VIRTUAL INTELLIGENT DRAWING SOFTWARE TOOL

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ABSTRACT

Painting and drawing software are rapidly produced by the software industry. Each of them has its own pros and cons. One of the main disadvantages of these drawing software's is the lack of accurate pointing devices. As gesture recognition technology has improved, it has been applied to various consumers' appliances to provide natural interfaces. Drawing annotations with 3D hand gestures in augmented reality is useful for creating visual and spatial references in the real world, especially when these gestures can be issued from a distance. Here we introduce the VIDI (Virtual Intelligent Drawing system), which is a gesture based painting software for professional and nonprofessional use. It uses the hand movements for drawing. User does not need an external hardware-pointing device to draw. Instead, the different gestures of the fingertips are used to activate the drawing functionalities such as pen-up, pen-down, copy, paste drawn shape etc. We designed this system as a primary level software product, which aims to provide entertainment to the user. The software can be further upgraded by adding extra drawing features. Tracking hand is based on fingertip area detection. The gestures will be detected based on the outline of the hand using colored gloves.

Keywords: Hand Gesture Recognition, Intelligent Drawing, Image Processing.

INTRODUCTION

Gestures are widely defined due to its wide variety of applications and uses in particular domains. Gestures are considered the most primary and expensive form of human communication and the reason behind is the importance of gestures for computer interaction with human. (Archana et al., 2012) have defined the gestural taxonomy that is the motion of body intended for communication. Fingers, hands, arms, head, face or body movement produces these gestures. Since hand gestures will be used for computer interaction then to have a successful communication, both the sender and the receiver must have the same set of information for particular gesture. Successful communication generates meaningful information to interact with the environment. Gestures provides more flexibility for interacting with environment compared to graphical user interface like mouse and keyboards. Gestures are categorized by the involvement of the human body in to: hand and arm gestures, head and face gestures, body gestures. Among all the gestures stated previously hand gestures are the most expressive and used more frequently. The use of hand gesture for computer interaction communication generated the motivation for a research for hand gesture recognition. Understanding the static and dynamic gestures over period is the process of hand gesture recognition.

Through the decades algorithms developed and many algorithms have been proposed for hand gesture recognition. Different attempts used to solve the hand gesture recognition problem using gloves based devices, vision based techniques and specific types of cameras and sensors.

When looking at the local markets, this project might be seen as a rare project in such a field, since not so many projects are there for use by all types of users. In addition, the product might get the idea of wireless drawing into attention of the public and start getting them interested into how such a project was made possible. Such project could be used in art schools to increase creativity level and interaction of students. Since it is a digital drawing technology, it will have less negative environmental impacts as there is no need to use papers or toxic materials in paint.

The following are the project objectives:

- Software can be used on any PC.
- Allow user to save and load their work for later use.

- Allow user to perform editing features such as cut, paste, copy shapes, choose color, and erase shape, clear shape, change stroke size, and change brush type to draw.
- Allow user to import shapes to apply drawing on it drawn.

The rest of this paper is organized as follows. Section II describes research methodology. Section III describes how VIDI works, its functionalities, prototype and output. Finally section IV concludes our work and outline future research directions.

RESEARCH METHODOLOGY

Gestures are widely defined due to its wide variety of applications and uses in particular domains. Gestures are considered the most primary and expensive form of human communication and the reason behind is the importance of gestures for computer interaction with human. (Archana et al., 2012) have defined the gestural taxonomy that is the motion of body intended for communication. Fingers, hands, arms, head, face or body movement produces these gestures. Since hand gestures will be used for computer interaction then to have a successful communication, both the sender and the receiver must have the same set of information for particular gesture. Successful communication generates meaningful information to interact with the environment. Gestures provides more flexibility for interacting with environment compared to graphical user interface like mouse and keyboards. Gestures are categorized by the involvement of the human body in to: hand and arm gestures, head and face gestures, body gestures. Among all the gestures stated previously hand gestures are the most expressive and used more frequently. The use of hand gesture for computer interaction communication generated the motivation for a research for hand gesture recognition. Understanding the static and dynamic gestures over period is the process of hand gesture recognition.

(Rababaah, 2013) stated that there are two main ways to produce sign language recognition system by, data gloves based and vision based. The data glove approach that includes censored-gloves that detects the position of the finger establishing a data vector that uniquely represents a gesture. The vision based approach uses image processing to segment and extract the hand gesture from the environment to precisely represent a gesture pattern. (Rababaah, 2013) stated that the approach provided a multi-color based glove used to establish uniquely patterns of the different hand signs. The approach used image processing to recognition, transform a visual hand gesture into spoken letters, and displayed text. The testing included RGB-filter in the segmentation stage by collecting sample image frames of individual signs then sampling each fingertip multiple times. For each of the sample the mean and sigma tolerance was computed then for each sample the calibration accuracy was computed to test if it is acceptable in the range. The system generated accuracy greater than 93 percent.

Nowadays user interaction approaches has developed between user and computer for more flexible communication. Machine learning and computer vision started to be considered in the latest produced applications. (Benjamin et al. 2017) produced a "Gesture based augmented reality annotation" that presented different annotation drawing techniques for issuing arrow, circle, and free form annotations in mid-air or at real world surfaces at a distance. Shapes considered are all made up of strokes are drawn as free-form annotations. The proposed system designed three different drawing methods: surface drawing, air drawing, and mid-air drawing. Surface drawing is applied directly on detected surface. Both air-drawing and mid-air drawing is applied directly at the user fingertip. Different types of gestures are included in the system, pinch and drag gestures are used to perform the drawings by both applying and releasing the gestures.

PROPOSED WORK

In this section, we discuss the technicality of the project by describing the type of the project to develop and its functionality. We will also represent the project application development types.

We will connect a camera that OpenCV will use to get the required input to write the algorithms and send output to the SDK. The SDK is used to record and save gestures and sent to OpenCV to analyze them and send the results back. Software used, programming language: JAVA IDE: NETBEANS and additional libraries: OpenCV. Hardware

used a normal camera with the required resolution Blue or pink colored pair of gloves and a laptop with Core i5 or above.

This project aims to provide a software that allows user to create digital drawings using hand gestures. User can edit the drawings using editing features such as cut, paste, copy, erase and save shape. The user also has multiple options for drawing such as changing colors, stroke thickness and brush type. Figure 1 shows the context diagram of VIDI with all of the mentioned features.

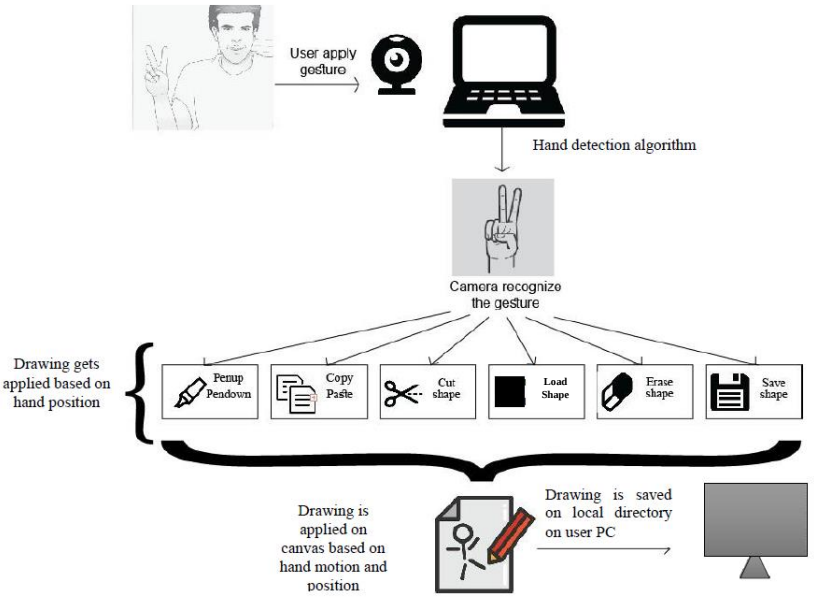

Figure 1: The Context Diagram

The aim of our project is to use a normal camera rather than a camera that contains motion and depth sensors to track motion. The reason behind this is that we want to show that motion tracking can be done using minimum requirements.These project functionalities all work in a similar manner.Translating hand gestures into commands this functionality will require OpenCv to read hand gestures from the user through the camera that will be used and using different algorithms to analyze the gesture, compare it to its match in the dictionary and display or compute the command associated with the hand gesture on the screen. In our software, we will be using algorithms to detect the color of the glove then we will be later associating the gestures for the commands.Detecting hand motion for drawing, this will be the main aim and concept of our project. As soon as a certain gesture is read, the user will have to move his/her hand to draw whatever they want by hovering over certain positions on screen. The diagram drawn will then be processed by the software, converted into an image type file, and then shown on the screen for the user to see what is drawn.This software allow user the total freedom to start and pause or end the drawing experience under any circumstances for any reasons that fit the user needs. Having this feature provides user with more flexible experience.

Once the gesture is identified then the user will be able to edit the shape he/she is drawing by performing gestures. Editing features include, erasing the shape drawn, clear the shape drawn, copy the shape drawn, paste the shape drawn, and finally they will be able to cut the shape drawn. The user will be introduced to the editing gestures by the handbook that comes with the software. Previously drawn shapes once retrieved that user will be able to draw, copy/paste whole shape and erase the shape. Copy/paste the shape is one of the challenging functions to be applied in the system, so the developers team decided to perform the copy/paste for the specific shape based on user hand position on area targeted to apply command and this will help user drawings to be more customized.Choosing the color of a drawn shape is one of the available features from the system that will allow the user choose the color needed from sequence of colors. These colors will be available on the screen where the user is drawing as in figure 1. Once the color is chosen, it will be applied to the drawn shape and the user will have the freedom to choose

another color when needed to color the drawn shape. Importing shapes will help users to have more flexibility, more variety and more creativity to drawn shapes or designs. User perform pen down first and place his/her hand over desired area on screen canvas to import the circle and/or square shapes.User can choose stroke size to be large or small before drawing or while drawing.User can choose stroke type dotted or flat and to be large or small before drawing or while drawing. The following figure 2 shows the uses case diagram for the editing features.

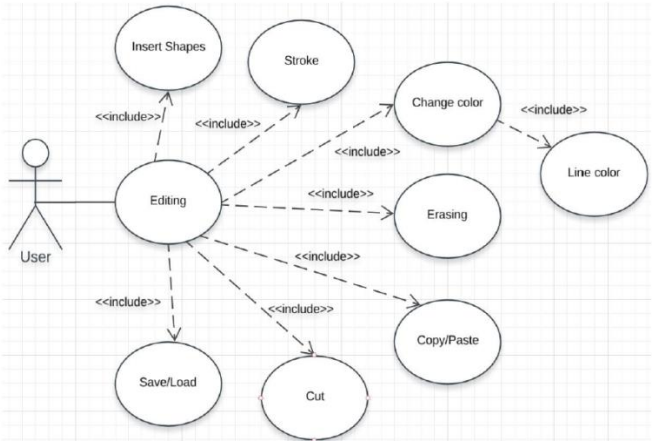

Figure 2: The Use Case Diagram

Figure 3 illustrates the activity diagram of VIDI. Once user load the software the user press the start button, which directly opens the live stream from the camera, where the image processing starts. Once the gesture is recognized the gesture is translated into, commands from user ad apply drawing command. However if user paused the software they can either choose to quit or continue. Figure 4 illustrates the user interface of VIDI where it contains three main sections, one for hand gesture and motion the second for canvas for drawing and the third is for the editing command. This is the output of the software with the aim of having user-friendly interface allowing users of different ages to communicate with the software freely.

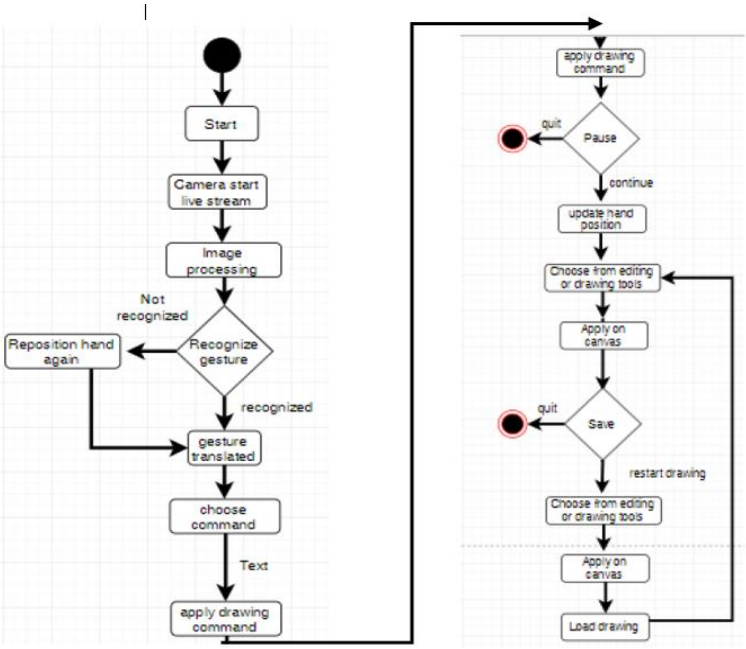

Figure 3: The Activity Diagram

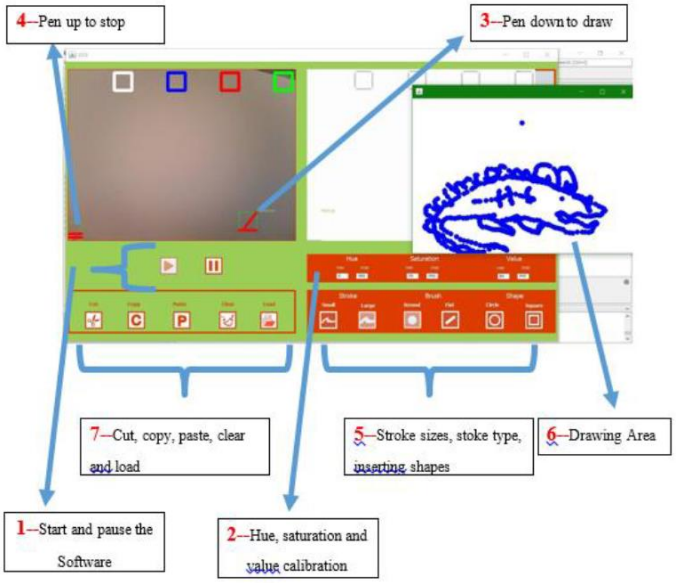

Figure 4: VIDI User Interface

CONCLUSION

The software proposed have multiple purposes involving education. One major purpose it can be used for is in replacing some drawing tools used in graphic design, as it would be easier to drawing using the software. It can also be used for kids in educational terms and entertainment. A computer is not an easy thing to learn. It may be believed that putting a child into a class that uses computer software gives them the basic skills needed to understand a computer. Interest in drawing on mobile devices is growing. With the rapid development of innovative pens and digital apps and improved hardware, artists and programmers are empowered to create a new medium of digital art where natural media can be realistically simulated. As hardware and apps continue to expand capabilities and evolve to better emulate the paper experience, more designers will adopt digital as a larger part of the creative process. In future extra implementation a form might be required to get user name, age etc. to keep the drawings of each user under his/her personal environment. For future implementation, more users will be considered to use the software and then more computers will be considered when more users use the software then it will be considering a bigger version including network. Maybe multiple users use different machine or same considering multi user system.

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