrated into games for a controller like functionality.

This custom object will provide the functionality of a game controller. The web camera will detect the object-using image processing algorithm and will further integrate it, to use as a motion controller. This application allows users to interact with their computer without the need of a controller through a very simple user interface. It detects the objects to be used as a controller using a web camera. It identifies the operation of research and dynamic nature of new system that can be extended in near future.

Using several image processing techniques, we define an area where real time image will be displayed. The image displayed in the image box will identify an object that could be used as a game controller [7].

Whenever a person will open a game,where controller is required, then a dialog box will open, and it will ask the user to select object, after selecting the object, the user will be asked to put keep selected object in front of the webcam. Webcam will then start scanning that object, and after few seconds, the gamer is ready. The object, which is kept in front of the webcam, is now converted into a game controller. Suppose, a pen has been chosen as object. Now when the game starts, the user doesn't need either mouse or any external controller device. Instead will be using that pen as the game controller device. The way it will move its pen, the same way the character or object inside the game will move. Let's assume that it's a car game, then if one has placed the pen horizontally, then if he/she will move the left side of the pen, the car will go towards the left side and if he is moving the right side of pen, same way car will move on the right direction.

**Design**

Here, how the object is being tracked as a controller is based on taking the measurements of the object. That is by taking the length, breadth, diameter and radius. The specifications of the object are noted by the system. The system tracks the objects movements with a video camera and translates them into the movements of the mouse pointer on the screen. Translation is being done by considering the object as an image and by performing certain image processing techniques. This is how the object is acting as the game controller. Thereby, specifies that there is no need for any external controllers like steering wheel, etc. The same working is done on any type of object that the user has chosen [8]. To explain the detailed working of the proposed system through this paper is well explained using various modelling techniques. Here to better understand it, we are using the UML diagrams to illustrate better.
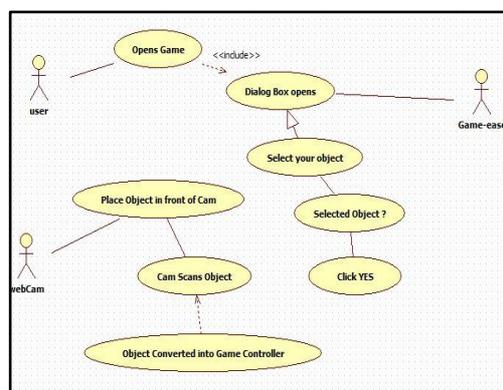


**Fig.1:Use case diagram for Virtual Game Controller Application.**

In Fig. 1, we have shown how actually when you select the game to play works with the help of our system. Automatically the application asks you to select your object and then the webcam converts it into a Game Controller. In Fig. 2, we took an example of an object considered as pen. How it will be working is clearly shown. That is, if you are moving the left side of pen, car will move towards the left side and if you are moving the right side of the pen, car will move towards the right side. In the diagram, L. Side refers to left hand side and R. Side refers to right hand side [9].
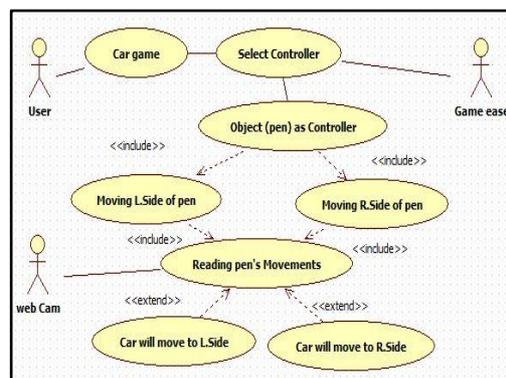


**Fig.2: Example of taking pen as object.**

In Fig.3, it is explained how an object is scanned and then its measurements such as length, breadth, diameter, and radius are stored into the system. This is the way object becomes the controller as when it's moved, its earlier stored measurements are compared with the new ones, that is how this system works.
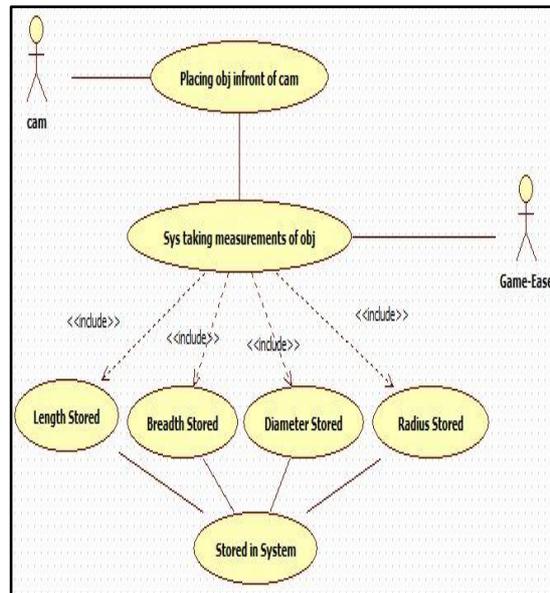


**Fig.3: This is how object is tracked as a controller.**

## Proposed Algorithm

Invoke web camera

- Apply Image filtering to obtain the boundaries of the object with similar color

- Perform Eroding operation on the image

    o Take a structuring element of rectangle shape size 10x5

    o Iterate once

- Perform Dilation operation on the image

    o Take a structuring element of rectangle shape size 6x3

    o Iterate thrice

- Smoothen the image using Gaussian filter to obtain the object.

- Apply Convex Hull algorithm to retrieve the perfect shape of the object.

- Find center of the object and divide the coordinates by 5 to bring steadiness.

## Limitations

- Does not perform well if there is a lot of disturbance in the noise

- Integration with gaming applications due to several security measures by developers.

- Support only for windows PC

- All controls of a typical game controls are not present.

**Conclusion**

There are several applications, algorithms and devices available over the Internet and market where we can experience the ultimate joy of technology. The games that are played on laptops and consoles have their own functionalities and features, which are in demand by the consumers. This application provides a new unique feature of custom game controller integration in real time which can bring the hefty costs down to nil and also can give a feel of touch enabled devices to non touch devices.

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