# DEVELOPMENT OF VIRTUAL ROBOT ASSISTED LEARNING (VRAL) IN ROBOTIC COURSE USING VIRTUAL ENVIRONMENT TECHNIQUE

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**UNIVERSITI UTARA MALAYSIA**
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# DEVELOPMENT OF VIRTUAL ROBOT ASSISTED LEARNING (VRAL) IN ROBOTIC COURSE USING VIRTUAL ENVIRONMENT TECHNIQUE

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## ABSTRAK

Realiti Maya, perkembangan terbaru dalam bidang reka bentuk antara muka dan grafik komputer interaktif, menawarkan kebaikan kepada kaedah klasik pengajaran dan pembelajaran. Beberapa modul pendidikan berasaskan Realiti Maya telah dilakukan untuk mengkaji kebaikannya. Penyelidikan ini berusaha untuk menawarkan sumber alternatif kepada pelajar yang tidak dapat menggarap pembelajaran di dalam kelas dan buku teks sepenuhnya dengan menggunakan teknologi Realiti Maya. Objektif utamanya ialah memberikan pelajar satu kaedah baru yang akan memberikan kefahaman yang lebih mendalam kepada pembelajaran yang sebelum ini dipersembahkan dalam bentuk tradisional.

Cara yang terbaik untuk mengajar robotik ialah setiap pelajar dapat mengawal robot masing-masing. Tetapi, kos untuk menyediakan setiap pelajar satu robot adalah terlalu mahal. Dengan sistem robot maya, pelajar akan dapat pengalaman secara terus pengendalian robot secara maya. Dalam penyelidikan ini, satu prototaip robot maya dibina untuk membantu pembelajaran kursus robotik. Prototaip ini kemudiannya diuji oleh pelajar Diploma Kejuruteraan Mekanikal, Politeknik Sultan Abdul Halim Muzaffar Syah (POLIMAS) untuk mendapatkan maklumat awal mengenai kebaikan dan kelemahan prototaip ini. Ciri-ciri yang diuji adalah: interaksi, kebolehpercayaan, ergonomik, kebebasan menjelajah, keselamatan, pembelajaran dan robotik. Keputusan menunjukkan bahawa prototaip ini berpotensi untuk membantu pembelajaran robotik kerana pelajar bersetuju dengan kebaikan yang ditawarkan oleh prototaip ini.

## ABSTRACT

Virtual Reality (VR), the recent development in the fields of user interface design and interactive computer graphics, offers significant advantages to classical methods of teaching and learning. A series of VR based educational modules are being developed to explore the capabilities. This research aims to offer an alternative resource for those students who did not fully grasp the material in class or from the text by utilizing VR technology. Its main objective is to provide these students with another viewpoint that will give them a better understanding to the material that was previously presented through traditional means.

The best way to learn robotics is that each persons control his/her own robot. But the cost of providing a robot for each student is too expensive. With the virtual robot system, students can have hands-on experience virtually. In this research, a virtual robot prototype was developed to assist robotics course teaching. It was then evaluated by the students from Mechanical Engineering Diploma, Politeknik Sultan Abdul Halim Muzaffar Syah (POLIMAS) students to get initial insights of the prototype benefits and limitations. The features being tested were: interaction, believability, ergonomics, freedom to explore, safety, learning and robotics. The result shows that the prototype has a potential in assisting robotics learning as the students agreed to the benefits that the prototype could offer.

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# LIST OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF APPENDICES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| CAD | Computer Aided Design |
| CAVE | CAVE Artificial Virtual Environments |
| CBT | Computer-based Training |
| HMD | Head Mounted Display |
| Lab | Laboratory |
| LOD | Level of Details |
| PC | Personal Computer |
| POLIMAS | Politeknik Sultan Abdul Halim Muadzam Shah |
| SUS | System Usability Scale |
| VAT | Value Added Tax |
| VE | Virtual Environment |
| VICHER | Virtual Chemical Reactors |
| VR | Virtual Reality |
| VRML | Virtual Reality Modeling Language |
| VRAL | Virtual Robot Assisted Learning |
| WoW | Window on World |
| WWW | World Wide Web |
| 3D | 3 Dimensional |

# CHAPTER 1
# INTRODUCTION

Technological advancement in information and communication technology (ICT) has created paradigm shift in education. One of the many innovations in education tool is the use of Virtual Reality (VR) technology in delivering information and provides operative simulation to enrich student learning.

The strive for a competent and practical system that is dependable, safe and easy to use has always been the motivation to come out with a new application from a new technology. Although VR is being used widely, however a thorough understanding of how VR can be utilized and what affects it gives to humankind is still lacking. Motivated from this point, this research is aimed to provide a baseline in exploring the features in VR that could be applied in the areas of robotics particularly in education domain.

## 1.1 Motivation

Realizing the advantage of VR, effort has been taken to use VR system in robotics education. A common problem in robotics education is the limited availability of expensive robotics and control equipment which allow the students in the educational program to work, in order to acquire valuable 'hands-on' experience (Safaric et al, 2001a). In learning robotics, students are required to have valuable 'hands-on' experience to be competitive in the job market and in line with current needs of the industry. But most institutions encountered the problem with the unavailability of enough robots to facilitate robotics learning. This problem resulted from lack of exposure in operating robots and made the students weak in the basic understanding of robotics.

The contents of the thesis is for internal user only

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