CHAPTER 1

INTRODUCTION

1.1 Background

Computer has become the essence of our everyday lives. We are dependent to a computer whether in our personal lives or working life. Most of our activities in our studies and in our jobs are computer dependent. Therefore, the research and studies to ease the usage of computer is growing rapidly parallel to the demands of computer users.

Computer users also tend to skew towards using a light, compact and portable computer such as laptops, smart phones and tablets as it is more convenient for travels and easier work anywhere. Laptop is the closest device to a computer’s function and it is a better choice for works.

Next, computer users seek to ease the usage of technological devices and improve the simplicity of HMI (Human Machine Interaction) In the modern days, computer GUI (Graphical User Interface) is mainly controlled by external and internal devices such a touchpad, mouse or touchscreen. All these methods requires user to touch the devices to control GUI. Due to the advancement of technology, the demand of virtualisation technique for HMI has increased. For example, the development of Kinect technology that uses image processing for various virtual reality products such as x-box gaming console, 3D models scanning and robotic movement control via body movement and gestures. However, virtual techniques require extra device or equipment that requires additional cost for installation.

Hence, a method is proposed to promote virtualisation technique to control computers’ GUI without having to pay for extra cost. The method only uses internally installed device on the laptop which is the laptops’ web camera. The method involves movement of hand gestures which are captured by the laptops’ built in web camera and translated with high level programming language to control the laptop’s cursor. The hand gesture detection could also
boost HMI by using laptop’s web camera instead of common input device such as mouse and touchpad. Furthermore, the web camera can be used as backup cursor’s controller if the build-in touchpad couldn’t be used instead of having to connect external device like a mouse to the laptop.

MATLAB software is chosen as high level programming language as it has user-friendly interface for image processing and computer visions functions such as image processing toolbox and computer vision system toolbox. MATLAB is also easier to program compared to JAVA, C programming and Ruby freeware software as the other software require complex programming to translate the image capture into machine language. The translation will take up unnecessarily long processing time that could be avoided with the use of MATLAB software.

This new technology is suitable for the modern era where laptop users tend to travel and they would want a technology which is convenient without having to carry external devices around and is not costly to install. The user would also be able to control laptops’ GUI without having to touch a device.

1.2 Problem Statement

Secondary GUI devices need to be prepared if the build-in touchpad could not be used and it would be easier to use the build-in web camera instead of plugging in external devices to control laptop’s GUI.

A method to ease HMI should be developed so that human can naturally interact with machine such as laptop with body parts movements and gestures. A hand gesture cursor controller that could detect different hand sizes developed for various users.

A system has to be developed for users to control laptops’ GUI without having to touch a device with their hands for the ease of usage.

A system that can detect fingertips movement to move mouse cursor which is the basic function of a mouse and touchpad without having to connect the laptop to external devices needs to be developed.
1.3 Project Objective

The primary objective of this project is to design a system which control computers’ cursor by movement of fingers. The objectives are:

1.3.1 To develop a system that could control GUI with computer vision system.
1.3.2 To develop a system that could focus only on the fingertips of the hand.
1.3.3 To develop a system that could detect movements of fingertips and centre of the palm.
1.3.4 To develop a system that could differentiate the background from the hand image.

1.4 Scope of Project

1.4.1 The system developed detects only users’ right hand.
1.4.2 The system developed uses laptop’s build in web cam with 1.3M pixel resolution.
1.4.3 The system is developed by using MATLAB software and coding.
1.4.4 The system runs in white background with no external objects