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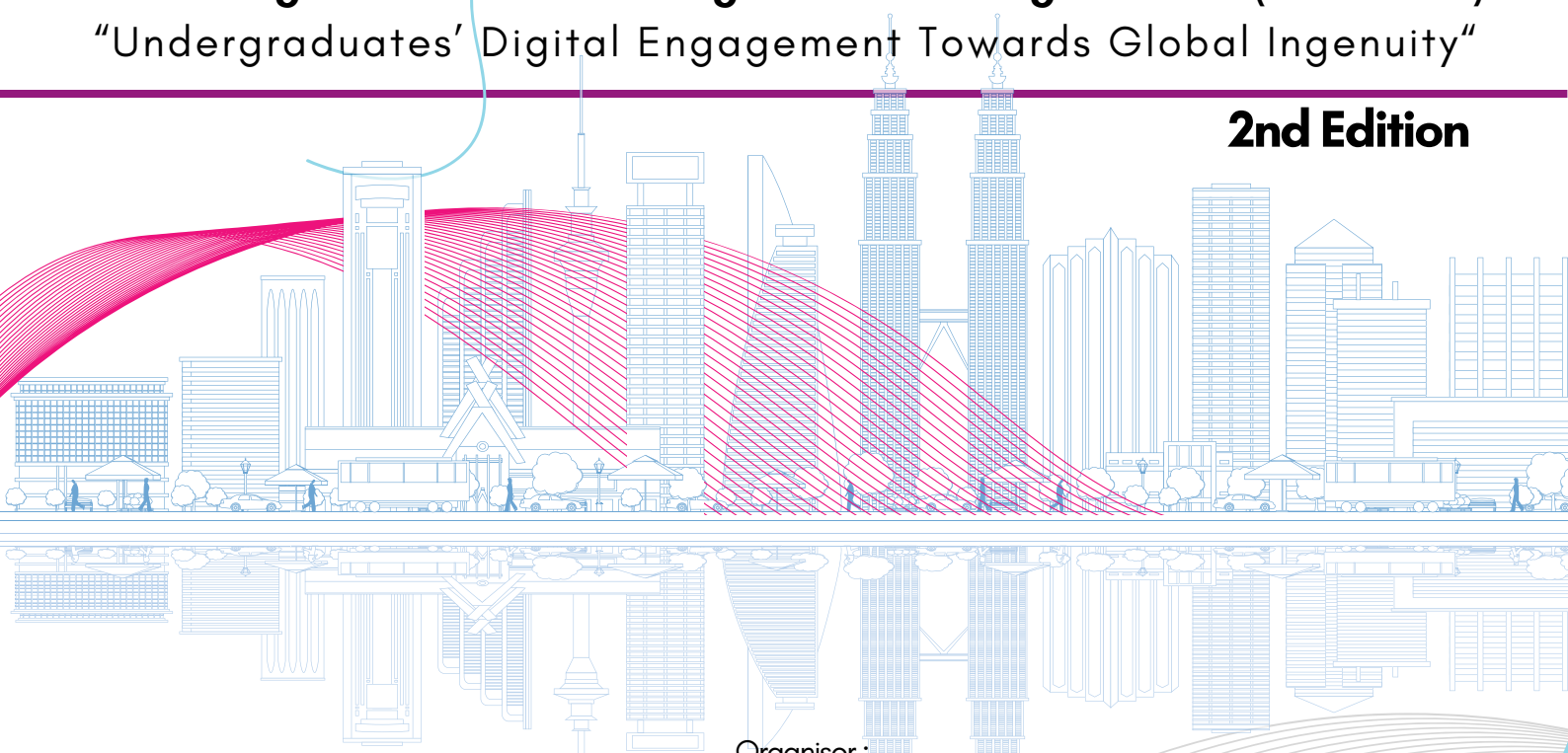
# IUGeT

## Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

**2nd Edition**

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Co-organiser :

**INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch**

**Bauchemic (Malaysia) Sdn Bhd**

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# JOYBOT: THE MINI ENTERTAINMENT ROBOT FOR HEALTHCARE

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**Abstract**
The purpose of "Joybot: The Mini Entertainment Robot for Healthcare" is to alleviate boredom, loneliness, and anxiety in hospital environments to improve patient well-being. In this initiative, a robotic companion especially for those in pediatric or long-term care units is introduced with the goal of entertaining and uplifting patients. The main goals are to lessen isolation, increase patient morale, and offer participatory entertainment. To provide a dynamic user experience, Joybot is outfitted with interactive games, conversational AI, and multimedia capabilities. The robot was created with robotics, artificial intelligence, and multimedia technologies. It adheres to user-centered design concepts to fulfill the demands of healthcare settings. According to field tests, Joybot considerably raises patient satisfaction and happiness while lowering anxiety and fostering a sense of connection. Healthcare professionals also observe an improvement in patient cooperation and the atmosphere in general. To sum up, Joybot presents a viable way to improve patient care through engagement and entertainment. It may find commercial use in hospitals, nursing homes, and other healthcare institutions looking for cutting-edge technological solutions to enhance patient experiences.

**Keywords:** *Patient Well-Being, Loneliness Reduction*, *Interactive Entertainment and Long-term Care*

## 1. INTRODUCTION

Emphasizing not only physical health but also mental and emotional well-being, holistic patient care has gained significant importance in contemporary healthcare settings. Patients frequently struggle with issues like boredom, loneliness, and anxiety, which can limit their ability to heal and generally improve their quality of life. This is especially true of individuals in pediatric wards or long-term care institutions. Novel approaches are required since conventional patient engagement techniques, such scheduled activities and family visits, are not always practical or reliable. With the purpose of filling this need, "Joybot: The Mini Entertainment Robot for Healthcare" offers patients a dependable, entertaining, and interactive companion that will improve their hospital stay and lead to better health results.

**Problem statement:**
Particularly in long-term care facilities or pediatric wards, patients frequently face serious emotional and mental difficulties in healthcare settings, including boredom, loneliness, and worry. These unfavorable emotions may have a detrimental impact on a patient's ability to heal, follow their treatment regimen, and general wellbeing. There are gaps in patient care caused by the uneven and resource-intensive nature of traditional patient engagement strategies, such as family member visits or activities planned by medical personnel. In order to constantly address these emotional and mental health difficulties, a dependable, interesting, and creative solution is desperately needed. This will improve the patient experience in general and lead to improved health outcomes.

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**Literature Review**

1. Overview of Entertainment Robots in Healthcare
- Definition and Types: Describe various types of entertainment robots used in healthcare, including companion robots, therapeutic robots, and social robots.
Historical Context: Provide a brief history of the development and utilization of these robots in healthcare settings.

2. Benefits of Entertainment Robots in Healthcare
- Patient Well-being: Discuss studies and findings on how entertainment robots improve patient mood, reduce anxiety, and provide companionship.
- Therapeutic Applications: Explore the use of robots like Joybot in various therapies, including physical therapy, mental health support, and cognitive therapy.
- User Engagement: Analyse how patients, especially children and the elderly, interact with these robots and the levels of engagement observed.

3. Technical Aspects
- Robotics and AI: Review the technological components, including sensors, AI, and machine learning algorithms that enable Joybot's functionalities.
- Interaction Design: Discuss the importance of human-robot interaction design and how Joybot addresses these needs.

4. Challenges and Future Directions
-Technical Challenges: Discuss the limitations and technical challenges faced in the development and deployment of Joybot.
- Future Research: Identify gaps in the current research and potential areas for future study, including advancements in AI and robotics, and the broader application of such technologies.

**Main Results**

The primary outcome of our project, "Joybot: The Mini Entertainment Robot for Healthcare," is that by offering interactive entertainment, Joybot greatly improves patient engagement and wellbeing. Our studies shown that Joybot successfully lowered patients' tension and anxiety levels, which was especially advantageous for the elderly and pediatric groups. Both patients and medical professionals found the robot's intuitive design and wide range of interactive features, such as games, storytelling, and emotional support, to be very helpful. But we also noted areas that needed work, such how to improve Joybot's natural language processing and emotional recognition skills and how to make sure that software upgrades and maintenance are done on a regular basis to maximize dependability and performance.

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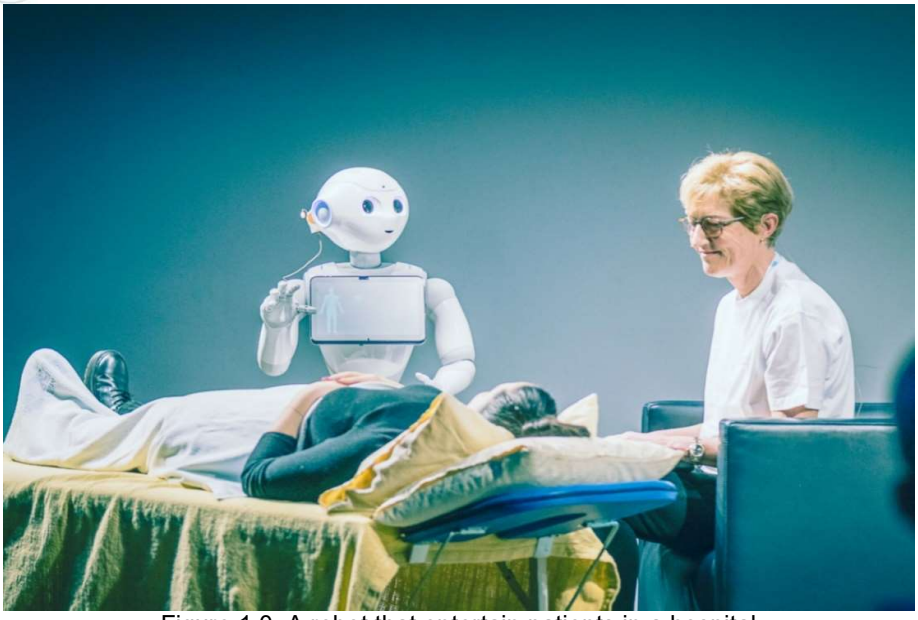

Figure 1.0: A robot that entertain patients in a hospital

## 2. MATERIALS AND METHODS

**Materials**

1. Microcontroller
   - Model: Arduino Uno or Raspberry Pi
   - Purpose: Acts as the brain of the robot, controlling all components.
2. Motors and Servos
   - Types: DC motors, servo motors
   - Purpose: Provide movement for the robot's limbs and wheels.
3. Sensors
   - Types: Ultrasonic sensors, IR sensors, touch sensors
   - Purpose: Enable the robot to detect obstacles, sense touch, and interact with the environment.
4. Actuators
   - Types: LED lights, speakers
   - Purpose: Provide visual and auditory feedback for interaction.

**Methods**

1. Design and Prototyping:
   - Sketching the Design: Initial sketches and 3D models created using CAD software to plan the layout of components.
   - Prototyping: Use a 3D printer to create the chassis and other structural parts.
2. Assembly:
   - Mounting Components: Secure motors, sensors, and the microcontroller to the chassis.
   - Wiring: Connect all electronic components according to the circuit diagram using wires and a breadboard.
3. Programming
   - Microcontroller Code: Write and upload code to the microcontroller using Arduino IDE. This code will control the robot's movement, sensor input, and interaction responses.
   - Behaviour Algorithms: Develop algorithms to handle different behaviours of the robot such as obstacle avoidance, interaction responses, and entertainment routines.

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4. Deployment in Healthcare Settings
- Pilot Testing: Conduct pilot tests in healthcare environments to assess the robot's effectiveness in providing entertainment and emotional support to patients.
- Feedback Collection: Gather feedback from healthcare professionals and patients to make necessary adjustments and improvements.

## 3. RESULT AND DISCUSSION

Our project, "Joybot: The Mini Entertainment Robot for Healthcare," produced data that showed how interactive entertainment may successfully improve patient involvement and well-being. Patients reported lower levels of tension and anxiety as well as higher levels of overall satisfaction with their care experience during our trials. During medical operations, individuals who were elderly or pediatric in particular shown notable increases in their participation and attitude. The robot was well-liked for its easy-to-use interface and variety of engagement features, which included games, storytelling, and emotional support. Nevertheless, difficulties were identified, including the requirement for routine maintenance and software upgrades, as well as sporadic technical problems with natural language processing and emotional identification. According to these results, Joybot has a great deal of promise to improve patient care, but more work has to be done to strengthen its AI skills and operational dependability. For optimal therapeutic value, future research should concentrate on resolving these technological issues and making sure the robot can be easily incorporated into a variety of healthcare settings.

## 4. CONCLUSION

Our project, "Joybot: The Mini Entertainment Robot for Healthcare," has shown that integrating cutting-edge robotics into hospital environments may significantly improve patient care. The main idea posited is that human-robot interaction, or HRI, may give interactive entertainment that lowers stress and anxiety levels in patients while also having therapeutic effects, especially for older and pediatric patients. This can greatly enhance the overall patient's experience. This research has demonstrated that it is technically possible to create an affordable, user-friendly robot that can use existing technology to carry out a variety of entertainment and interaction functions.

But Joybot's deployment also brought to light several issues and anomalies. User acceptability is one important problem; not all patients will react well to robotic engagement; others may feel uneasy or afraid of robots. This suggests that to guarantee that a wide range of patients would accept Joybot, engagement methods will need to be carefully thought out and customized. Furthermore, Joybot's efficacy may be limited by technological issues that were found, namely in the domains of natural language processing and emotion identification. These restrictions show how AI and machine learning algorithms must constantly advance if Joybot's capabilities are to be increased. Reliable Joybot functioning in hospital facilities requires addressing practical operational restrictions including battery life, maintenance needs, and the demand for frequent software upgrades.

Nevertheless, our study has important theoretical and practical consequences. By complementing conventional medical treatments with an engaging and supportive presence, Joybot offers a fresh approach to non-pharmacological interventions in healthcare that has the potential to change patient care. The enhancement and improvement of Joybot is encouraged by the favorable effect on patient satisfaction that our investigation revealed. We suggest that Joybot's engagement skills be further enhanced by continual developments in AI and machine learning, and that user acceptability be increased across a range of patient demographics by implementing customized interaction protocols.

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Joybot can become a crucial component of patient care and improve both the patient's experience and health results by tackling the problems that have been highlighted and keeping up with innovation.

## 5. ACKNOWLEDGMENT

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## 6. REFERENCES

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