

**VIRTUAL MODELS FOR REAL-WORLD LEARNING: THE  
DEVELOPMENT AND EVALUATION OF A PATIENT  
SIMULATOR FOR EYE DISABILITY DIAGNOSIS**

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Thesis submitted in partial fulfilment for the degree of  
MASTER OF COMPUTER SCIENCE (INFORMATION SECURITY AND  
ASSURANCE)

UNIVERSITI SAINS ISLAM MALAYSIA

September 2023

## AUTHOR DECLARATION

I hereby declare that the work in this thesis is my own unless specified and duly acknowledged by quotation.

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## ACKNOWLEDGEMENTS

I would like to thank everyone who had contributed to the successful completion of this project. I would like to express my gratitude to my research supervisor, Dr. Azuan Ahmad for his valuable advice, guidance and his enormous patience throughout the development of the research.

My deepest gratitude to both of my parent, Mohd Rapi bin Mohd Noor and Rosnani binti Kassim for giving their biggest support and encouragement for completing this research. Without them, I could not make it here.

My thanks and appreciations go to my colleagues who were willingly helped me out with their abilities to overcome my difficulties and problems.

Finally, a million of thanks to all individual that directly or indirectly involve in completing this research. Thank you for the great support in my life and studies. May Allah bless and grant you the best in return.



## ABSTRAK

Simulator pesakit telah menjadi alat yang semakin popular dalam pendidikan perubatan, menyediakan persekitaran yang selamat dan realistik bagi pelajar untuk berlatih kemahiran klinikal dan membuat keputusan. Namun, terdapat kesenjangan yang ketara dalam latihan oftalmologi, di mana penggunaan simulator pesakit adalah terhad, terutamanya untuk diagnosis penyakit mata. Kajian ini bertujuan untuk mengisi kesenjangan penting ini dengan menerangkan pembangunan dan penilaian simulator pesakit yang disesuaikan untuk latihan oftalmologi, dengan fokus kepada diagnosis penyakit mata. Simulator ini mengintegrasikan data pesakit dunia nyata dan menghasilkan skenario penyakit mata yang realistik yang direka untuk menguji kemahiran diagnosis pelajar. Bagi mencapai ini, teknik algoritma diterapkan dan dinilai untuk meningkatkan realisme dan keberkesanan simulator pesakit untuk latihan oftalmologi. Selain itu, kaedah penilaian antara muka pengguna dan pengalaman pengguna direka dan diuji untuk mengoptimumkan kebolehsampaian dan kerahsiaan simulator ini, yang menggabungkan pelbagai alat diagnosis dan melindungi data maklumat pengguna. Metodologi penyelidikan meliputi seluruh kitaran hidup simulator, termasuk pembangunan, penciptaan beberapa skenario penyakit mata yang realistik, dan penilaian menyeluruh keberkesanannya dalam meningkatkan kemampuan diagnosis pelajar. Hasil daripada kajian ini menunjukkan peningkatan yang ketara dalam kemampuan pelajar untuk mendiagnosis penyakit mata selepas menggunakan simulator ini. Selain itu, penyelidikan ini memberikan pandangan berharga ke dalam kerumitan dan cabaran yang berkaitan dengan pembangunan dan penilaian simulator pesakit dalam konteks latihan oftalmologi. Melampaui kesan segera terhadap amalan pendidikan, kajian ini menerangkan potensi bidang penyelidikan masa depan dalam bidang ini. Dengan mengisi kesenjangan yang ada dalam latihan oftalmologi, simulator pesakit yang diperkenalkan dalam kajian ini berjanji untuk menjadi alat pendidikan yang berharga, menawarkan pengalaman pembelajaran yang realistik dan menarik kepada pelajar sambil meningkatkan kemahiran diagnosis mereka dalam bidang diagnosis penyakit mata.

## ABSTRACT

Patient simulators have become an increasingly popular tool in medical education, providing a safe and realistic environment for students to practice clinical skills and decision-making. However, a notable gap exists in the realm of ophthalmology training, where the use of patient simulators is limited, especially for the diagnosis of eye disabilities. This study aims to address this critical gap by describing the development and evaluation of a patient simulator tailored for ophthalmology training, focusing on the diagnosis of eye disabilities. The simulator integrates real-world patient data and generates lifelike eye disability scenarios designed to challenge students' diagnostic skills. To achieve this, algorithm techniques are applied and evaluated to enhance the realism and effectiveness of the patient simulator for ophthalmology training. Additionally, user interface and user experience evaluation methods are designed and tested in optimizing the usability and confidentiality of the simulator, which incorporates different diagnostic tools and protects user information data. The research methodology encompasses the complete lifecycle of the simulator, including its development, the creation of several realistic eye disability scenarios, and the thorough evaluation of its effectiveness in enhancing student diagnostic capabilities. Results from this study reveal a significant improvement in students' ability to diagnose eye disabilities after utilizing the simulator. Furthermore, this research provides valuable insights into the intricacies and challenges associated with both the development and evaluation of patient simulators in the context of ophthalmology training. Beyond the immediate impact on educational practices, this study sheds light on potential avenues for future research in this area. By bridging the existing gap in ophthalmology training, the patient simulator introduced in this study holds the promise of being a valuable educational tool, offering students a realistic and engaging learning experience while simultaneously enhancing their diagnostic skills in the realm of eye disability diagnosis.

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## الملخص

أصبحت محاكيات المرضى أداة شائعة بشكل متزايد في التعليم الطبي، حيث توفر بيئة آمنة وواقعية للطلاب لممارسة المهارات السريرية واتخاذ القرار. ومع ذلك، هناك فجوة ملحوظة في مجال تدريب طب العيون، حيث تكون استخدام محاكيات المرضى محدودة، وخصوصاً في تشخيص إعاقات العيون. تهدف هذه الدراسة إلى معالجة هذه الفجوة الحرجة من خلال وصف تطوير وتقييم محاكي المريض المصمم خصيصاً لتدريب طب العيون، مركزة على تشخيص إعاقات العيون. يدمج المحاكى بيانات المرضى من العالم الحقيقي ويولد سيناريوهات واقعية لإعاقات العيون تهدف إلى تحدي مهارات التشخيص لدى الطلاب. ولتحقيق ذلك، يتم تطبيق تقنيات الخوارزميات وتقييمها لزيادة واقعية وفعالية محاكي المريض في تدريب طب العيون. بالإضافة إلى ذلك، تم تصميم واختبار أساليب تقييم واجهة المستخدم وتجربة المستخدم في تحسين قابلية الاستخدام وسرية المحاكى، الذي يدمج أدوات تشخيص مختلفة ويحمي بيانات المستخدم. تشمل منهجية البحث الدورة الكاملة للمحاكي، بما في ذلك تطويره، وإنشاء عدة سيناريوهات واقعية لإعاقات العيون، والتقييم الشامل لفعاليتها في تعزيز قدرات التشخيص لدى الطلاب. تكشف نتائج هذه الدراسة عن تحسن كبير في قدرة الطلاب على تشخيص إعاقات العيون بعد استخدام المحاكى. وعلاوة على ذلك، تقدم هذه البحث رؤى قيمة حول تفاصيل وتحديات تطوير وتقييم محاكيات المرضى في سياق تدريب طب العيون. وبعيداً عن التأثير الفوري على الممارسات التعليمية، تسلط هذه الدراسة الضوء على آفاق بحثية محتملة في هذا المجال. من خلال سد الفجوة الحالية في تدريب طب العيون، يحمل محاكي المريض الذي تم تقديمه في هذه الدراسة وعداً بأن يكون أداة تعليمية قيمة، تقدم للطلاب تجربة واقعية ومشوقة وفي نفس الوقت تعزز مهاراتهم التشخيصية في مجال تشخيص إعاقات العيون.

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