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“Optimizing Innovation in Knowledge, Education and Design”

EXTENDED ABSTRACT



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Assalamualaikum warahmatullahi wabarakatuh,



First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality. I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services. By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality. I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

Professor Dr. Roshima Haji Said
RECTOR
UiTM KEDAH BRANCH



WELCOME MESSAGE (i-SPIKE 2023 CHAIR)



We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPIKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPIKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail

Chair

3rd International Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023)

MOBILIAID: ROBOTIC INDEPENDENCE OF DISABILITIES

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ABSTRACT

The MobiliAid project aims to revolutionize the lives of individuals with disabilities by leveraging cutting-edge robotics technology. This innovative system, powered by SPIKE Prime and Word Blocks programming language, is designed to provide enhanced mobility, assistance, and remote monitoring for people facing mobility challenges. The project encompasses multiple functionalities, including acting as a smart wheelchair with adjustable height, medicine assistance, and a versatile arm/gripper for various tasks. MobiliAid's core objectives are to foster independence and improve the overall quality of life for individuals with disabilities. Through the integration of advanced sensors, the robot can navigate safely, assist with daily tasks, and even fetch and deliver medicines. Its remote monitoring feature allows family members and caregivers to keep a watchful eye on their loved ones from afar, ensuring their well-being and prompt responses in case of emergencies. The development process focuses on safety, personalization, and user-friendliness. Extensive testing was conducted to refine the system to meet individual needs and preferences. MobiliAid represents a significant step forward in leveraging technology to create a more inclusive and accessible world. By providing seamless assistance and augmenting independence, this innovative robotics system sets a new standard for empowering individuals with disabilities, enabling them to live with dignity and self-reliance.

Keywords: disability, assistive robotics, inclusive technology

INTRODUCTION

In a world marked by rapid advancements in technology, robotics emerges as a transformative force with the potential to revolutionize various aspects of human life (Cochran, Jones, 2022; Smith et al., 2023). One promising application is in the realm of assisting people with disabilities, where robotics can play a pivotal role in enhancing their quality of life and promoting independence. This project, MobiliAid, sets its sights on harnessing the power of innovative robotics, specifically utilizing the SPIKE Prime platform and Word Blocks programming language, to address the critical challenges faced by individuals with disabilities. The primary aim of the MobiliAid project is to empower people with disabilities by offering them a comprehensive and versatile robotics system. Through smart engineering and thoughtful design, MobiliAid aspires to augment their mobility, provide seamless assistance in daily tasks, and create a more inclusive environment that fosters independence and dignity.

Problem Statement

Individuals with disabilities often encounter numerous obstacles that hinder their freedom and restrict their access to essential services (see for instance Cochran, 2020; Naami, 2019).

Traditional approaches to mobility assistance and caregiving may fall short in meeting their unique needs, leaving them dependent on others for essential tasks (Corbett & Barton, 1992). Additionally, remote monitoring and ensuring timely medication delivery can be challenging for both the individuals and their caregivers. The lack of customized, adaptable solutions for the diverse needs of people with disabilities creates an urgent problem in the pursuit of inclusivity and accessibility (Kett et al., 2020). Hence, the MobiliAid project seeks to address these challenges through the integration of cutting-edge robotics technology, user-centric design, and ethical considerations, aiming to revolutionize the way we empower and support individuals with disabilities. By doing so, MobiliAid envisions a future where technology plays a pivotal role in breaking barriers and enabling every individual to lead a fulfilling and self-reliant life.

MOBILIAID: AN ALL-IN-ONE ROBOTICS SYSTEM FOR ENHANCED ASSISTANCE AND INDEPENDENCE

MobiliAid is an innovative robotics system designed to cater to a diverse range of needs for individuals with disabilities. This multifunctional solution incorporates advanced sensors to facilitate seamless movement from one point to another, acting as a smart mobility aid. Not limited to mobility support, MobiliAid transforms into a versatile wheelchair, with an adjustable height feature to accommodate users' preferences. Furthermore, MobiliAid goes beyond physical assistance, offering medicine assistance by fetching and delivering medications to patients with disabilities. This feature ensures timely and accurate delivery, promoting better healthcare management for the user. The innovation also addresses the emotional aspect of care by allowing family members and caregivers to remotely monitor their loved ones. Real-time video feeds and audio communication enable constant vigilance, providing peace of mind to caregivers and fostering a sense of security for the person with disabilities. Moreover, MobiliAid enhances users' interaction with their environment by featuring an arm/gripper mechanism. This functionality enables the robot to pick up trash or objects, empowering individuals with disabilities to accomplish tasks independently and maintain a tidy living space. In summary, MobiliAid is a comprehensive and user-centric robotics system, offering a wide range of functionalities to assist individuals with disabilities in various aspects of their daily lives, thereby promoting greater autonomy and inclusivity.



Figure 1: Prototype of MobiliAid

The prototype is made of LEGO. It houses the main processing unit and connects to various sensors and motors, enabling the robot to perceive its environment and execute programmed actions. For the MobiliAid system, different types of sensors can be utilized, such as ultrasonic sensors for obstacle detection, colour sensors for line following, and gyro sensors for balancing and navigation. The motors offer the necessary mechanical power to move the robot's wheels or arm/gripper mechanism. These motors can be programmed to perform various movements, facilitating tasks like carrying objects, picking up trash, or adjusting the wheelchair's height. Lastly, the LEGO bricks and building elements provide a flexible framework for constructing the physical structure of the robot. They allow for easy modifications and adaptations, enabling the prototype to be customized to fit the specific needs and functions of the MobiliAid system. Using Python and block-based software, the MobiliAid robot is programmed to execute various functions and tasks. Python is a versatile programming language that allows for more complex and sophisticated programming, while block-based software provides an intuitive and beginner-friendly interface for programming.

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