PowerPoint Gesture Based Navigation Using Kinect

By

Ting Hie Ping

Dissertation submitted in partial fulfillment of

the requirements for the

Bachelor of Technology (Hons)

(Information and Communication Technology)

Supervisor: Dr. Dayang RohayaBt Awang Rambli

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CERTIFICATION OF APPROVAL

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Approved by,

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(Assoc. Prof. Dr. Dayang Rohaya Bt Awang Rambli)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
SEPTEMBER 2012

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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(TING HIE PING)

ABSTRACT

The application of technology in education has emerged very rapidly due to its positive effects on teaching and learning skills. Teaching applications need to be used wisely among the educators in order to enhance and improve academic performances. As we know, PowerPoint slides are a powerful aid to today's lecturer, who can use it to easily prepare dozens of slides to accompany a lecture. This dissertation will discuss the development of a Kinect application for navigating PowerPoint presentation.

A main tool used to develop this application is the Kinect sensor. The Microsoft Kinect for Xbox 360 ("Kinect") has been implemented in all sorts of applications because of its convenient and inexpensive depth mapping sensor. The Kinect technology cannot operate in the classroom without being integrated with a computer or laptop, projector and other compatible software. Kinect has been proving that it has the potential to improve the integration between lecturer and student and encourage student participation in the class.

To meet the most important aim of this project, which is to let the user navigate a PowerPoint presentation easily, the Kinect motion sensor used to detect human gesture and perform hand segmentation based on the depth map of the user and tracks the hands which entered active motion zone. The application then recognizes various hand gestures based on the tracking information detected. After that, perform part of mouse actions to navigate slide show by using gesture recognized. User able to enjoy realistic navigation experience using hand gestures respectively.

ACKNOWLEDGEMENT

First and foremost, I would like to express my immense gratitude to my supervisor, Dr. Dayang Rohaya Bt Awang Rambli, for her constant support and guidance on various matters mainly in clarifying my doubts and correcting my mistakes. She had been kind and patience on teaching me new things and coaching me that has facilitated me in delivering my project. I thank her for her willingness to give feedbacks, advices and opinions on what I have done which had allowed me to improve myself.

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CHAPTER 1: INTRODUCTION

1.1 Background of Study

The research Sandi did (Dr. Sandi Mann is senior lecturer in occupational psychology at the University of Central Lancashire in the UK) showed that almost 60% of students say that at least half their lectures are boring, and about 30% say that they find most or all of their are lectures boring!

Then, what do these students do when they are bored? Daydream, doodle, chat with friends, send texts, pass notes to friends, playing games, etc. They are just wasting their time. Besides that, over a quarter of students leave the lecture at the mid-session break! Some even skip the class, as they said that, “better do study ourselves or we are just wasting our time in class.” This problem should not happen in university.

He found that, one of the main contributors to student boredom is the use of PowerPoint. PowerPoint slides are a powerful aid to today’s lecturer; they can use it to easily prepare dozens of slides to accompany a lecture. The way to navigate the PowerPoint presentation is also very important. Most commonly, people tend to use keyboard or mouse to control the slide presentation, some use PowerPoint remote control to navigate the power point. Some presenters cannot freely present their slide as they need to pay attention in controlling the slides show.

From here, we know that, solution need to carry out to solve the problem face by most of the lecturer. Functionality of Kinect encourages educators to evaluate its feasibility in education field. Kinect which is one of the latest motion sensing devices that are available to the public that are affordable. It was first release in November 2010 in Europe. With this development in gaming industries, the public are made available to access motion sensing technologies with a cheap and affordable price. Kinect able to detects user’s movements’ gestures by using its infrared projectors and cameras, and is able to detect spoken commands.

Besides that, the Kinect System Development Kit (SDK) for windows has been released on 16 June 2011. The SDK allows developers to build applications for Kinect using Microsoft Visual Studio 2010, C++, and C#. Through this SDK, developers are able to access Kinect capabilities on:

- Raw sensor Streams: - access low streams from the depth sensor, colour camera sensor, and four-element microphone array.
- Skeletal Tracking: - The capability to track the skeletal image of one or two people, moving within the Kinect field of view for gesture-driven applications.
- Advanced Audio Capabilities: - Audio processing capabilities include sophisticated acoustic noise suppression and echo cancellation, beam formation to identify the current sound source, and integration with the windows speech recognition API.
- Sample code and Documentations.

In addition, Kissco (2011) have been expresses his excitement by predicating that Kinect will become a focal classroom technology in the time. Interactivity has long been identified as a main factor to successful teaching and learning. In order to enhance the interactivity of classroom activities, technology needs to provide interactive affordances, which can be implemented to support interactive teaching strategies and to create pedagogical opportunities. Other than employing human friendly keyboard and mouse control device, a kinect application can be used to actively track the presenter, so that, it is possible for them to control learning materials by using their body gesture.

1.2 Problem Statement

As common, a lot of lecturer choosing to remain next to the computer during the presentation to control (e.g., change slides, page up, page down, etc.) the PowerPoint. In order to maintain a quick access to the mouse and keyboard, the presenter was constrained to the computer.

Some presenter would either have to walk back and forth between the projection screen and the mouse to control the PowerPoint, or with an aid of an assistant to operate the presentation according to the presenter's needs. From here, we know that by using conventional mouse and keyboard to control slideshow presentation can be substantially inconvenient and restrictive. This virtual tether may limit the overall effective of the presentation.

With the aid of the PowerPoint remote controller still cannot fully solve the problems as it is inconvenience. For example, lecturer forgot to bring it to the classroom and for the battery operated remote control, user need to charge or change battery regularly to make sure controller can function properly during the presentation. In addition, sometimes, lecturers may feel uncomfortable holding the remote control on their hand, especially when they need to express their action.

1.3 Objective

- To conduct a survey of techniques used for PowerPoint Presentation Navigation Control.
- To develop a powerful Kinect PowerPoint control application for presenter. User can navigate the PowerPoint presentation by using simple hand gesture as long as user's hands entered in active motion zone.
- To evaluate the reaction and acceptance of this technology in teaching and learning.

1.4 Significance of the Project

This application development is significant to the users which are lecturers and presenters. Nowadays, technology is very important for every educator in order to mold or shape the future of next generation. PowerPoint has long been used by lecturer to present their teaching materials.

By using this, PowerPoint navigation using Kinect, lecturers and presenters can easily navigate the PowerPoint by using specific and simple hand gesture. This application will detect the most front user as controller. So, it will not get confuse in identifying the controller. Recognized motion such as swipe left, swipe right, and lift up and cross used to navigate the slide show, such as previous slide, next slide, end slide and go to first slide.

In a nutshell, this Kinect application is mainly used to navigate the slide show in classroom which can facilitate and enhance teaching and learning. It is a useful application for presenter as it can improve the interaction between presenter and audience. User can focus more on the audience instead of the PowerPoint navigation.

1.5 The Relevancy of the Project

Kinect is one of the latest motions tracking device that are made available to the public, so far its usage are mainly in the gaming industries. What the project aims to do is to open a new field where these Kinect technologies can be used. There are many real world applications where motion detecting devices can be a real use. But right now its purposes and functions are still small and narrow, mainly because of the mindset of the people. Most people will associate Kinect with games as that is what they are intended to do in the first place. But the possibilities of its usage and implementation are almost limitless. And the developments of this project are as such. Not only the project seeks a new way to implements Kinect, the project also seeks a new fun way to facilitate the teaching and learning process. If the project was a success, this will change the way to navigate the PowerPoint Presentation. Learning will be more interactive as there is more interaction between lecturer and students. Lecturers will be able to pay more attention to the students in classroom, if hand gesture based navigation of PowerPoint can be implemented.

1.6 Scope of Project and Time Frame

Target Group:	Lecturer or presenter
Platform:	NUI (natural User Interface) which consists of an SDK, API and a driver for Microsoft's Kinect Hardware (Xbox NUI Audio, NUI Camera, NUI Motor and Accelerometer) devices
Application:	PowerPoint gesture based navigation using Kinect
Time Frame for development:	5 months

The focus of this project is to improve the current technique of PowerPoint presentation navigation, so that presenter can present their material in a more naturally manner. They no more bounded to the keyboard or mouse or remote controller in navigating the PowerPoint. This will introduce a new teaching experience for lecturer. The learning process for student will be more interactive and interesting. The scope of study is limited to lecturer or presenter in classroom. This group of people usually works with PowerPoint to present their teaching material. The application is about Kinect application and build using Microsoft Kinect SDK. The application will be completed within the end of Final Year Project II timeline.

1.7 Feasibility Study

Feasibility study is a process of studied and analysis of the current operation and identifies requirement or alternative. Two main feasibility are technical feasibility and operational feasibility.

Technical Feasibility

In terms of technical feasibility, the software is feasible technically, although there are some risks taken into consideration. It concerns whether or not the system can be developed.

Low to Medium risk on Technology Area

Based on the general study, it can be said that majority of lecturer are well versed in the technological advancement. Thus, the risk of developing the proposed system is medium.

As for the developer point of view, the developer has some experiences in some programming languages such as C#, C++, etc. This knowledge is very helpful in creating the system to ensure the system can be built. A part from that, open source development tools and software related are available over the internet which can be used to develop this system. Therefore, the risk is low to medium for the system developer to transform the ideas into a working solution.

Medium risk on Familiarity of the Functional Area

The system developer needs to explore on how to come up with the suggested and proposed system. Plus, the developer must have a comprehensive understanding of what it is has to be done, who else to be influenced by the project, what the project will achieve and defining in definitive terms the outcome of the project. At the same time, a better understanding on current application used to navigate the PowerPoint, and how to improve it to attract the user to use my product. Hence, the risk is medium in this context area.

Medium risk on Project Size

Based on the suggested and proposed features that are made available in the system development, the project size of the proposed system is in a small to medium scale. It is due to the development of this system is only done by a developer; Furthermore, the user involvement is required to be able to come up with this system.

In terms of time frame, how reasonable the project timetable is. It is about how we manage time for the development software and how deadline work effectively. A complete and thorough study of the subject matter especially in the algorithm approach requires a high time commitment. Since the research period is very short, it is limiting the extensive research outcomes and transforming ideas and solutions into a working system will be quite challenging. With all the constraints that may be encountered throughout the development phase, the risk on the project size is medium.

Operational Feasibility

Operational feasibility refers to the acceptance of users on the system development, how they feel about the solution provided, and it is a measurement whether a system can work and will work to solve the problem addressed (Castro &Mylopoulos, 2002., p.3).

The proposed system helps lecturer to enjoy realistic navigation experience using hand gestures respectively. Kinect PowerPoint control system can facilitate and enhance teaching and learning. At the same time, there are more integration between lecturer and students, as lecturer no more focus on controlling the PowerPoint.

In order to cater the adaptability challenges that the proposed system will issue, internal training and user guide manual will be provided to the lecturers, on how to use the application.

CHAPTER 2: LITERATURE REVIEW

2.1 PowerPoint Presentation

Nowadays people are relying more and more on computers and PowerPoint presentation software to convey ideas to public. PowerPoint is a Microsoft office product that provides users with an interface to design multimedia slides to be displayed on a projection system or personal computer. The software incorporates images, sounds, videos, text, and charts to create interactive presentation. PowerPoint™ have been popular for years, Microsoft estimates that over 30 million PowerPoint presentations are given daily around the globe (Wendy Russell, 2012). Besides that, PowerPoint have been prove that it confers an enormous benefit towards education in that students like the courses better, have a more positive impression of the instructor, and therefore, have a more favorable attitude toward their education.

2.2 Techniques used for PowerPoint Presentation Navigation Control

Based on Wizard of Oz user study, three techniques have been use to control PowerPoint which are Standard (Mouse/Keyboard), PowerPoint remote controller and bare hand (X. Cao, E. Ofek and D. Vronay, 2010).

2.2.1 Standard (Mouse/Keyboard)

The techniques commercially available to control PowerPoint rely on mouse and keyboard.

Figure 1: Mouse and Keyboard..

Advantages:

Standard technique (Mouse/Keyboard) is reliable, familiar, well-known and fit most of the scenarios.

Concerns:

The presenter was constrained to the computer. The presenter had to stay with the computer, making it near impossible to use body language and eye contact. Some presenter chooses to walk back and forth between the computer and the projection screen, resulting in many interruptions. Without using hand to emphasize contents, the presentations were found less easy to understand. This can prove by the research done by X. Cao, E. Ofek and D. Vronay.

2.2.2 PowerPoint remote controller

PowerPoint remote controller, presenter can use it point to the projection screen and pressing a button on it to navigate the PowerPoint presentation. There are varieties of PowerPoint remote controller in the market, such as:

- **Remoter for PowerPoint**, it is just like the other PowerPoint apps which use to control presentations. It is one of the apps for the Smartphone. The app connects to the host via Bluetooth and Wi-Fi. Once the app is installed and working user can use it to control slides, including animations as well as view annotations. Besides that, user can use the black screen toggle feature to easily black out the screen. (Brenda Barrett, 2011)

- **Remoter Point Jade** which is the world's most advanced presentation remote and the first to combine a laser green pointer, full mouse functionality and an impressive 150' range. It also features 4 programmable keys as well as convenient keys for Next Slide, Previous Slide and Laser Pointer functions. And, it works in any direction, even with people and other obstacles in the way.

Figure 2: Example of PowerPoint remote controller.

Advantages:

The presenter can move freely on the stage as they wished. In addition, the presenter could make all the operations by using small finger and wrist motion, this accelerate the interaction. So that, the presenter had more space for using body language and eye contact to convey their ideas to the audience (Cheng, K., & Pulo, K, 2003).

Concerns:

PowerPoint remote controller, which can be distracting and disengage the audience, especially when the presenter’s hand tremor, making it very hard to control the slide precisely and stably. If the PowerPoint remote controller accidentally drops down to the floor, it may not able to function properly. In addition, for the battery operated remote control, user need to charge or change battery regularly to make sure controller can function properly during the presentation. Lastly, by expressing their action better during the presentation, user will put the controller at somewhere. When they need it back, they can’t remember where the actual place they put is as the size of controller is quite small. All these problems are commonly face by the user of remote controller.

2.2.3 Bare Hand

Based on the Baudel, T., and Beaudouin-Lafon, M., the basic idea of Bare Hand technique is to navigate the PowerPoint presentation by touching on “hot areas” or dragging “active objects” on the screen using hand directly. Touch-sensitive large display, for example: Smart Board system or by computer vision techniques is needed.

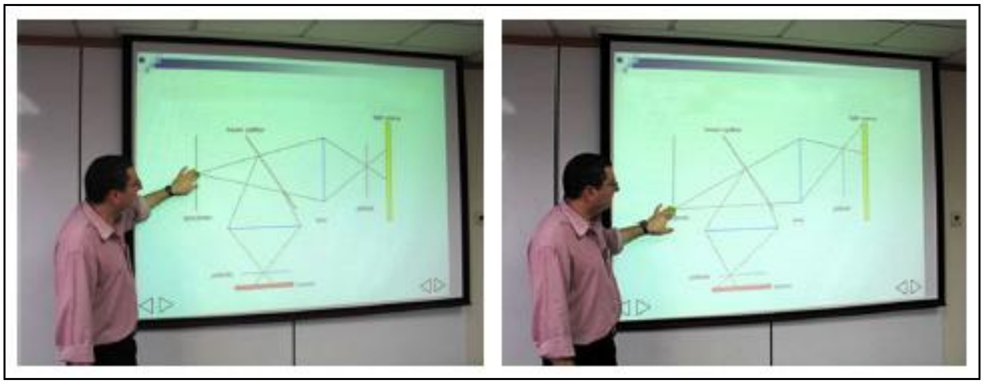

Figure 3: Using Bare Hand to control presentation.

Advantages:

Presenters had the habit or preference of standing besides the screen and using hand to emphasize things on the screen. So the Bare Hand technique was natural and simple to use for them. The presenters could make more use of eye contact and body language than was possible if compare with the other two technique (Remote controller and mouse cursor). The audiences felt that Bare Hand enabled very attractive presentations as the technique itself appealing to them. Pointing with hand was found easiest to follow by the audience.

Concerns:

Presenter need to stand near to the screen to navigate the PowerPoint presentation, they may block the slide content from the audience. Besides that, presenters might feel constrained to the space near the projection screen when they did wish to walk around. In addition, there was no firm feedback for the hand, like the force feedback provided by the button in remote controller and standard, presenters may be worried whether their actions have been received, or they would mis-trigger an action when pointing to the screen spontaneously. Finally, since “Next Slide” was the most frequently used command, presenters preferred having a quick way to achieve that instead of looking an arrow to touch.

2.3 PowerPoint Navigation Control Design Directions

In the Research paper: Evaluation of Alternative Presentation Control Techniques by Xiang Cao, Eyal Ofek, David Vronay. **S**ome possible design directions for PowerPoint navigation control comes out after done a research which compares the few control techniques. This also inspired by the participants' feedback.

- **Quick "Next Slide" operation**. As for both Bare Hand and PowerPoint remote controller techniques, a quick "Next Slide" operation is needed, such as a special button click or a special gesture.

- **Error prevention and recovery.** To prevent mis-triggering actions when the presenters point hands spontaneously to the screen, we could apply highlighting or other visual hints to the hot areas when the hand is hovering over them. On the other hand, a globally available "undo" or "Previous Slide" operation, could be achieved by use of special gestures to make up for any unwillingly triggered actions.

- **Combine Bare with PowerPoint remote controller.** According to figure below (which compare the technique used to navigate the PowerPoint presentation), we know that audience prefer the presenter use the remote controller and Bare hand. So, it is important to exploit the advantages of both techniques and adapt to various scenarios, PowerPoint remote controller could be combined with Bare Hand. The presenter could use a laser pointer as an auxiliary control device when he/she needed to walk away from the projection screen, or when the intended control component on the screen are out of the reach of bare hand.

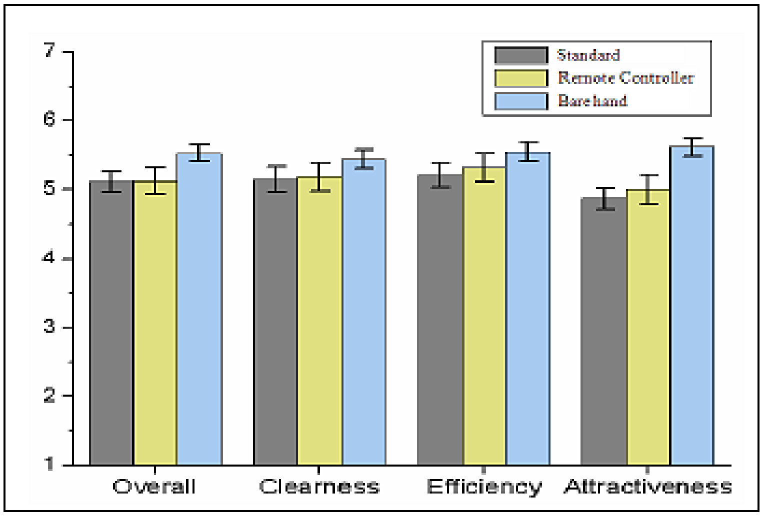

Figure 4: Quantitative rating by techniques and criteria..

- **Interactive presentation authoring tool.** It is essential to have a tool to easily author presentations that incorporate the interactive features supported by the techniques. For example, minimize the presenter's need to walk back and forth to navigate the PowerPoint, etc.

Having Kinect as a navigation tool could bring all these 4 design together. This enables more interactive presentation. The presenters could make more use of eye contact and body language than was possible to convey their ideas. User can navigate the PowerPoint presentation by using simple hand gesture.

2.4 GUIs to NUIs

Before the existent of gesture based recognition hardware, the mouse and the graphical user interface (GUI) interface are the most common interaction technique. The interaction with computer is indirect. With cheap yet reliable Kinect, the interaction becomes intuitive with gestures. GUIs have evolved gradually into NUIs, which stands for natural user interfaces. Kinetic user interface is a kind of natural user interface (NUI). Kinetic user interfaces (KUIs) are an emerging type of user interfaces that allow users to interact with computing devices through the motion of objects and bodies.

2.4.1 Definition of Natural User Interface (NUI)

According to Wikipedia, Natural User Interface (NUI) is an emerging paradigm shift in man machine interaction that focuses on traditional human abilities such as touch, vision, speech, handwriting, motion or gesture and more importantly higher level processes such as cognition, creativity and exploration. The aim of NUI is to replicate real world environments by utilizing emerging technological abilities and sensing solutions which will allow for more accurate and optimized interaction between physical and digital objects.

An interface is natural if it "exploits skills that we have acquired through a lifetime of living in the world." (Bill Buxton, 2010)

A natural user interface is “a user interface designed to use natural human behaviors for interacting directly with content” (Joshua Blake, 2010).

According to Joshua Blake (2010), this definition contains 3 important points for defining NUI.

i. NUIs are Designed

Firstly, natural user interfaces are designed. This means that they require forethought and specific planning efforts in advance. Special care is required to make sure NUI interactions are appropriate for the user and the content. This interaction must not bring burden to the users as NUIs use natural human behaviors.

ii. NUIs Used Natural Human Behaviors

Secondly, NUIs use natural human behaviors. The primary way humans interact with NUI is through natural behaviors such as touching, gesturing, and talking, and any other innate skills. Innate skills are in contrast with learned skills. For example, pushing things around with your fingers on a surface is an innate skill, which is a skill that all human can do and will be able to do without training. On the other hand, using a mouse with a computer is a learned skill.

To give a better idea of what NUI is, GUI and CLI are taken for examples. GUI uses pointing device, such as a mouse for input while using windows, menus, and icons for output; CLI uses keyboard for test input and test output. In contrast, NUI is an interaction technique which focuses on natural human behaviors.

iii. NUIs have Direct Interaction with Content

Finally, NUIs interact directly with content. Unlike GUI, which interacts with content using windows, menus, and icon, for NUI, users manipulate the content directly using natural human behaviors. Although NUI allows the use of control, the content interaction should be primary and artificial interface elements (controls) should be secondary and used only when necessary.

Based on the clear description of NUI, it is obvious that the use of kinetic user interfaces falls under natural user interfaces. By using Kinect as motion sensor device, users manipulate the content directly with their innate skills.

2.4.2 Interaction with NUI, Gesture Recognition

Based on Wikipedia, gesture recognition is a technique for computers or laptop to identify human body language. It enables humans to interface with the machine and interact naturally without any add on device on their hand or body. Computer vision and image processing are the techniques used to conduct gesture recognition.

Besides that, based on the type of the input data, the approach for interpreting a gesture could be done in different ways, for example: 3D model-based algorithms, skeletal-based algorithms, appearance-based models. For the Kinect motion sensor, it uses Skeletal-based algorithms to interpret the human body gesture. This technique also known as a skeletal representation of the body, where a virtual skeleton of the person is computed and parts of the body are mapped to certain segments. The analysis is done using the position and orientation of these segments and the relation between each one of them. Several advantages of using this algorithm:

- Interpreting body gesture in a fast way as it only analyses key parameters.
- Pattern matching against a template database is possible
- By using key points, detection program can focus on the significant parts of the body

2.5 Kinect

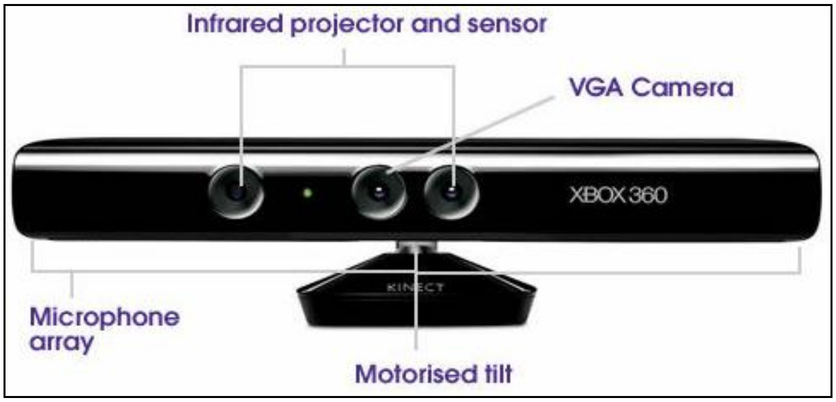

Figure 5: Kinect.

Kinect is a motion sensing input device by Microsoft for the Xbox video game console and Windows PCs. Even though motion sensing technology has been around for quite a while, it was never an easy access to the public and is usually costly. Even though motion sensing technology has been around for quite a while, it was never an easy access to the public and is usually costly. With the current development in the gaming industries, these technologies are now available to the public at a much lower cost. Kinect is a software enabled device which enables users to control and interact with the Xbox 360 by capturing, tracking and recognizing human body‟ s movements, gestures and voice. In other words, users do not need to be tied to the human friendly keyboard and mouse control device when controlling the software programs. Its original purpose is to be used in combination with Microsoft Xbox 360 for entertainment or game purpose. After the release of open source drivers (Giles, 2010), Kinect is able to be connected to personal computers or laptop to be used with software programs other than Microsoft Xbox. The Kinect SDK allow programmer to write Kinect application in C++/CLI, C#, or Visual Basic.NET. This has spark new interest in the public and has opened up a lot of new fields where Kinect can be implemented to give better life to human being.

2.5.1 Advantages

Kinect are one of the most advanced motion sensing technologies available to the public in the market, one might think that the costs of implementing this system are going to be expensive. But this is not the case, the price for the Kinect itself would only cost from RM 400 to RM 600 depending on the types. As most schools are already implementing the usage of multimedia at schools which implement usage of laptops and projectors which cost thousands, the implementation of Kinect can be considered as a cheap add-on. The costs for implementing this system are cheap but the advantages and the change that it will provide in the learning system are huge. The schools and teachers can simply integrate this new Kinect system with the available system. This will allow greater flexibility for teachers in class. In other words, the implementation of Kinect in class is very feasible and useful compared with its cost.

In terms of a tool for teaching, Kinect has the following characteristics. First, Kinect is a flexible teaching tool. Teachers can interact with contents via body movements, gesture and voice without using keyboards or mice. Second, Kinect can accommodate multiple users; therefore, students can have a fare share of control over interactions. A Kinect-enabled classroom can support whole-class instruction, group work and teacher-student one-to-one interaction. Third, it is a versatile tool. As it collects 3D information, Kinect can support various teaching activities such as dance and martial arts. Special instructional design can be implemented to reinforce the connection between teaching contents and student physical responses. Fourth, Kinect engages students. The interactions enabled by Kinect support multiple physical engagement patterns, involve more time on task from students, and imply better utilization of multiple intelligences.

In terms of interactivity and participation, they (Kennewell, Tanner, Jones & Beauchamp, 2005) suggest that students seem eager to come up to the board and enjoy interacting physically with IWBs. Though the idea of finger touch as a controller may sound ordinary, the IWB-enabled activities make students feel like a magician and thus boost their willingness of participation. Lacina (2009) summarizes the benefits of integrating technology into the classroom including meeting the needs of visual learners, more interactively teaching whole-class lessons, and better engaging students. Interactivity has long been identified to contribute to successful teaching and learning. By connecting to computers and projectors, Kinect can provide natural and intuitive interaction patterns via body, gesture and voice control over digital contents; thus, student participation can surely be promoted. Mainly because using Kinect in education is a unique and creative innovation. Its Kinestatic features and gesture-based interaction will surely motivate educators to devote themselves to use Kinect accordingly in class and fully utilize its capabilities.

There are a lot of benefits in implementing Kinect in education. The aim of this project is to develop a Kinect application for presenter, which can increase the interaction between user and audience. By doing this, presenter able to present their material in more natural manner and focus more on audience, instance of the PowerPoint. It has always been known that interactivity plays an important part in learning. The matter of interactivity and how it affects the process of learning in the classroom are also being discussed by Hui-mei Justina Hsu. Interactivity here means how much can the teachers control the classroom and have the attention of their students.

2.5.2 Disadvantages

According to Hui-mei Justina Hsu, in her paper "The Potential of Kinect in Education", stated that the implementations of Kinect in a classroom have its own limitations. The limitations that she mentions are Kinect needs a large classroom space, lack of easy-to-use development tools, and long calibration time and pedagogical constrains such as the difficulties in shifting to kinaesthetic pedagogical practices and limited understanding of its effects. In addition, main constrains of using Kinects is that Kinect can't work as a stand-alone system, it need to work with computer and projector. There are certain limitations that we must face, but the benefits that the learning institutes can obtain by implementing this new style of teaching or way to navigate PowerPoint presentation is worth the investment.

Other than that, disadvantage of Kinect is that the accuracy detection of its technology. Although Kinect can be considered as advance motion sensing equipment, it is still far from perfect. The stereo optics used in Kinect is fairly old. Besides that, level of accuracy that Kinect can detect still low. Kinect will show some detection error when an object stands between the users and the system. This is largely to the weakness of the skeletal system that Kinect implements. Kinect are supposed to map user's body with this skeletal system and the skeletal will move according to user's gestures. But if there is an obstacle or other object between Kinect and users, the system will mistake that the object are part of the skeletal system as well. This will gives incorrect and inaccurate input to the system.

2.6 Application of Kinect

2.6.1 Kinect in Educational Field

Kinect has been used in educational field to help student to improve their academic performance. Here are two examples:

Firstly, an education game called ALERV (Aprendendo Ler e Escrever com Reconhecedor de Voz) has been developed based on teaching tasks which aid children with problem in reading and writing. The resources used to develop this game include mouse, keyboard, console XBOX 360, Sensor Kinect and voice recognition. The ALERV was developing to arouse the children's curiosity besides motivate and help to improve their self-confidence. This game starts with playful situations to offer learning on writing, reading and recognition of common objects which are main ideas to start the learning stage. In addition, voice recognition engine and Kinect Sensor also used to increase the child's communication with the game. Through this game, it able to evaluate the child's emitted command, checking if child pronounce properly word or image displayed by the game. Moreover, it increased interactivity of the child's body, as it provides the child's greatest interest by the game. The game was built by using the C# language and XNA Game Studio 4.0 framework (XNA 2010) and implements a voice recognition engine pt-BR (Brazilian Portuguese). XNA permits the possibility to operate the game in XBOX 360, allowing use the motion sensor Kinect to increase interaction between player and game. The teaching tasks are imported from GEIC and customize them for a game ambient. The scenario challenges (small labyrinths, map exploration and MiniGames) and character evolution characteristic is used to motivate the player, so that user will play in repeatedly and gain more knowledge. Educational game for kids has proven to be a very beneficial learning tool.

Besides that, “robotics with Kinect as a part of the sensor equipment” has been introduced by Michal Tölgyessy and Peter Hubinský. This is a great and complex application that can be used to teach learners many common robotic tasks, ranging from the easiest (collision detection) to the most complex (3D mapping). 3D object detection is a current research movement; studying sensor is interesting and inspiring. The common methods that use infrared, ultrasonic or laser sensors are used to analyses the frames obtained from depth and color algorithms. After that, students can compare the result by using several tactics, such as: Data Fusion, Obstacle Avoidance and Collision Detection, Object Recognition, 3D Modelling, and Gesture Control. At the end, student able to know firsthand what suites their particular project more. (Michal Tölgyessy and Peter Hubinský, 2011)

2.6.2 Kinect in Medical Field

Kinect-based rehabilitation system has been developed to assist therapists in rehabilitating students in public school settings. The system for physical rehabilitation, is Kinerehab (aportmanteau of the words “Kinetic” and “rehabilitation”). The main tool used to build this system is Microsoft Kinect which is a webcam-style add-on peripheral intended for the Xbox 360 game console. This system lets the users to control and interact with the game console without the need to touch a game controller such as mouse or keyboard; user can interact with the game easily by using simple body gestures. The Kinect device comes with an RGB camera and a depth sensor, this offer human body motion capture abilities and body gesture recognition. Other than using Kinect for entertainment purpose or playing games, developers leveraged the human body gesture recognition capabilities of Kinect to check whether a patient performed specific exercise correctly in physical rehabilitation. By using Kinect, patient no more bothered by body sensors. Moreover, the system developed can avoid the users from wearing sensors that are disturbing. Kinerehab detects the user‟ s joint position, and uses the data collected to determine whether the students‟ exercise have done correctly (for example, jump to the specific hign) and the sufficient number of exercises in 1 day. This system uses Kinect sensor to detect human body gesture. By using this system, it can motivate user to do exercise correctly in physical rehabilitation, so that they can recover in shorter time (Yao-Jen Chang a, Shu-Fang Chen b, Jun-Da Huang c, 2011).

In addition, an open-source system for a controller-free, highly interactive exploration of medical images is presented by Luigi Gallo, Alessio Pierluigi Placitelli, Mario Ciampi (2011). By using a Microsoft Xbox KinectTM as the motion sensor device, the system‟ s allows the users to interact at a distance through hand gestures. Interaction techniques they developed specially for the deviceless navigation of medical imaging data. Besides that, filters have been carrying out to filter the noise in the device signal, and increase the correctness of the remote pointing and to filter hand tremors during navigation process. The user‟ s body acts as the system controller, system developed will recognize the body motion or gestures of user and estimate the z-value and x-value of user. All these data will be collected and used to navigate the medical imaging data. The skeleton fitting process is performed automatically in a non-intrusive way. The user interface is touch-free; it is appropriate for using in operating rooms, where non-sterilizable devices cannot be used. The accuracy of the skeleton tracking appears sufficient to use for navigation of medical imaging data.

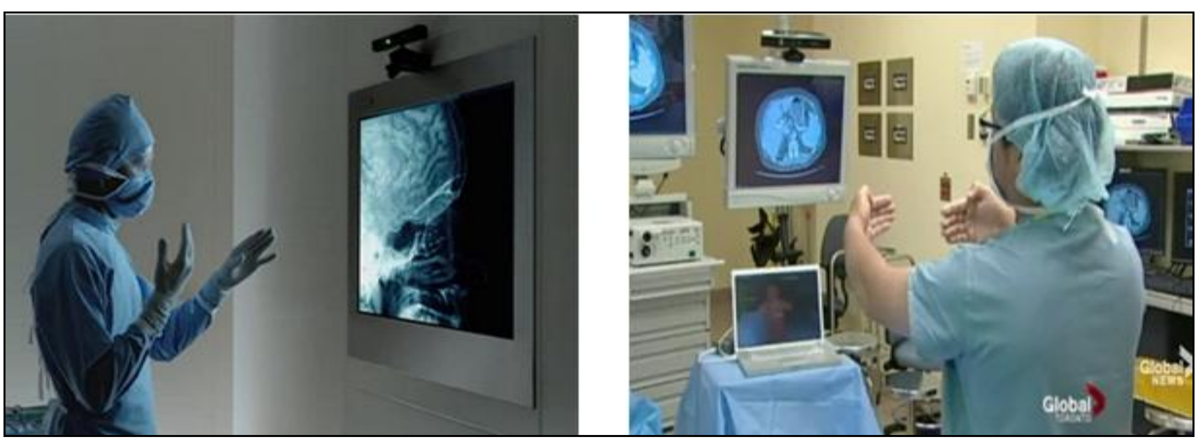

Figure 6: Controller-free interactive exploration of medical images through the Kinect.

According to Aaron Rothberg and Janet Bailey (2011), one of Kinect application have been developed which has the almost same features as the product developed by Luigi Gallo, Alessio Pierluigi Placitelli, Mario Ciampi (2011). This application turn the Kinect into a form of medical equipment which allowing medical personnel to manipulate medical images using voice and hand-gesture commands, they no more tied to the keyboards and mouse to control it. Besides that, it also help to save money as it eliminate the usage of x-ray films. The main purpose of this Kinect application is to reduce the need for physically touching extraneous devices when medical personal do the operation, and can manipulate medical imaging easily.

This Kinect application perform the following benefits in manipulating medical images:

- Easy-to-use and intuitive interface that allows user voice commands and physically hands-free operation
- Reduction of the time it takes for medical personal in navigate medical images
- Avoiding the unsanitary working circumstances by eliminating the need to touch extraneous equipment
- Increased security of patient information by using biometrics to identify medical professionals
- Reduce costs associated with maintaining a sterile environment

2.6.3 Kinect in Science

Kinoogle, a natural interaction interface for Google Earth by using Microsoft Kinect. Kinoogle lets the user to navigate 3D Google Earth by using body gestures. The main hardware used in Kinoogle is Microsoft Kinect. Kinect generates image frames in real time, where each pixel corresponds to an estimate of the distance between the Kinect sensor and the closest human in the scene at that pixel‟ s location. Based on image, the Kinect application let Kinoogle to accurately detect human body gestures. Kinoogle designed around a specific setup for operation that allow the controller standing about 0.4m to 7m in front of view of Kinect, with shoulders parallel to the device. The first object, KinectControl, interfaces with NITE and OpenNI to collect relevant useful data from Kinect. This application collecting data from the Kinect and Kinect detect the human body gesture. After receiving the data, eventually control the 3D earth.

In addition, being a versatile technology, the application of Kinect can be used an implement in many areas. The technology is so user friendly and versatile has enables them to suits almost any purposes in any fields. The fields of science are also beginning to look into new possibilities in Kinect. In 2011, SEIMENS has conducted a competition called SEIMENS Competition in Math, Science & Technology. The aim of this competition is to explore the new possibilities in Math, Science & Technologies and recognize young talents and fosters growth in them. One of the winners for 2011 is using Kinect as their project. Ziyuan Liu and Cassee Cain uses Kinect and Computer Vision to create a program that analyze Human walking pattern. This technology will then be used to help to prescribe treatment to those who suffers from injuries or ailment that effects movements,people who need amputations and hand gone through joint replacement surgery. The team was awarded $100,000 for their projects.

2.7 Discussion and reflection:

The results of the study give us a better insight and deeper knowledge on kinect, it able to recognize hand gestures using RGB and depth data. It have been used in many field, so it is a good idea to be used in classroom to control the power point presentation, presenter no more tied to the screen or computer or passing on the instruction to someone else. This surely can improve the current existed technique to navigate the PowerPoint presentation. By using kinect as sensor of motion detection together with computer or laptop and projector, presenter able to enjoy realistic PowerPoint navigation by using hand gesture. This will make learning more fun and interesting for the students. The system will be more as a tool for the teacher to use. Further explanation about how the system would be will be explained in chapter 3.

CHAPTER 3: METHOLOGY

3.1 System Development Methodology

Choose the right methodology is very crucial for developing new system. It is combination between model and technique. The methodology that the author chooses is System Development Life Cycle (SDLC). It can increase speed the development of Kinect application. Speed of development can be achieved through variety methods including prototyping, the use of system architecture and other technique. Besides that, it also can meet the user requirement and enhance the quality of the system.

In this chapter, the methodology on how the system worked will be explained. This will explain in further details on how the project will be done. But this project focuses more on planning, analysis, design and implementing phases.

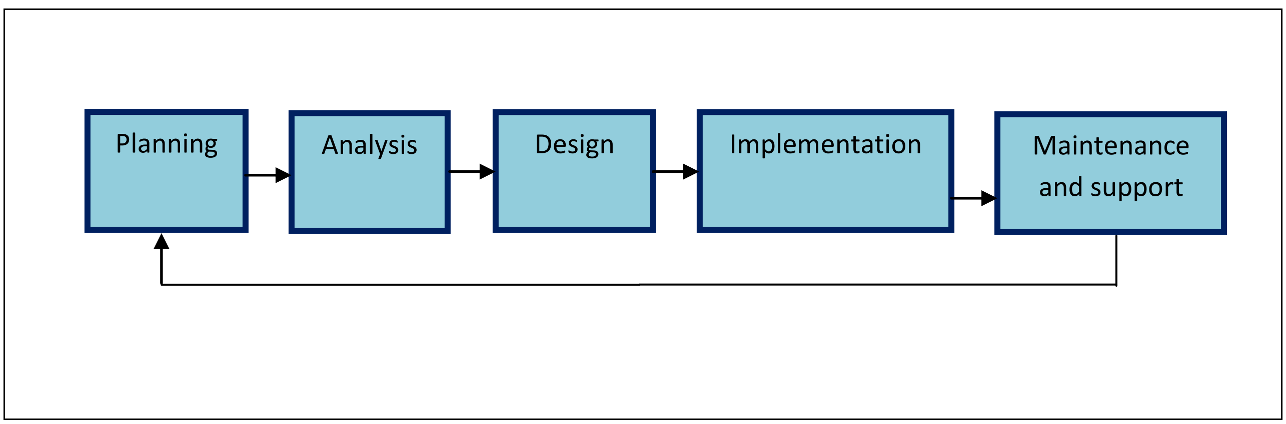

Figure 7: SDLC Phase

3.2 Project Activities

Details description for each phase of methodology is follow as below:

3.2.1 Planning Phase

Planning is the most crucial phase in the development cycle. It determined the future activities for the software development. The project overview and goals determined in early stages of this phase. Besides that, information collections also carry out to evaluate the current techniques used for PowerPoint presentation navigation control (as shown in Table 1) and tried to develop a new system which can solve the problem facing by current user.

Tools required for the development of this application (PowerPoint Gesture Based Navigation Using Kinect) include both hardware and software.

Hardware:

- Kinect, Desktop / laptop and Projector

Software:

- *Microsoft Visual Studio (C # Programming Language):* Microsoft Visual Studio 2010 software was chosen because I already familiar with the language used. Besides that, C# is a popular and widely used programming language for creating computer programs. It was designed to be compiled using a relatively straightforward compiler, to provide low-level access to memory, to provide language constructs that map efficiently to machine instructions, and to require minimal run-time support.
- *Microsoft Kinect SDK:* It used to create Kinect application. It offers skeletal tracking, face tracking, seated mode skeletal tracking, and resources. Besides that, is also offer depth data, which provides the distance of an object from the Kinect camera, as well as the raw audio and image data, which together open up opportunities for creating richer natural user interface experiences.

Technique	Advantages	Concerns
Standard (Mouse/Keyboard)	- Reliable, familiar, well-known and fit most of the scenarios.	- Presenter had to stay with the computer, making it near impossible to use body language and eye contact.
PowerPoint remote controller	- Presenter can move freely on the stage as they wished. - presenter had more space for using body language and eye contact to convey their ideas to the audience	- User need to charge or change battery regularly to make sure controller can function properly during the presentation. - User always forgot where they put the controller as it is quite small size.
Bare Hand (navigate the PowerPoint presentation by touching on "hot areas" on the screen or Touch-sensitive large display using hand directly.)	- Technique is natural and simple to use. - Presenters could make more use of eye contact and body language than was possible - Audiences felt that Bare Hand enabled very attractive presentations as the technique itself appealing to them. Pointing with hand was found easiest to follow by the audience.	- Presenters might feel constrained to the space near the projection screen when they did wish to walk around. - There was no firm feedback for the hand, presenters may be worried whether their actions have been received

Table 1: Techniques used for PowerPoint Presentation Navigation Control

Through the evaluation, author gets to know the problem faced by the presenter. So, the PowerPoint gesture based navigation using Kinect application will bring 4 important designs together, which consists of quick "Next Slide" operation, error prevention and recovery, combine bare hand with PowerPoint remote controller and interactive presentation authoring tool.

3.2.2 Analysis Phase

After the planning phase done, it proceed with the analysis phase. Analysis phase involved the requirement gathering from the end user. This step involves breaking down the system in many pieces to analyze the situation, analyzing project goal, breaking down what needs to be created and engage with users so that definite requirements can be defined. In addition, a few methods have been done to gather the requirement such as interview, questionnaires and surveys. All the data gathered have been further analyse and documented.

Basically, most of the user agree and support the idea (PowerPoint gesture based navigation using Kinect) proposed. This can proved by the responding of potential user through the questionnaire distributed (as shown in Figure 8). Some additional functions also have been request to add into the system.

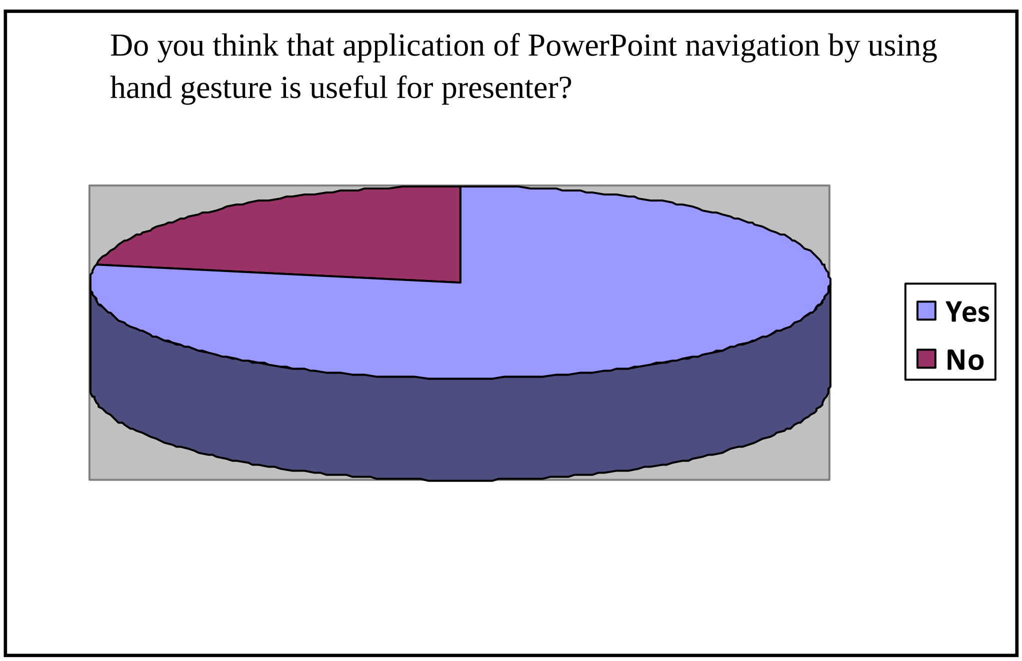

Figure 8: Potential user responding

3.2.3 Design Phase

Design phase converted the user requirement into designed systems. Desired features or functions and operation described in detail, this include screen layout, process diagram or flow chart, and other documentation. System designed according to the requirement documented or collection of modules or subsystem.

Design elements included basic system architecture (as shown in Figure 9), flow chart (as shown in Figure 10), and functional hierarchy diagrams. These design elements described the software in sufficient detail that can develop the software with minimal additional input design.

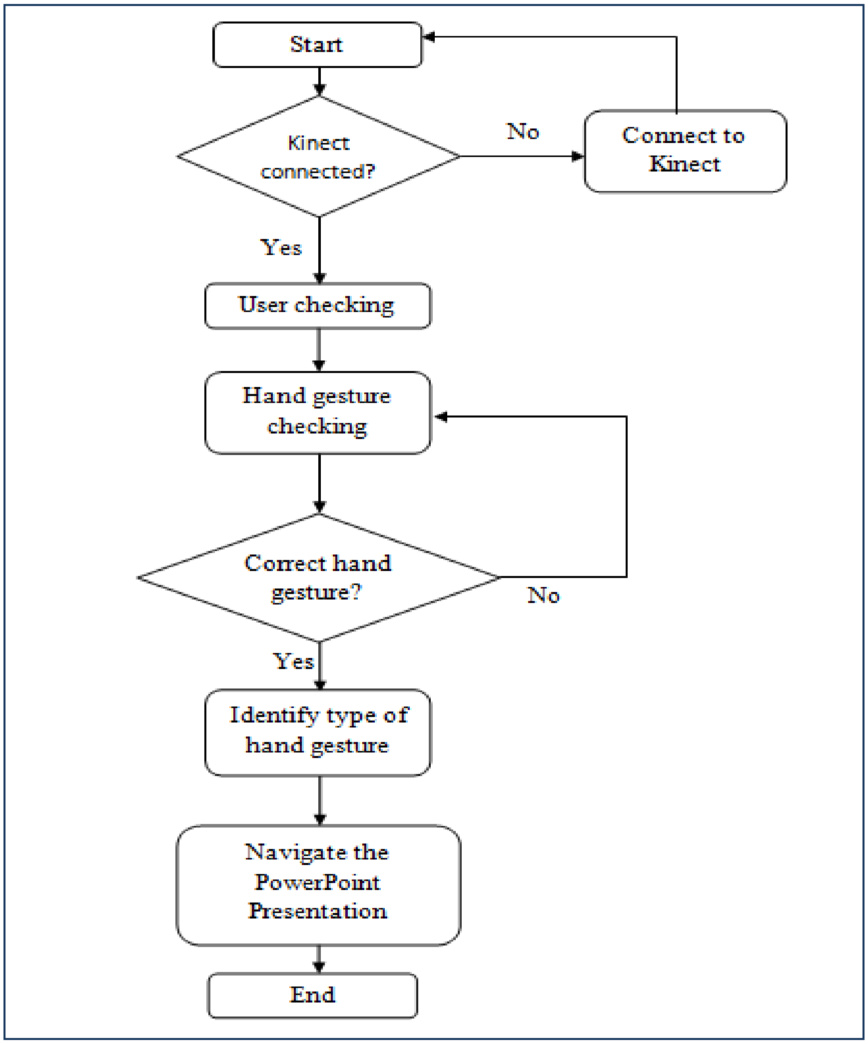

Figure 9: Flow Chart

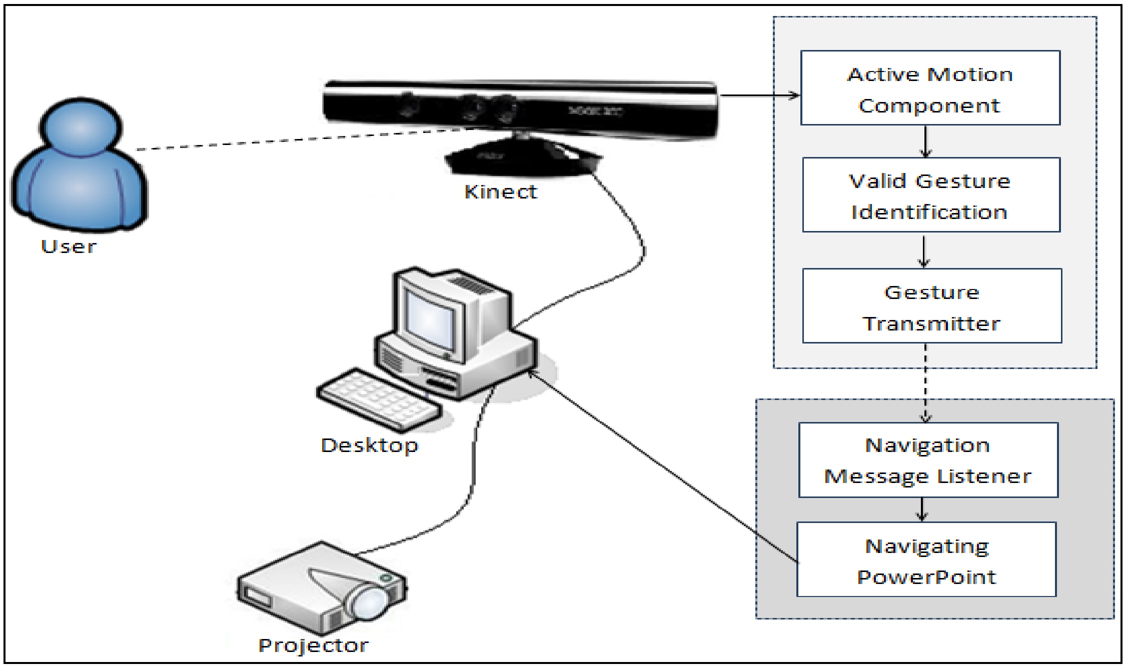

Figure 10: Basic System Architecture

Application of PowerPoint gesture based navigation using Kinect consists of 6 modules, which includes:

- **Active Motion Component**

  This module connect with kinect sensor and collect all the data from Kinect sensor. Kinect able to captures video image around 30 frames per second while this module will collect every frame. Human gesture is the signal generator and this module is established to determine acceptability of signal generated by user. Here, the absolute positions of hands are recorded and evaluated in order to detect the gesture in slow speed. By utilizing the depth information from Kinect sensor with Kinect SDK, the application I developed is capable to recognize the basic framework of few human bodies with actual metric size information, such as height of body, and length of hand. Furthermore, it could localize the position of each body part with respect to sensor. In this component, important functions are achieved using body framework and position information: determining active motion zone. The active motion zone is to detect user generating acceptable movement and it is modeled as a 3D cube volume, as shown in figure 11.

Thus, to determine this active motion zone, position of user's hand is compared with shoulder position in Z-axis, to recognize the action of lifting hand into this motion zone. After that all the data will be sent to "Valid Gesture Identification module".

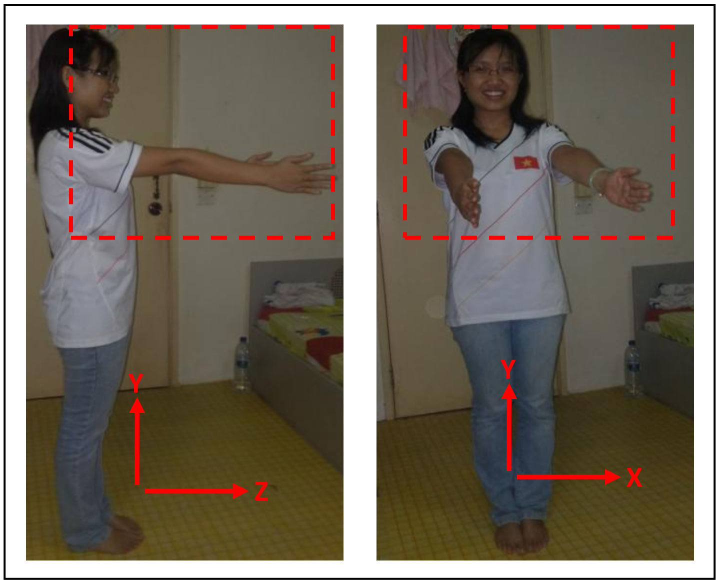

Figure 11: Graphical description of active motion zone for the front view and the side view(in the red box)

- **Valid Gesture Identification**

  This module processing or analysing the data become higher application data. For example, when the user swipe his right hand to left side, it will send message like"left", followed by the speed of movement. If a lot of people stand in front of the kinect, the application will choose the nearest one as the user. The resulting data will be sent to the "Gesture Transmitter Module" to further analyze or for other purpose.

  The procedure to identify the hand gesture of user is explained as follows:

  - The system detects the most front user as controller so that the Kinect application will not get confusing in choosing the user. The application need to collect the z-axis position of every user as the Kinect provide a 640x480 depth map in real time that indicate which objects are near versus far in the given scene. After the application collect the data, comparison need to carry out and the controller will pass to the people with smallest z-axis value which is the most front user.

- System will check either user is sending a valid command or not. This is done by checking the distance between elbow and hand in z-axis and the system will only accept user's hand gesture when this distance value is larger than a threshold (approximately 25cm).

- After that system will identify either user wants to send single hand command or both hand command. These hand gestures are determined by comparing 3D position of hands between previous and current frame. Here, all the hand gestures are characterized as follows:

Hand gesture	Offset Value in X-axis	Offset Value in Y-axis
Swipe Left	Right Hand – Negative	-
Swipe Right	Left Hand – Positive	-
Lift up	-	Both Hands – Negative
Cross	Right hand – negative & Left Hand – Positive	

Table 2: Comparing of offset for all of the hand gestures

- **Gesture Transmitter**

  Responsibility of this module is transmitting all the data to "Navigation Listener Module". The data must be accurate with all the detail, such as the recognized motion with the speed of the motion.

- **Navigation Message Listener**

  This module collect all the message send from the "Gesture Transmitter Module".

- **Navigating PowerPoint**

  This module will navigate the PowerPoint based on the message received. For example: PowerPoint will move to next slide when it receive "right" message or move to previous slide when it receive "left" message. User able to enjoy realistic navigation experience using hand gestures respectively when user's hands entered in active motion zone.

3.2.4 Implementation Phase

After the system architecture is being established and designed, the next step is to develop the system. During this phase, systems are developed and real code is written based on detailed design specifications. Microsoft Kinect SDK used to develop the Kinect application (as shown in Figure 11).

Acceptance testing carried out to ensure that the system functions as expected and the user's requirements are satisfied. Integration test will be done to ensure the system fit with the environment. Some expected user such as lecturers, tutors and students have been participated in testing process.

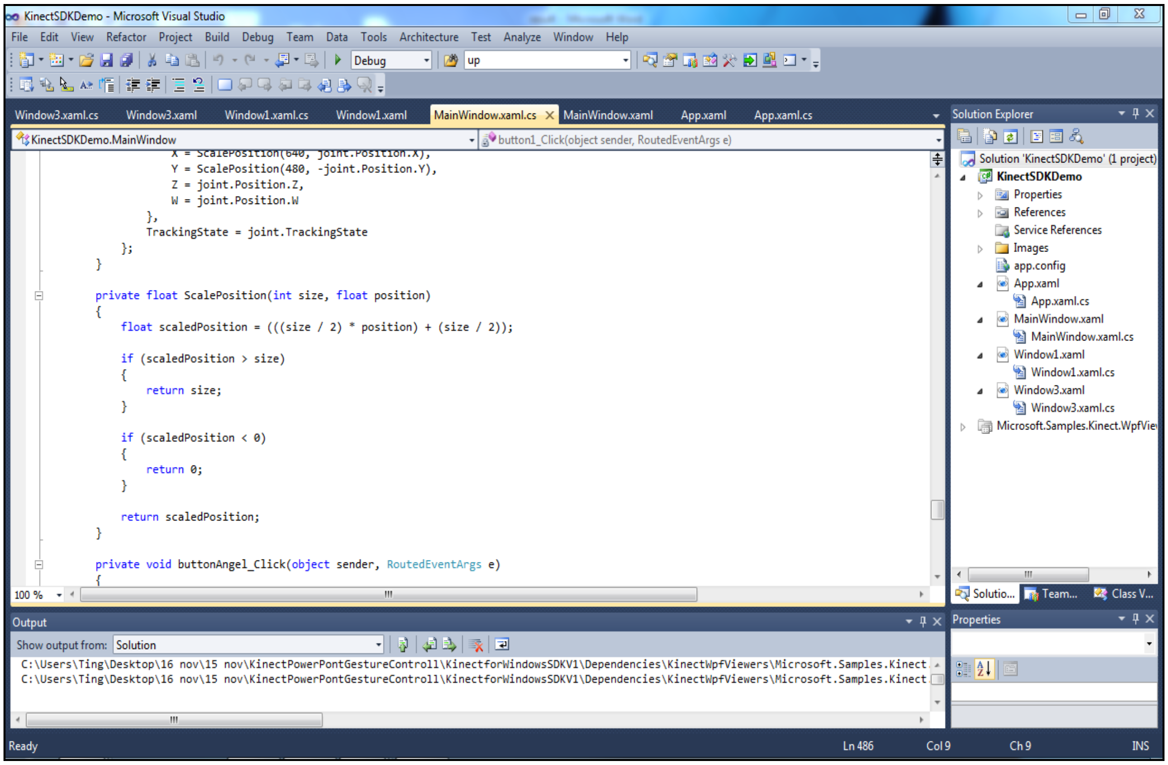

Figure 12: Microsoft Visual studio 2010 software used to create the system, and C# programming language and Kinect SDK have been chosen to write the code.

Figure 13: User testing

3.2.5 Maintenance and Support

Now, this project still under maintenance and support phases in order to improve performance or other attributes. Preventive maintenance also performed in order to prevent problems before they occur. In this paper, the main focus of authors is towards corrective maintenance to overcome all problems arising in the area of design, coding, and testing activities.

I had improved the active motion zone. Before the correction carry out, the active motion zone is smaller, then I found out, there is a lot of detection error when user doing the hand gesture while controlling the PowerPoint presentation. This usually happen, because the presenter always do some gesture when they doing their presentation, in actual they have no intention to navigate the PowerPoint. After that, I resize the active motion zone. (Figure 14)

Figure 14: Before and after the improvement for the active motion zone (Red box).

3.3 Key milestones

Table 3.1 shows the key milestones of Final Year Project I (FYP I) that had been completed.

Key Milestones	Dates
Selection of Topic	Week 1 (8th May 2012)
Submission of Proposal	Week 3 (6th June 2012)
Submission of Extended Proposal	Week 6 (27th June 2012)
Proposal Defense	Week 10 (25th July 2012)
Interim Report	Week 12 (9th August 2012)

Table 3: Key Milestones FYP I.

Table 3.2 shows the key milestones of Final Year Project II **(**FYP II) which will be completed within this semester.

Key Milestones	Dates
Submission of Progress Report	Week 4 (10th October 2012)
Dissertation	Week 11 (26th November 2012)
Pre-Sedex	Week 11 (28th November 2012)
Proposal Defense	Week 12 (5th December 2012)
Final Dissertation	Week 14 (19th December 2012)

Table 4: Key Milestones FYP II.

CHAPTER 4: RESULT

4.1 User Interface

This part will discuss on the prototype functionalities which consist of flow and processes throughout the system usage.

1)

Figure 15: Starting page

The starting page is the first screen that appears when the system is being run.User can simply click on the "start" button to continue using this application or click on cross to close it.

Human-Computer interaction (HCI) have been applied here, it make the user interface become more attractive to user and user can easily know where to click the button in order to continue.

2)

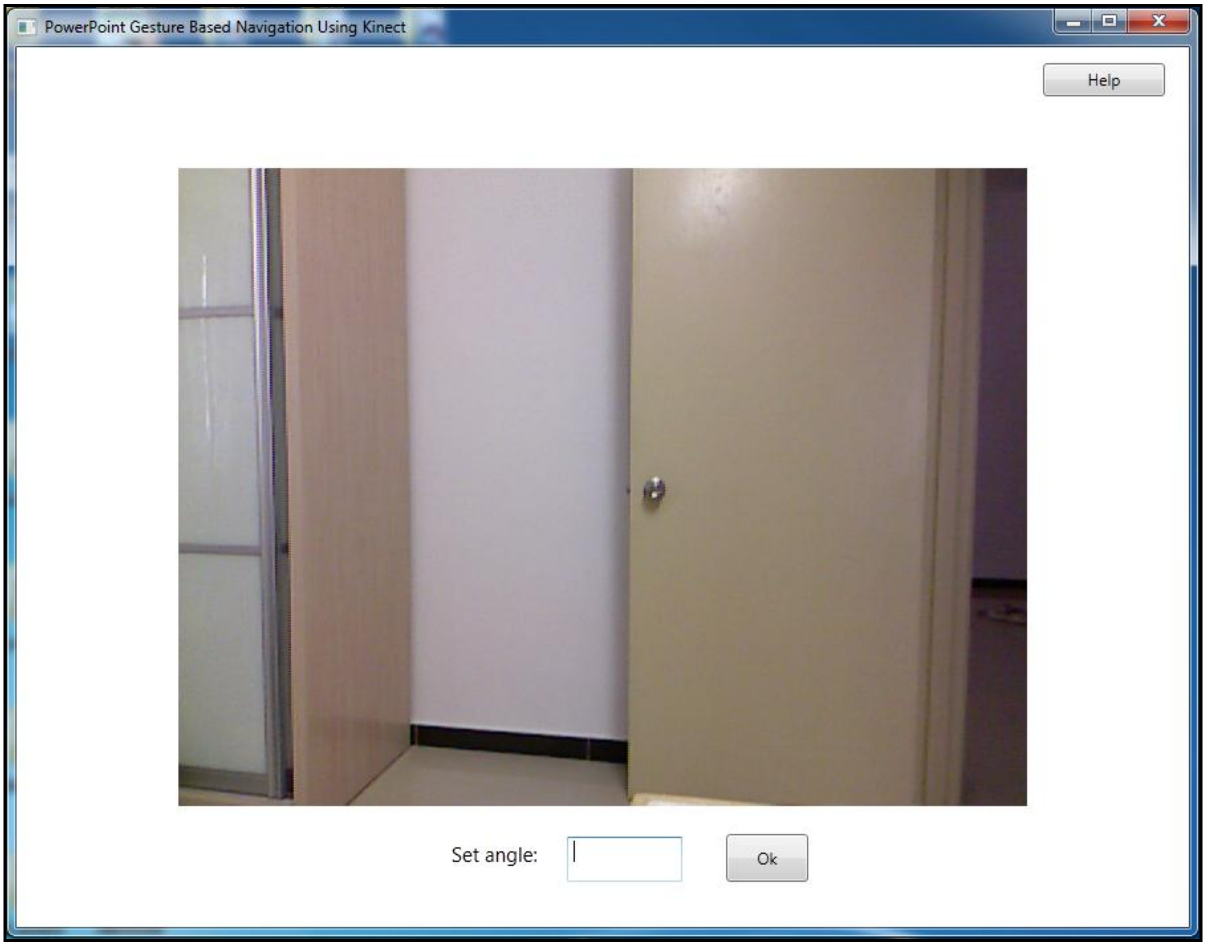

Figure 16: Kinect field of view

Right now, the interface displays the Kinect field of view. The Kinect angle adjuster on the bottom and “help” button on the top right side.

Kinect angle adjuster can be used to adjust the angel of the Kinect. The value ranges from -27 being the lowest, and 27 being the highest. User can enter the value between the ranges as they wish. If value entered out of the range, error message will pop out to notify user to re-enter the value. Besides that, if the user found some problem when using this application, they can click on “help” button to solve their problem.

3)

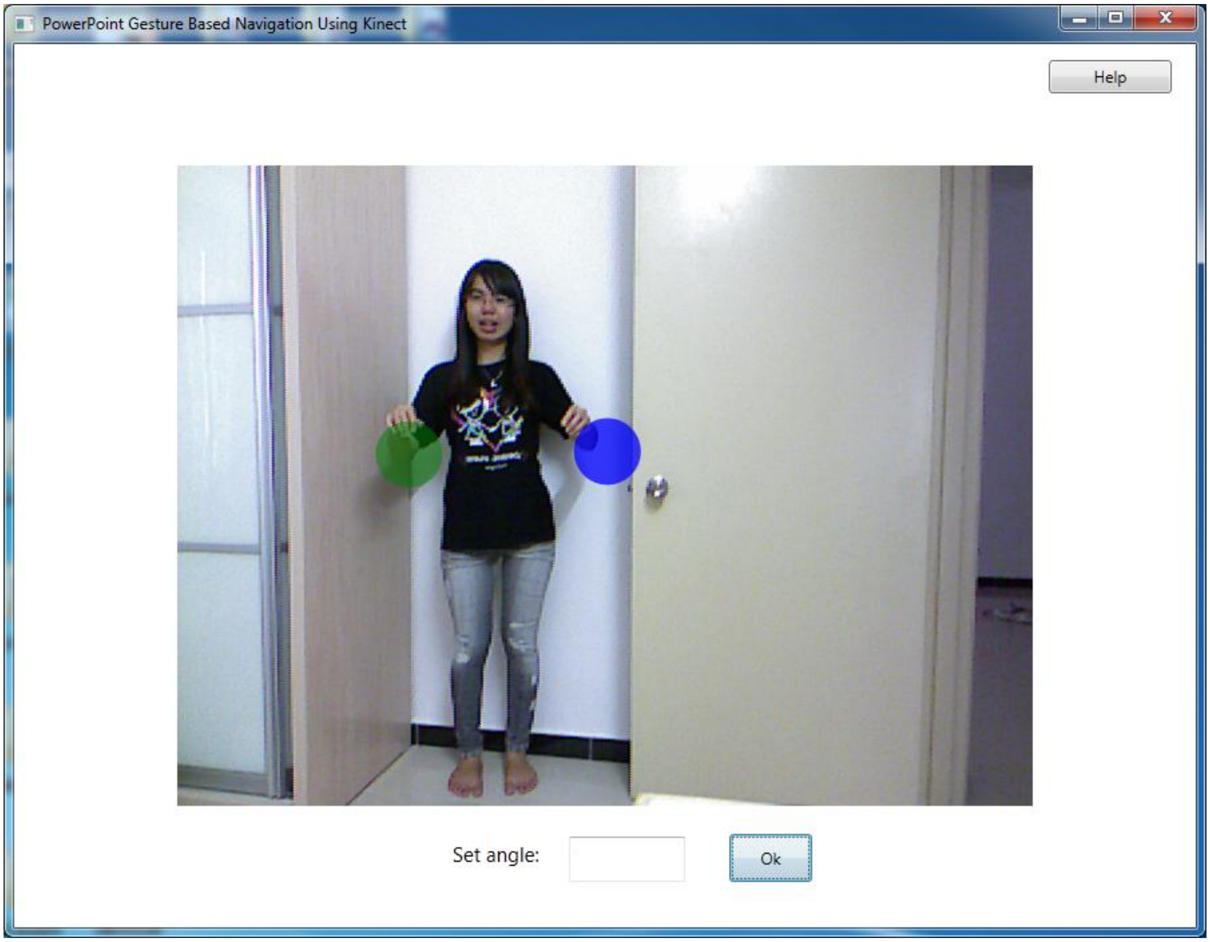

Figure 17: When Kinect detected the user.

From the user interface above, user can do the testing, user will be able to know whether they are in the right distance to interact with Kinect and use it. When the user inside the active motion zone ,Kinect will detect the user hands, circle filled with green color will follow the right hand, while the circle filled with blue color will follow the left hand. When the user moves around, the circles also move around.

4.2 Gesture Type Recognized and Motion Explanation

1)

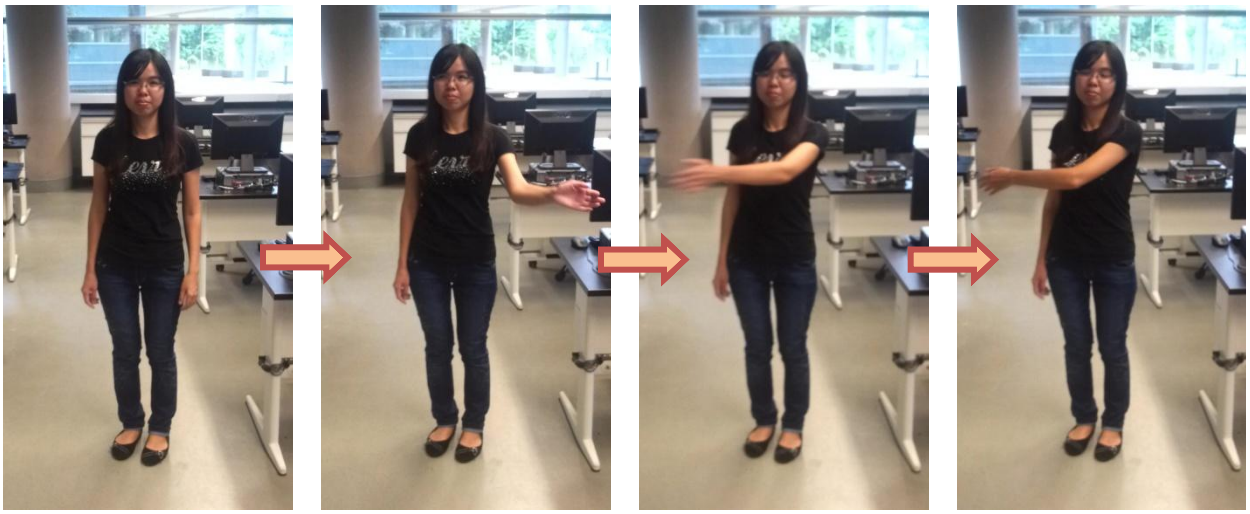

Figure 18: Motion of gesture: swipe right

Motion explanation: Swipe left hand from left to right to navigate the PowerPoint presentation to next slide.

2)

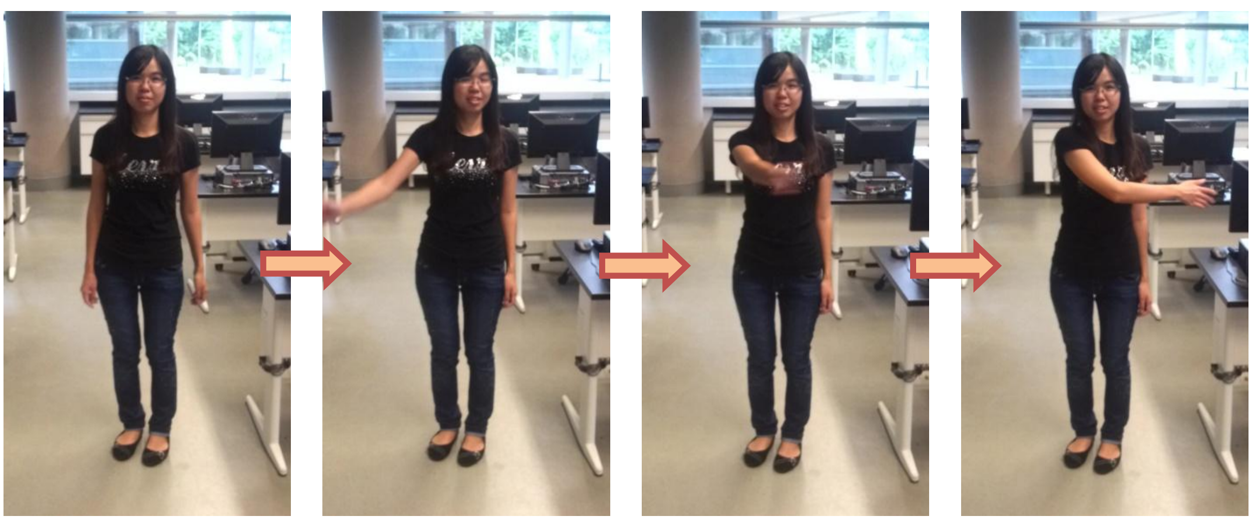

Figure 19: Motion of gesture: swipe left

Motion explanation: Swipe right hand from right to left to navigate the PowerPoint presentation to previous slide.

3)

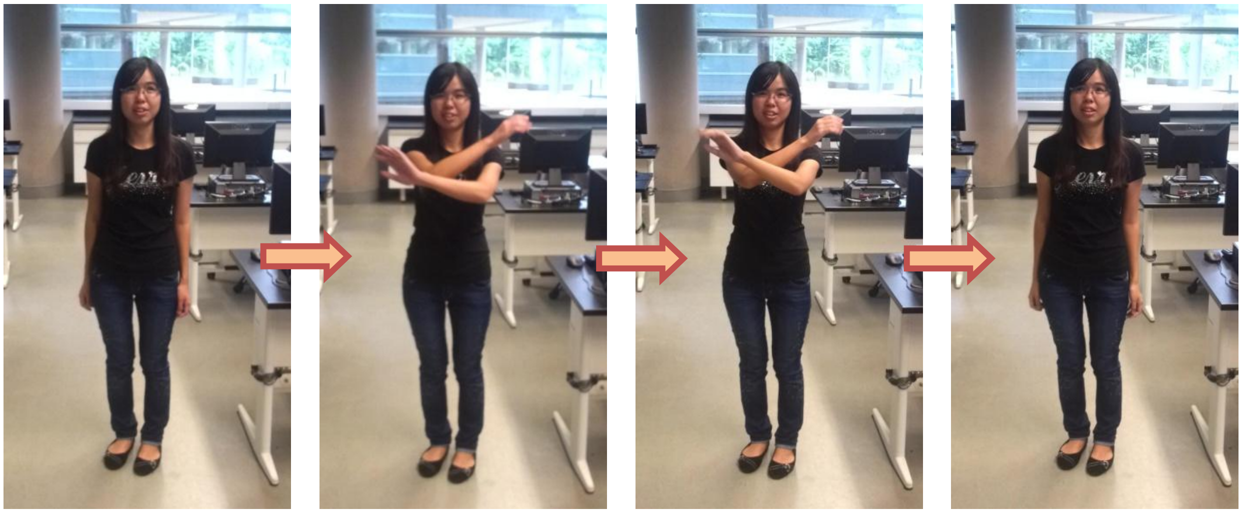

Figure 20: Motion of gesture: cross

Motion explanation: Hands cross to navigate the PowerPoint presentation to first slide.

4)

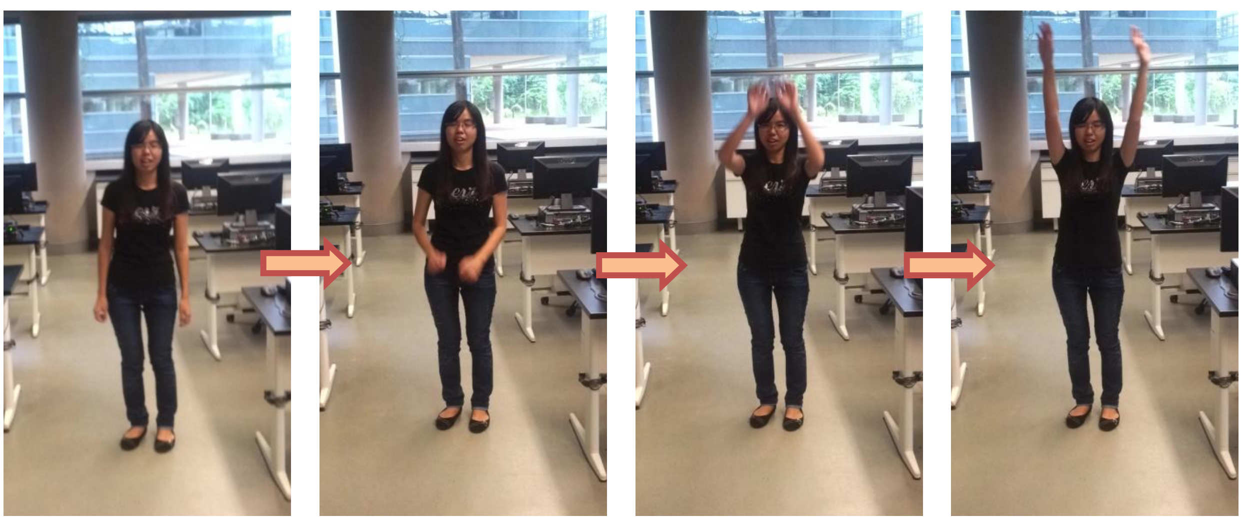

Figure 21: Motion of gesture: Lift up

Motion explanation: Both hands lift up to end the PowerPoint presentation or move to last slide.

4.3 Experiment Results

The performance of the system developed was evaluated by proposed gesture recognition function in this experiment. 8 users participated into this experiment and each of them stand inside the Kinect's view and repeated the gesture of swipe left, swipe right, lift up and cross for 10 times. The performance is measured according the number of PowerPoint slide navigation which is same as user gestures. The result of this experiment is illustrated in Table below.

Experiment candidate	**Functionality performance (%)**			
	Swipe Left	**Swipe Right**	**Cross**	**Lift Up**
Male 1	90	80	70	80
Male 2	80	80	80	70
Male 3	100	80	80	80
Male 4	80	70	90	70
Female 1	80	100	70	80
Female 2	90	90	70	90
Female 3	70	80	80	70
Female 4	90	90	90	80
Average	85.00	83.75	78.75	77.50

Table 5: Experiment results of functionality performance of the system

(PowerPoint gesture based navigation using Kinect)

Through this experiment, it shows that two hands motion has lower detection rate, comparing to one hand motion. There are still some detection errors when the user doing the hand gesture to navigate PowerPoint presentation. The main reason is the sensitivity issue and not the program. If the users move their hands faster, sometimes system missed the gesture to detect. Another reason is the distance between Kinect and the user, user can be more perfectly detected if he or she stand in front of the kinect and the best distance is around 1.6 meter. Other distance may cause more error detection.

4.4 User evaluation

After conducting all the user testing and functional testing of the system, all the feedbacks from the users had been interpreted as in figure 16. Based on the pie chart, more than 70 percent of the users strongly agree and agree on the implementation of the system. They agree on the system helpfulness and the benefits of implementing it in classroom.

They also recommend some improvements to the system as well as suggest little more additional functionality to the system. More function should be implementing in the future, for example, using the hand gesture to perform the mouse action. In overall, the system had met the requirements.

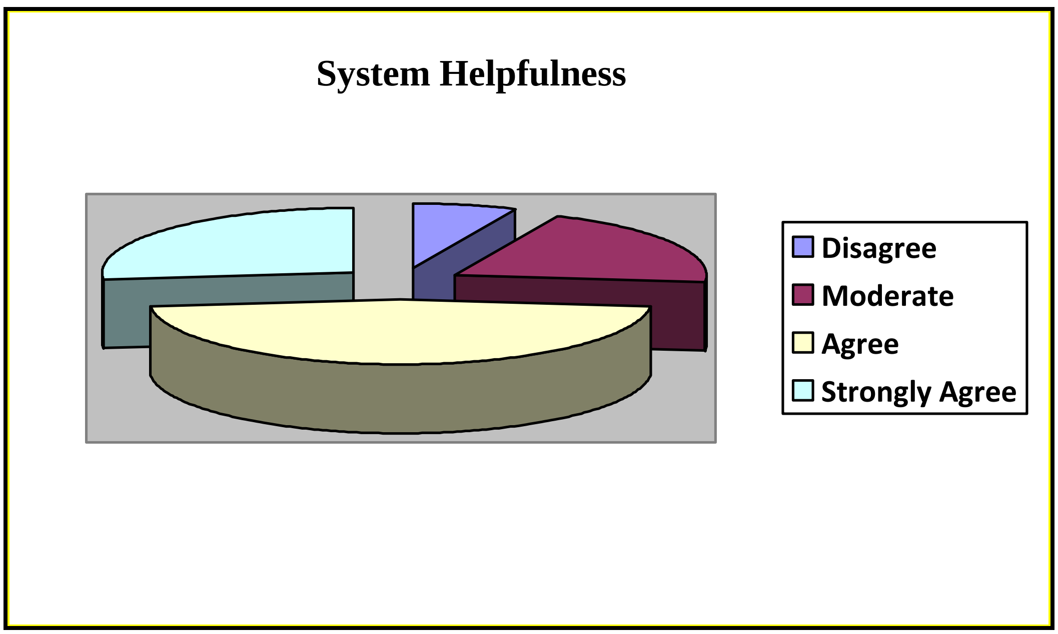

Figure 22: User Evaluation result

4.5 Challenges

Working with Kinect has many challenges as this is a new technology. The resources available to use and to refer to are very low. Now, the Kinect SDK still undergoing some improvement. Since this is a relatively new technology, there are not many tutorials that can be used to learn on how to code programs for Kinect. Due to the requirement of well knowledge of motion detection in Xbox Kinect which is less exposed during the lecture. So, I have gone through some related video and sample code before start the coding and then keep explore myself.

The thing I found during the field testing is that the system cannot work properly when there is too much infrared from the sun. This happen when testing carried out in the classroom which located in UTP, as the wall of classroom make up of glass. This hinders Kinect from functioning properly and the Kinect itself cannot distinguish users from the environments. Besides that, program also doesn’t work well when user stand too far from the Kinect or too near with the Kinect. So, in order to make the program become better, more kinect needed to detect the user.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

As a conclusion, this project is about developing a new technique of PowerPoint presentation navigation. The aim is to let the user navigate the PowerPoint presentation using simple hand gesture such as: swipe left, swipe right, and lift up and cross. At the same time, PowerPoint will be under control regards the motion gesture detected. From the research that I made, I found that I have met the objectives of my project. The system is easy to use, user not need going through training or reading a lot of instruction, just some easy instruction, they manage to use it.

Besides that, I also manage to conduct fields testing to see their acceptance of the technology. User testing has been carried out in classroom and meeting room. From there, I get to know that a lot of students felt that using hand gesture to navigate slide enabled very attractive presentations as the technique itself appealing to them. Students will be more interested in the subject and focused more in class. Besides that, presenter can improve the interaction between presenter and audience as the user can focus more on the audience instead of the PowerPoint control and they can move freely on the stage.

Since this project only covers some basic function to navigate the PowerPoint, there are many rooms for more improvement in the future. This project will only serve as s proves of concept or as a tool to measure how effective if it used in classroom and how people able to adapt with this new technology. For the future work, many more function can be added in to the current application developed. For example, user navigates to specific slide by doing some hand gesture.

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CHAPTER 7: Appendices

7.1 Gantt chart

Gantt Chart for FYP I

No	Task Name / Week	1	2	3	4	5	6	7	8	9	10	11
1	Selection of Project Topic											
2	Preliminary Research Work											
3	Submission of Project Proposal											
4	Literature Review											
5	Submission of Extended Proposal											
6	Preparation for VIVA and do more research											
7	VIVA											
8	Preparation of Interim Report											
9	Submission of Interim Report											

Gantt chart for Final Year Project I (FYP I) which is the first phase of this project. The Task for FYP I have been completed within the timeline.

Gantt Chart for FYP II

No	Task Name / Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Work Continues	■	■	■											
2	Submission of Progress Report				■										
3	Development of application					■	■	■							
4	Pre-SEDEX								■						
5	Preparation of Dissertation									■	■	■			
6	Submission of Dissertation											■			
7	Project Improvement and Project Testing											■			
8	Preparation for VIVA											■	■		
9	VIVA												■		
	Preparation of Final Project Dissertation												■	■	
10	Submission of Final Project Dissertation														■

Below is the Gantt chart for Final Year Project II (FYP II), developer will follow the timeline to develop the application.

7.2 Sample Questionnaires

The objective of this questionnaire is to find out the acceptance of implementing Kinect PowerPoint navigation in classroom for lecturer in university. Through this application, lecturer can control the PowerPoint navigation with just a simple hand gesture. This can avoid the tethering to a mouse or keyboard to change the slides as it limit the freedom of presenter.

Please take a few minutes to answer the following questions. The response will be kept private and confidential and will be solely used for the purpose of the final year project. It is hope that each question will be answered. Thank you in advance for your cooperation. Please take a few minutes to answer the following questions.

1. Please select your gender.

☐ Male ☐ Female

2. Please select your age group.

☐ 15 years old and below ☐ 26 to 35 years old

☐ 16 to 20 years old ☐ 36 to 45 years old

☐ 21 to 25 years old ☐ 46 years old and above

3. Please select your years of experience in teaching.

☐ 1 year or fewer ☐ 11 to 15 years

☐ 2 to 5 years ☐ 16 to 25 years

☐ 6 to 10 years ☐ 16 years or more

4. Do you know what Kinect is? [If you don’t know about Kinect, proceed to question 7.]

☐ Yes ☐ No

5. Do you have a Kinect?

☐ Yes ☐ No

6. Have you ever used body language to interact with your computer or television (for example Microsoft kinect, PlayStation move, Nintendo wii) ?

☐ Yes ☐ No

7. If you had to make a choice between a Wii, the Kinect with a 360, which one would you go for?

☐ Wii

☐ Kinect

8. What method or way do you used to navigate the PowerPoint presentation?

☐ Mouse or keyboard

☐ PowerPoint remote controller

☐ I-clicker

☐ Others: ________________________

9. Do you think that application of PowerPoint navigation by using hand gesture is useful for presenter?

☐ Yes ☐ No

10. Do you agree that there is less interaction between lecturer and students in class?

Strongly Disagree ☐ ☐ ☐ ☐ ☐ Strongly Agree

1 2 3 4 5

11. Do you think that Kinect PowerPoint navigation can create interactivity between a presenter and his/her audience?

☐ Yes ☐ No

12. How would you rate the level of convenience if the Kinect PowerPoint control application use in classroom?

Least Convenient ☐ ☐ ☐ ☐ ☐ Very Convenient

1 2 3 4 5

7.3 Part of the code

Code for the Main XAML

```
//Ting Hie Ping
//12887
//ICT
//Topic: PowerPoint gesture based navigation using Kinect
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Data;
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Navigation;
using System.Windows.Shapes;
using Microsoft.Research.Kinect.Nui;
using SocketVB;
using System.Net;
using System.Net.Sockets;
using System.Threading;
using System.Windows.Forms;

namespace KinectSDKDemo
{
```

```
public partial class MainWindow : Window
{
    Runtime _nui;
    string _kinectSendMessage = "null";
    int Window_Zoom = 100;

    bool LeftXAction = false, LeftYAction = false;
    bool RightXAction = false, RightYAction = false;
    int NoActionCnt = 0, ActionHappenCnt = 3;

    int LeftX_SpeedCnt = 0, LeftY_SpeedCnt = 0;
    int RightX_SpeedCnt = 0, RightY_SpeedCnt = 0;
    bool ActionHappening = true;



    const int ZoomInAct = 1;
    const int ZoomOutAct = 2;
    const int SwipeLeftAct = 3;
    const int SwipeRightAct = 4;

    float PreviousLeftX=0, PreviousRightX=0;
    float CurrentLeftX = 0, CurrentRightX = 0;

    float PreviousLeftY = 0, PreviousRightY = 0;
    float CurrentLeftY = 0, CurrentRightY = 0;

    bool IsMouseDown = false;

    Joint Leftjoint = new Joint();
    Joint Rightjoint = new Joint();
```

```
        public MainWindow()
        {
            InitializeComponent();
        }

        private void Window_Loaded(object sender, RoutedEventArgs e)
        {
            _nui = new Runtime();

            _nui.VideoFrameReady += new
EventHandler<ImageFrameReadyEventArgs>(Nui_VideoFrameReady);
            _nui.SkeletonFrameReady += new
EventHandler<SkeletonFrameReadyEventArgs>(Nui_SkeletonFrameReady);

            try
            {
                _nui.Initialize(RuntimeOptions.UseDepthAndPlayerIndex |
RuntimeOptions.UseSkeletalTracking | RuntimeOptions.UseColor);
                _nui.VideoStream.Open(ImageStreamType.Video, 2,
ImageResolution.Resolution640x480, ImageType.Color);

                 //Must set to true and set after call to Initialize
                _nui.SkeletonEngine.TransformSmooth = true;

                //Use to transform and reduce jitter
                var parameters = new TransformSmoothParameters
                {
                    Smoothing = 0.80f,
                    Correction = 0.0f,
                    Prediction = 0.0f,
```

```
            JitterRadius = 0.05f,
            MaxDeviationRadius = 0.04f
          };

          _nui.SkeletonEngine.SmoothParameters = parameters;

        }
        catch (Exception ex)
        {
          System.Diagnostics.Debug.WriteLine(ex.Message);
        }
      }

      void Nui_VideoFrameReady(object sender, ImageFrameReadyEventArgs e)
      {
        var image = e.ImageFrame.Image;

        img.Source = BitmapSource.Create(image.Width, image.Height, 96, 96,
  PixelFormats.Bgr32, null, image.Bits, image.Width * image.BytesPerPixel);
      }



     //set x, y, z value to zero
      void Nui_SkeletonFrameReady(object sender, SkeletonFrameReadyEventArgs e)
      {
        float HeadX = 0.0f;
        float HeadY = 0.0f;
        float HeadZ = 0.0f;

        float HandLeftX = 0.0f;
        float HandLeftY = 0.0f;
```

```
float HandLeftZ = 0.0f;

float HandRightX = 0.0f;
float HandRightY = 0.0f;
float HandRightZ = 0.0f;

float ShLeftX = 0.0f;
float ShLeftY = 0.0f;
float ShLeftZ = 0.0f;

float ShRightX = 0.0f;
float ShRightY = 0.0f;
float ShRightZ = 0.0f;

canvas.Children.Clear();

int user_cnt = 0;
int min_user = 0;
float min_headx = 1000f;

foreach (SkeletonData user in e.SkeletonFrame.Skeletons)
{
   if (user.TrackingState == SkeletonTrackingState.Tracked)
   {
      foreach (Joint joint in user.Joints)
      {
         if (joint.Position.W < 0.6f) return;
         if (JointID.Head == joint.ID)
         {
            if (joint.Position.Z < min_headx)
            {
```

```
                min_headx = joint.Position.Z;
                min_user = user_cnt;
            }
        }

    }
}
user_cnt++;
}

    SkeletonData detect_user = e.SkeletonFrame.Skeletons[min_user];
    foreach (Joint joint in detect_user.Joints)
    {
        if (joint.Position.W < 0.6f) return;

       //Get the x, y, z value
        if (JointID.Head == joint.ID)
        {
            HeadX = joint.Position.X;
            HeadY = joint.Position.Y;
            HeadZ = joint.Position.Z;
        }

        if (JointID.HandLeft == joint.ID)
        {
            HandLeftX = joint.Position.X;
            HandLeftY = joint.Position.Y;
            HandLeftZ = joint.Position.Z;
        }

        if (JointID.HandRight == joint.ID)
```

```
    {
        HandRightX = joint.Position.X;
        HandRightY = joint.Position.Y;
        HandRightZ = joint.Position.Z;
    }

    if (JointID.ShoulderLeft == joint.ID)
    {
        ShLeftX = joint.Position.X;
        ShLeftY = joint.Position.Y;
        ShLeftZ = joint.Position.Z;
    }

    if (JointID.ShoulderRight == joint.ID)
    {
        ShRightX = joint.Position.X;
        ShRightY = joint.Position.Y;
        ShRightZ = joint.Position.Z;
    }

}

foreach (Joint joint in detect_user.Joints)
{
    switch (joint.ID)
    {
        case JointID.HandLeft:
            {
                Leftjoint = joint;
                int distx = (int)(Math.Abs(HandLeftX - CurrentLeftX)*1000);
                if ((ActionHappening == true) && distx > 65)
```

```
        {
            PreviousLeftX = CurrentLeftX;
            CurrentLeftX = HandLeftX;
            LeftXAction = true;
        }


        int disty = (int)(Math.Abs(HandLeftY - CurrentLeftY) * 1000);
        if ((ActionHappening == true) && disty > 65)
        {
            PreviousLeftY = CurrentLeftY;
            CurrentLeftY = HandLeftY;
            LeftYAction = true;
        }
    }
    break;

case JointID.HandRight:
    {
        Rightjoint = joint;


        int distx = (int)(Math.Abs(HandRightX - CurrentRightX) * 1000);
        if ((ActionHappening == true) && distx > 65)
        {
            PreviousRightX = CurrentRightX;
            CurrentRightX = HandRightX;
            RightXAction = true;
        }

        int disty = (int)(Math.Abs(HandRightY - CurrentRightY) * 1000);
        if ((ActionHappening == true) && disty > 65)
```

```
                {
                    PreviousRightY = CurrentRightY;
                    CurrentRightY = HandRightY;
                    RightYAction = true;
                }
            }
            break;
        }
    } //end foreach

    int LeftDiffZ = (int)((ShLeftZ - HandLeftZ) * 100);
    int RightDiffZ = (int)((ShRightZ - HandRightZ) * 100);

    int thres_Z = 25;
    int LRDiffX = (int)((HandLeftX - HandRightX) * 100);

   // hands cross
    if (HandRightX < HandLeftX && HandLeftX > HandRightX && HandRightX <
ShLeftX && HandLeftX > ShRightX && LRDiffX >= 35)
    {
        System.Windows.Forms.SendKeys.SendWait("{END}");
        Thread.Sleep(1000);
        ActionHappening = false;
        ActionHappenCnt = 0;
    }

    // both hand moving
    else if (LeftDiffZ >= thres_Z && RightDiffZ > thres_Z)
    {
        DrawPoint(Leftjoint, Colors.Green);
        DrawPoint(Rightjoint, Colors.Blue);
```

```
            double dist = Math.Sqrt(Math.Pow(HandRightX - HandLeftX, 2) +
Math.Pow(HandRightY - HandLeftY, 2));
            int User_Zoom = ((int)(dist * 100));
            if (User_Zoom < 20)
            {
                return;
            }

            else if (User_Zoom > 140)
            {
                return;
            }

            int magnitude = Math.Abs(User_Zoom - Window_Zoom);

            if (magnitude > 8)
            {

                if (User_Zoom < Window_Zoom)
                {
                    _kinectSendMessage = "BACKWARD_" + ((int)(0.8f
*User_Zoom)).ToString();
                    Thread.Sleep(5);

                }
                else if ((User_Zoom > Window_Zoom) && (HandRightY > HeadY) &&
(HandLeftY > HeadY))
                {
                    _kinectSendMessage = "FORWARD_";
                    textBox1.Text = textBox1.Text + _kinectSendMessage + "\n";
                    System.Windows.Forms.SendKeys.SendWait("{HOME}");
```

```
            Thread.Sleep(5);
        }
        Window_Zoom = User_Zoom;
    }
}
else if ((LeftDiffZ >= thres_Z)) // left hand moving

{
    ActionHappenCnt++;
    if ((ActionHappening == false) && ActionHappenCnt >= 8)
    {
            PreviousLeftX = HandLeftY;
            CurrentLeftX = HandLeftX;

            PreviousLeftY = HandLeftY;
            CurrentLeftY = HandLeftY;

            ActionHappening = true;
            NoActionCnt = 0;
            LeftX_SpeedCnt = 0;
            LeftY_SpeedCnt = 0;
    }

    if (ActionHappening)
    {
        DrawPoint(Leftjoint, Colors.Green);
        LeftX_SpeedCnt++;
        LeftY_SpeedCnt++;
    }

    int LeftDiffX = (int)((CurrentLeftX - PreviousLeftX) * 1000);
```

```
                    int LeftDiffY = (int)((CurrentLeftY - PreviousLeftY) * 1000);

                    if ((ActionHappening == true) && (LeftXAction == true) && (LeftDiffX > 50)
&& (HandLeftX > ShRightX))
                    {
                        System.Windows.Forms.SendKeys.SendWait("{PGDN}");
                        Thread.Sleep(1000);
                        LeftXAction = false;
                        LeftX_SpeedCnt = 0;
                    }
                }
                else if (RightDiffZ > thres_Z) // right hand moving
                {
                    ActionHappenCnt++;
                    if ((ActionHappening == false) && ActionHappenCnt >= 8)
                    {
                        PreviousRightX = HandRightX;
                        CurrentRightX = HandRightX;

                        PreviousRightY = HandRightY;
                        CurrentRightY = HandRightY;

                        ActionHappening = true;
                        NoActionCnt = 0;
                        RightX_SpeedCnt = 0;
                        RightY_SpeedCnt = 0;
                    }

                    if (ActionHappening)
                    {
                        DrawPoint(Rightjoint, Colors.Blue);
```

```
                RightX_SpeedCnt++;
                RightY_SpeedCnt++;
            }



            if (IsMouseDown == false)
            {
                int RightDiffX = (int)((CurrentRightX - PreviousRightX) * 1000);

                if ((ActionHappening == true) && (RightXAction == true) && (RightDiffX
<= -65) && (HandRightX < ShLeftX) && (HandRightX < HandLeftX))
                {
                    _kinectSendMessage = "LEFT_" + Math.Abs((int)((HandLeftX))).ToString();
                    textBox1.Text = textBox1.Text + _kinectSendMessage + "\n";
                    System.Windows.Forms.SendKeys.SendWait("{PGUP}");
                    Thread.Sleep(1000);
                    RightXAction = false;
                    RightX_SpeedCnt = 0;
                }
            }
        }
        else
        {
            if(ActionHappening)
            {
                NoActionCnt++;
                if (NoActionCnt > 5)
                {
                    ActionHappening = false;
                    ActionHappenCnt = 0;
                }
```

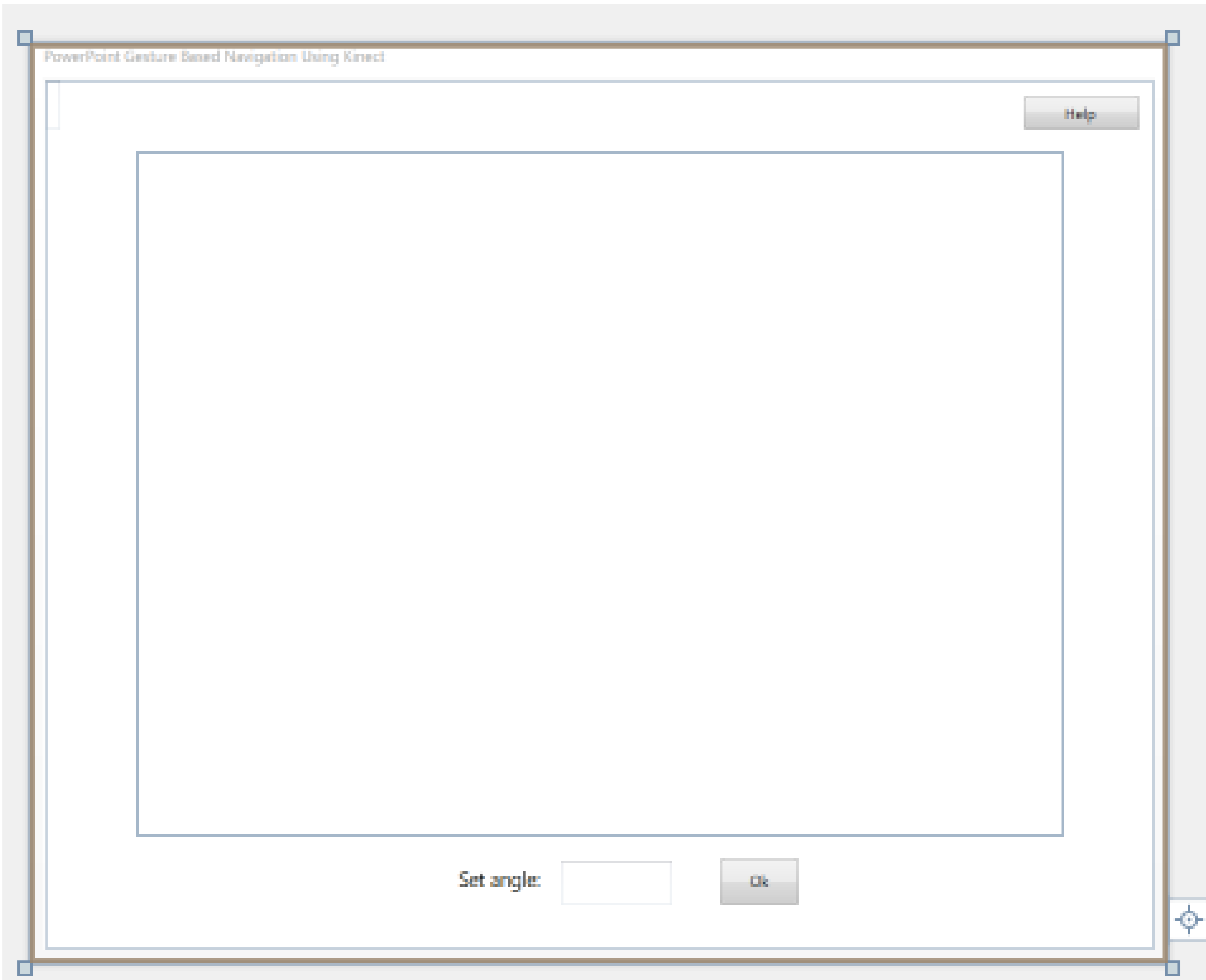
```
            }
        }

        LeftDiffZ = 0;
        RightDiffZ = 0;
}

// draw the ball
private void DrawPoint(Joint joint, Color color)
{
    var scaledJoint = ScaleJoint(joint);

    Ellipse ellipse = new Ellipse

    {
        Fill = new SolidColorBrush(color),
        Width = 50,
        Height = 50,
        Opacity = 0.5,
        Margin = new Thickness(scaledJoint.Position.X, scaledJoint.Position.Y, 0, 0)
    };

    canvas.Children.Add(ellipse);
}

private Joint ScaleJoint(Joint joint)
{
    return new Joint()
    {
        ID = joint.ID,
        Position = new Microsoft.Research.Kinect.Nui.Vector
        {
```

```
            X = ScalePosition(640, joint.Position.X),
            Y = ScalePosition(480, -joint.Position.Y),
            Z = joint.Position.Z,
            W = joint.Position.W
        },
                TrackingState = joint.TrackingState

    };
}

private float ScalePosition(int size, float position)
{
    float scaledPosition = (((size / 2) * position) + (size / 2));

    if (scaledPosition > size)
    {
        return size;
    }

    if (scaledPosition < 0)
    {
        return 0;
    }

    return scaledPosition;
}

//click button used to set the angle of the Kinect
private void buttonAngel_Click(object sender, RoutedEventArgs e)
{
    try
    {
```

```
            this._nui.NuiCamera.ElevationAngle = Convert.ToInt32(this.textAngel.Text);
        }

        // Error Message
        catch (Exception ex)
        {
            System.Windows.MessageBox.Show("Error! \n Parameter name: Elevation angle must
be between Elevation Minimum/Maximum (value between -27 & 27)");
        }
        textAngel.Clear();
    }

    private void Window_MouseDown(object sender, MouseButtonEventArgs e)
    {   IsMouseDown = true;
    }

    private void Window_MouseUp(object sender, MouseButtonEventArgs e)
    {
        IsMouseDown = false;
    }

    private void button1_Click(object sender, RoutedEventArgs e)
    {
        Window3 W2 = new Window3();
        W2.Show();
    }

    private void textAngel_TextChanged(object sender, TextChangedEventArgs e)
    {
    }
```

```
        private void textBox1_TextChanged(object sender, TextChangedEventArgs e)
        {
        }

    }
}
```

Design for the Main Window XAML.CS



Code for the Main Window XAML.CS

```
<Window x:Class="KinectSDKDemo.MainWindow"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="PowerPoint Gesture Based Navigation Using Kinect" Height="700" Width="900"
Loaded="Window_Loaded" MouseDown="Window_MouseDown"
MouseUp="Window_MouseUp">
    <Grid>
        <Image Name="img" Margin="73,54,71,86" />
        <Canvas Name="canvas" Margin="73,54,71,86">
            <TextBox Name="messageToSendHandLeft1" Focusable="False" Canvas.Left="-293"
Canvas.Top="-64" />
        </Canvas>
        <TextBox Height="34" HorizontalAlignment="Right" Margin="0,594,382,0"
Name="textAngel" VerticalAlignment="Top" Width="87"
TextChanged="textAngel_TextChanged" />
        <Button Content="Ok" Height="36" HorizontalAlignment="Left" Margin="535,592,0,0"
Name="buttonAngel" VerticalAlignment="Top" Width="62" Click="buttonAngel_Click" />
        <Label Content="Set angle:" Height="32" HorizontalAlignment="Left"
Margin="323,592,0,0" Name="label1" VerticalAlignment="Top" Width="80" FontSize="15" />
        <Button Content="Help" Height="25" HorizontalAlignment="Left" Margin="774,12,0,0"
Name="button1" VerticalAlignment="Top" Width="92" Click="button1_Click" />
        <TextBox Height="37" HorizontalAlignment="Left" Name="textBox1"
VerticalAlignment="Top" Width="168" TextChanged="textBox1_TextChanged" FontSize="48"
/>
    </Grid>
</Window>
```

Code for the Starting page

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Data;
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Shapes;

namespace KinectSDKDemo
{
    /// <summary>
    /// Interaction logic for Window1.xaml
    /// </summary>
    public partial class Window1 : Window
    {
        public Window1()
        {
            InitializeComponent();
        }

        private void button1_Click(object sender, RoutedEventArgs e)
        {
```

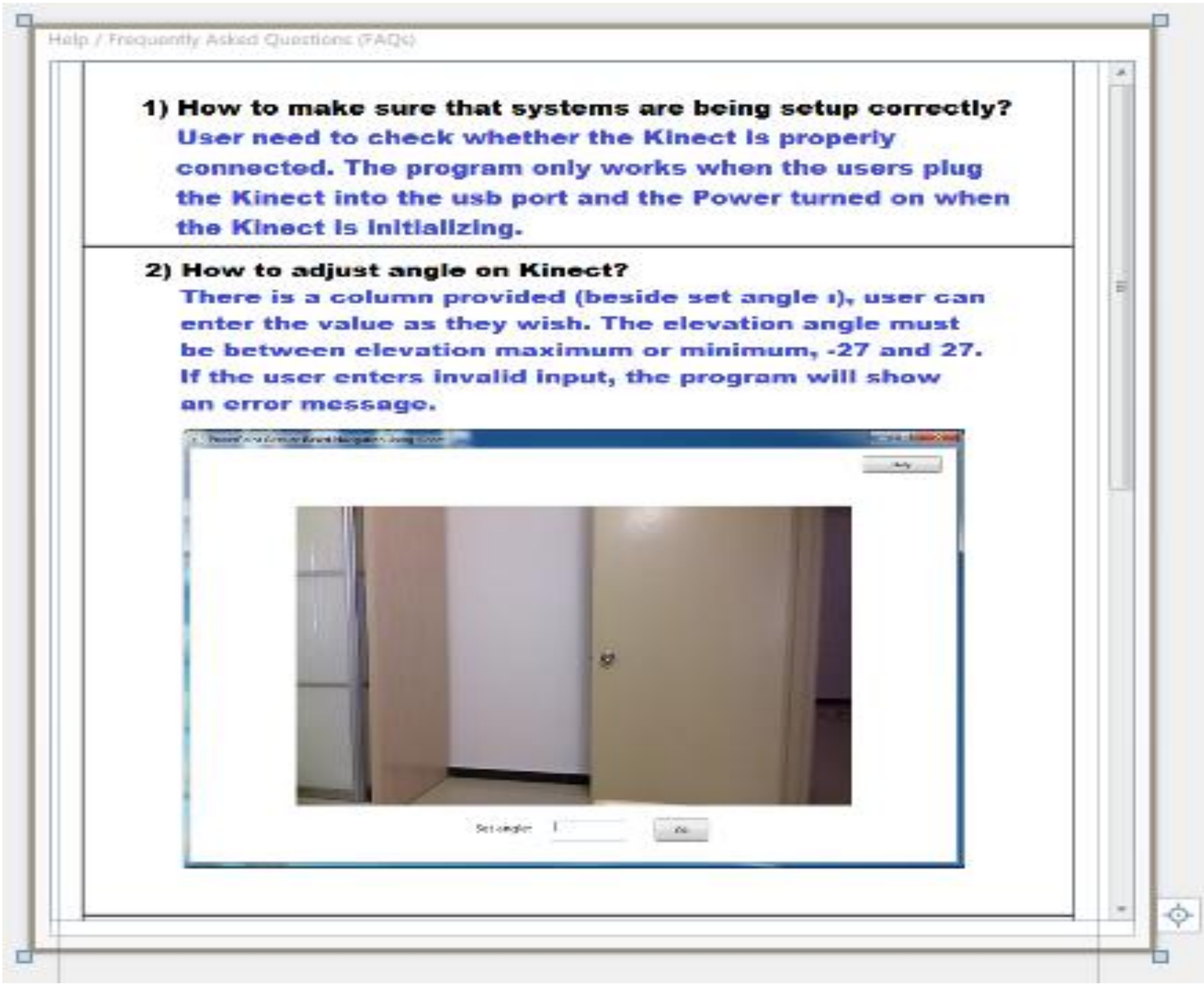
```
            MainWindow frm = new MainWindow();
            frm.Show();
            this.Close();


        }
    }
}
```

Design for the starting page XAML.CS

Code for the starting page XAML.CS

```
<Window x:Class="KinectSDKDemo.Window1"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="" Height="700" Width="900">
    <Grid>
        <Grid.Background>
            <ImageBrush ImageSource="/KinectSDKDemo;component/Images/JumpforNatal%20-
%20Copy.jpg" />
        </Grid.Background>
        <Button Content="START" Height="69" HorizontalAlignment="Left"
Margin="353,240,0,0" Name="button1" VerticalAlignment="Top" Width="179"
Click="button1_Click" Background="#CFF3EAD4" Foreground="#FF151414" FontSize="48"
FontStyle="Normal" FontFamily="Viner Hand ITC"></Button>
    </Grid>
</Window>
```

Design for the help page



Code for the help page XAML.CS

```
<Window x:Class="KinectSDKDemo.Window3"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="Help / Frequently Asked Questions (FAQs)" Height="700" Width="680">
    <Grid>
        <ScrollViewer Margin="0,0,0,12">

            <StackPanel x:Name="LayoutRoot" Orientation="Vertical" Width="630">

                <Rectangle Height="140" Name="rectangle1" Stroke="Black" Width="600">
                    <Rectangle.Fill>
                        <ImageBrush ImageSource="/KinectSDKDemo;component/Images/1.png" />
                    </Rectangle.Fill>
                </Rectangle>
                <Rectangle Height="505" Name="rectangle2" Stroke="Black" Width="600">
                    <Rectangle.Fill>
                        <ImageBrush ImageSource="/KinectSDKDemo;component/Images/2.png" />
                    </Rectangle.Fill>
                </Rectangle>
                <Rectangle Height="200" Name="rectangle3" Stroke="Black" Width="600">
                    <Rectangle.Fill>
                        <ImageBrush ImageSource="/KinectSDKDemo;component/Images/3.png" />
                    </Rectangle.Fill>
                </Rectangle>
                <Rectangle Height="455" Name="rectangle4" Stroke="Black" Width="600">
                    <Rectangle.Fill>
                        <ImageBrush ImageSource="/KinectSDKDemo;component/Images/4.png" />
                    </Rectangle.Fill>
                </Rectangle>
```

```
            </StackPanel>
        </ScrollViewer>

    </Grid>
</Window>
```

PowerPoint Gesture Based Navigation Using Kinect

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***Abstract*—The application of technology in education has emerged very rapidly due to its positive effects on teaching and learning skills. It should be used wisely among the educators in order to enhance and improve academic performances. As we know, PowerPoint slides are a powerful aid to today's lecturer, who can use it to easily prepare dozens of slides to accompany a lecture. In this project, we will discuss the development of a Kinect application for navigating PowerPoint presentation. A main tool used to develop this application is the Kinect sensor. The Microsoft Kinect for Xbox 360 ("Kinect") has been implemented in all sorts of applications because of its convenient and inexpensive depth mapping sensor. Some more, Kinect has been proving that it has the potential to improve the integration between lecturer and student and encourage student participation in the class. To meet the most important aim of this project, which is to let the user navigate a PowerPoint presentation easily, the Kinect motion sensor used to detect human gesture and perform hand segmentation based on the depth map of the user and tracks the hands which entered active motion zone. The application then recognizes various hand gestures based on the tracking information detected and perform part of mouse actions to navigate slide show by using gesture recognized.**

I. INTRODUCTION

Most commonly, people tend to use keyboard or mouse to control the slide presentation. That is why presenters cannot freely on the stage. From here, we know that, solution need to carry out to solve the problem face by most of the lecturer.

Functionality of Kinect encourages educators to evaluate its feasibility in education field. Kinect which is one of the latest motion sensing devices that are available to the public that are affordable. It was first release in November 2010 in Europe. With this development in gaming industries, the public are made available to access motion sensing technologies with a cheap and affordable price. Besides that, the Kinect System Development Kit (SDK) for windows has been released on 16 June 2011. The SDK allows developers to build applications for Kinect using Microsoft Visual Studio 2010, C++, and C#. Through this SDK, developers are able to access Kinect capabilities on:

- Raw sensor Streams: - access low streams from the depth sensor, colour camera sensor, and four-element microphone array.
- Skeletal Tracking: - track the skeletal image of few people.
- Advanced Audio Capabilities: - Audio processing capabilities include sophisticated acoustic noise suppression and echo cancellation, beam formation to identify the current sound source, and integration with the windows speech recognition API.
- Sample code and Documentations.

In addition, Kissco (2011) have been expresses his excitement by predicating that Kinect will become a focal classroom technology in the time. In order to enhance the interactivity of classroom activities, technology needs to provide interactive affordances, which can be implemented to support interactive teaching strategies and to create pedagogical opportunities. Other than employing human friendly keyboard and mouse control device, a kinect application can be used to actively track the presenter, so that, it is possible for them to control learning materials by using their body gesture.

A. Problem statement

As common, a lot of lecturer choosing to remain next to the computer during the presentation to control (e.g., change slides, page up, page down, etc.) the PowerPoint. Some presenter would either have to walk back and forth between the projection screen and the mouse to control the PowerPoint, or with an aid of an assistant to operate the presentation according to the presenter's needs. From here, we know that controlling PowerPoint presentation from keyboard and mouse can be limiting.

With the aid of the PowerPoint remote controller still cannot fully solve the problems as it is inconvenience. For example, lecturer forgot to bring it to the classroom and for the battery operated remote control, user need to charge or change battery regularly to make sure controller can function properly during the presentation.

B. Objectives

The aims of this project are:

1. To introduce a new PowerPoint navigation technique.
2. To conduct a survey of techniques used for PowerPoint Presentation Navigation Control.
3. To develop a powerful Kinect PowerPoint control application for presenter. User can navigate the PowerPoint presentation by using simple hand gesture as long as user's hands entered in active motion zone.
4. To evaluate the reaction and acceptance of this technology in teaching and learning.

II. LITERATURE REVIEW

A. Evaluation of Alternative Presentation Control Techniques

Technique	Advantages	Concerns
Standard (Mouse/ Keyboard)	Reliable, familiar, well-known and fit most of the scenarios.	Presenter had to stay with the computer, making it near impossible to use body language and eye contact.
PowerPoint remote controller	Presenter can move freely on the stage. Presenter had more space for using body language and eye contact to convey their ideas.	User need to charge or change battery regularly. User always forgot where they put the controller as it is quite small size.
Bare Hand (Touching on "hot areas" on the screen using hand directly.)	Easy to use. Presenter can move freely on the stage. Enabled attractive presentations as the technique itself appealing to them. Pointing with hand was found easiest to follow by the audience.	Presenters might feel constrained to the space near the projection screen when they did wish to walk around. There was no firm feedback for the hand, presenters may be worried whether their actions have been received

Table 1: Techniques used for PowerPoint Presentation Navigation Control

Based on Wizard of Oz user study [18], three techniques have been evaluate, which are Standard (Mouse/Keyboard), PowerPoint remote controller and bare hand.

Through the evaluation, authors get to know the problem faced by the presenter. So, they come out with the 4 important design which consist of quick "Next Slide" operation, error prevention and recovery, combine bare hand with PowerPoint remote controller and interactive presentation authoring tool.

B. Manipulating Medical Images: A Hands-Off Approach

This application turn the Kinect into a form of medical equipment which allowing medical personnel to manipulate medical images using voice and hand-gesture commands, they no more tied to the keyboards and mouse to control it. Interaction techniques they developed specially for the deviceless navigation of medical imaging data. Besides that, filters have been carrying out to filter the noise in the device signal, and increase the correctness of the remote pointing and to filter hand tremors during navigation process. Besides that, it also help to save money as it eliminate the usage of x-ray films. The main purpose of this Kinect application [8] is to reduce the need for physically touching extraneous devices when medical personal do the operation, and can manipulate medical imaging easily.

Figure 1: Controller-free interactive exploration of medical images through the Kinect.

This Kinect application perform the following benefits in manipulating medical images:

- Easy-to-use and intuitive interface that allows user voice commands and physically hands-free operation
- Reduction of the time it takes for medical personal in navigate medical images
- Avoiding the unsanitary working circumstances by eliminating the need to touch extraneous equipment
- Increased security of patient information by using biometrics to identify medical professionals
- Reduce costs associated with maintaining a sterile environment

C. Kinect in Robotic Education

Kinect have been used in educational field. This cans prove by Michal Tölgyessy and Peter Hubinsk [19]. They wrote a paper on this subject called The Kinect Sensor in Robotics Educations. This paper focuses on the field of educations of robotic sensing abilities. Since the papers are called The Kinect Sensor in Robotic Educations, it focuses more on Kinect as a sensor device for robotics. It focuses on what Kinect can do and what the students can learn by using Kinect.

In the paper, they stated that there are a lot of applications in which Kinect can be implements in the field of Robotics.

a) Data Fusion: Kinect consist of a few parts, that are the RGB camera, 3D depth sensing system, Multi-Array Microphone, and Motorized tilt. Since Kinect are equipped with RGB camera, it is very useful for robotic visions. By implementing and use Kinect, students can learn to fuse different data. The RGB information can be converted to any commonly used colour space, such as Normalized RGB, HIS, HSV, HSL, TSL, YCbCr, CIELAB or CIELUV. These entire colour space can be used for different task for Robotics visions, thus, this information can be used to create a detection and segmentation programs.

b) Obstacle Avoidance and Collision Detection: As Kinect are also equipped with 3D depth sensing technology, applications can also be created to serve these purposes. Kinect ability to provide depth map with good resolution make it a suitable technology for obstacle avoidance and collision detection.

c) Gesture Control: Kinect ability to provide Gesture control does not limited to in games only; this ability can also be extended in Robotics fields. It can be used to enhanced and improve Human-Robot Interaction (HRI). For example, a robotics system that synchronized with the movement of the users.

D. Discussion and reflection:

The results of the study give us a better insight and deeper knowledge on kinect, it able to recognize hand gestures using RGB and depth data. It have been used in many field, so it is a good idea to be used in classroom to control the power point presentation, presenter no more tied to the screen or computer or passing on the instruction to someone else. This surely can improve the current existed technique to navigate the PowerPoint presentation. By using kinect as sensor of motion detection together with computer or laptop and projector, presenter able to enjoy realistic PowerPoint navigation by using hand gesture. The system will be more as a tool for the teacher to use.

III. METHODOLOGY

A. *Research Methodology*

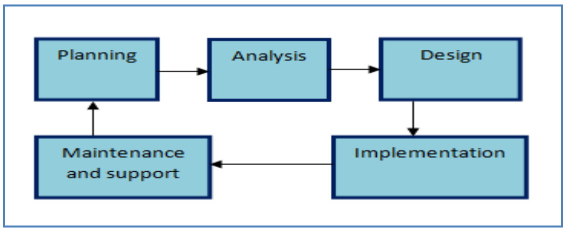

Figure 2: System Development Life Cycle (SDLC) phase

In this project, the software process model that being used is System Development Life Cycle (SDLC). It consists of five phases, details description for each phase of methodology is follow as below:

1. **Planning phase:** The project overview and goals determined in early stages of this phase. Besides that, information collections also carry out to evaluate the current techniques used for PowerPoint presentation navigation control and then tried to develop a new system which can solve the problem facing by current user.
2. **Analysis phase:** This phase involved the requirement gathering from the end user. A few methods have been done to gather the requirement such as interview, questionnaires and surveys. All the data gathered have been further analyse and documented. Basically, most of the user agree and support the idea (PowerPoint gesture based navigation using Kinect) proposed. This can proved by the responding of potential user through the questionnaire distributed (as shown in Figure 3).

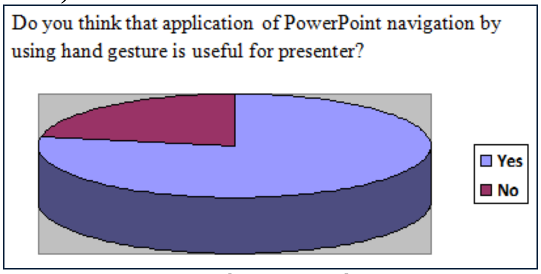

Figure 3: Potential user responding

3. **Design phase:** Design phase converted the user requirement into designed systems. Desired features or functions and operation described in detail, this include screen layout, process diagram or flow chart, and other documentation. System designed according to the requirement documented or collection of modules or subsystem.
4. **Implementation phase:** Systems are developed and real code is written based on detailed design specifications. Besides that, acceptance testing carried out to ensure that the system functions as expected and the user's requirements are satisfied. Integration test have been done to ensure the system fit with the environment. Some expected user such as lecturers, tutors and students have been participated in testing process.
5. **Maintenance and support phase:** Now, this project still under maintenance and support phases in order to improve performance or other attributes. Preventive maintenance also performed in order to prevent problems before they occur. In this paper, the main focus of authors is towards corrective

maintenance to overcome all problems arising in the area of design, coding, and testing activities.

IV. PROTOTYPE

A. System Architecture

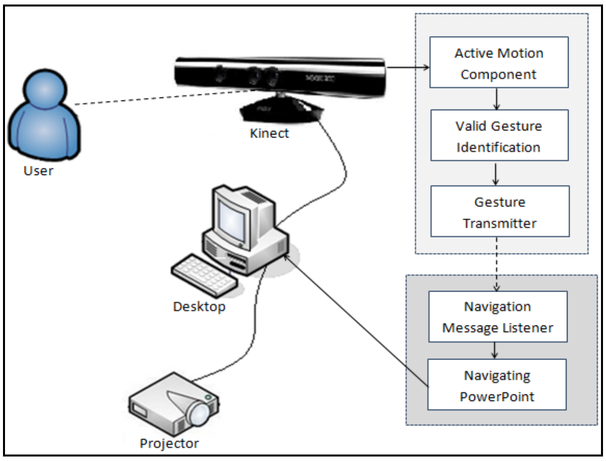

Figure 4: System Architecture

This is how the system will work. This system consists of 6 modules which are active motion component, valid gesture identification, gesture transmitter, avigation listener and navigating PowerPoint. The system will collect the information from Kinect and further analyze it before navigate the PowerPoint presentation based on user hand gesture. User only can navigate the PowerPoint when his or her hand enter active motion zone. (As shown in figure 5)

User uses their computers to interact with Kinect. But to enable communication between the user's computers and the Kinect, several things must be installed on the user's computers. That is Kinect SDK and Microsoft Visual Studio 2010 C#.

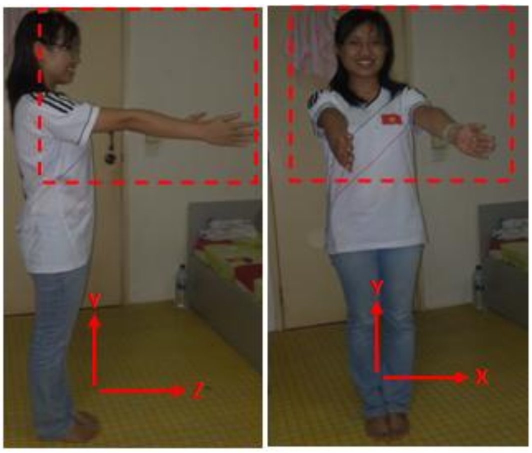

Figure 5: Graphical description of active motion zone for the front view and the side view. (in red box)

B. Flow Chart

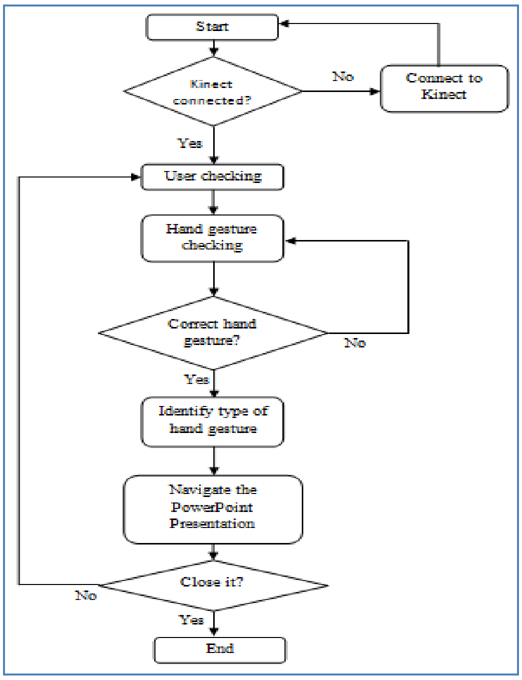

Figure 6: Flow Chart

The system was developed according to the flow chart as shown in figure 6. When the program starts, it will first check whether Kinect are being connected properly or not. If it was connected properly, then the user interface will display the Kinect's field of view. The nearest human detected will be the user and he or she can do the specific hand gesture to navigate the PowerPoint presentation. The program will keep on looping until the user close the program. The table below show the type of hand gesture recognized and motion explanation.

Hand gesture	**Motion explanation**
swipe right	Swipe left hand from left to right to navigate the PowerPoint presentation to next slide.
swipe left	Swipe right hand from right to left to navigate the PowerPoint presentation to previous slide.
Lift up	Both hands lift up to end the PowerPoint presentation or move to last slide.
Cross	Hands cross to navigate the PowerPoint presentation to first slide.

Table 2: type of hand gesture recognized and motion explanation

C. Sample User Interface

Figure 7: starting page

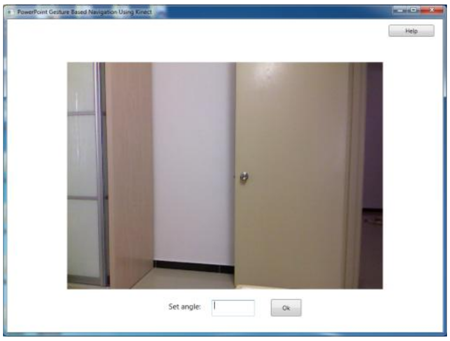

Figure 8: Kinect field of view

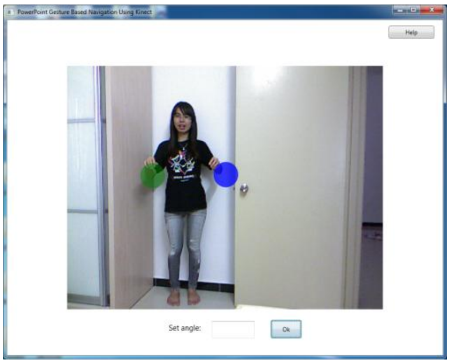

Figure 9: Mix and Match Quiz

D. RESULT AND DISCUSSION

A. User evaluation

The performance of the system developed was evaluated by the user which is the presenter or lecturer, I try to implement field testing and users do testing on functionality performance of this kinect application. The feedbacks that I get from the research are quite promising. More than 70 percent of the users strongly agree and agree on the implementation of the system. They agree on the system helpfulness and the benefits of implementing it in classroom. They also recommend some improvements to the system as well as suggest little more additional functionality to the system.

Some of user comment:

- "It work well responding smoothly to left and right gesture."
- "Add in more function."
- "it helps, if the sensor can detect user correctly."

B. Experiment result

Besides that, the performance of the system developed also evaluated by proposed gesture recognition function another experiment. 8 users participated into this experiment and each of them stand inside the Kinect's view and repeated the gesture of swipe left, swipe right, lift up and cross for 10 times. The performance is measured according the number of PowerPoint slide navigation which is same as user gestures. The result of this experiment is illustrated in Table below.

Experiment candidate	Functionality performance (%)			
	Swipe Left	Swipe Right	Cross	Lift Up
Male 1	90	80	70	80
Male 2	80	80	80	70
Male 3	100	80	80	80
Male 4	80	70	90	70
Female 1	80	100	70	80
Female 2	90	90	70	90
Female 3	70	80	80	70
Female 4	90	90	90	80
Average	85.00	83.75	78.75	77.50

Table 3: experiments result for the functionality of the system.

Through this experiment, it shows that two hands motion has lower detection rate, comparing to one hand motion. From the investigation, there are some detection errors when the user doing the hand gesture to navigate PowerPoint presentation. The main reason is the sensitivity issue and not the program. If the users move their hands faster, sometimes system missed the gesture to detect. Another reason is the distance between Kinect and the user, user can be more perfectly detected if he or she stand in front of the kinect and the best distance is around 1.6 meter. Other distance may cause more error detection. Another finding that I found is that user really enjoys this technique to navigate the PowerPoint as it not need go through any training. They can easily use the application after they know the specific hand gesture needed to navigate the PowerPoint presentation.

Figure 10: User enjoy the realistic navigation by using the hand gesture respectively

C. CONCLUSION AND RECOMMENDATION

As a conclusion, this project is about developing a new technique of PowerPoint presentation navigation. The aim is to let the user navigate the PowerPoint presentation by using specific simple hand gesture such as: swipe left, swipe right, and lift up and cross. At the same time, PowerPoint will be under control regards the motion gesture detected. The system is easy to use as the user not need going through any training or reading a lot of instruction. just some easy instruction, they manage to use it.

Besides that, I also manage to conduct fields testing to see their acceptance of the technology. User testing has been carried out in classroom and meeting room. From there, I get to know that a lot of students felt that using hand gesture to navigate slide enabled very attractive presentations as the technique itself appealing to them. Students will be more interested in the subject and focused more in class. Besides that, presenter can improve the interaction between presenter and audience as the user can focus more on the audience instead of the PowerPoint control and they can move freely on the stage.

A. Future Work

Since this project only covers some basic function to navigate the PowerPoint, there are many rooms for more improvement in the future. This project will only serve as s proves of concept or as a tool to measure how effective if it used in classroom and how people able to adapt with this new technology. For the future work, many more function can be added in to the current application developed. For example, by doing specific hand gesture, PowerPoint can navigate to specific slide, and apply the mouse function to click the link on the slide and pause or play the movie or video when needed. If this project were successful, it can be used in other area (meeting room).

D. ACKNOWLEDGEMENT

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