Universiti Teknologi MARA
Cawangan Perak

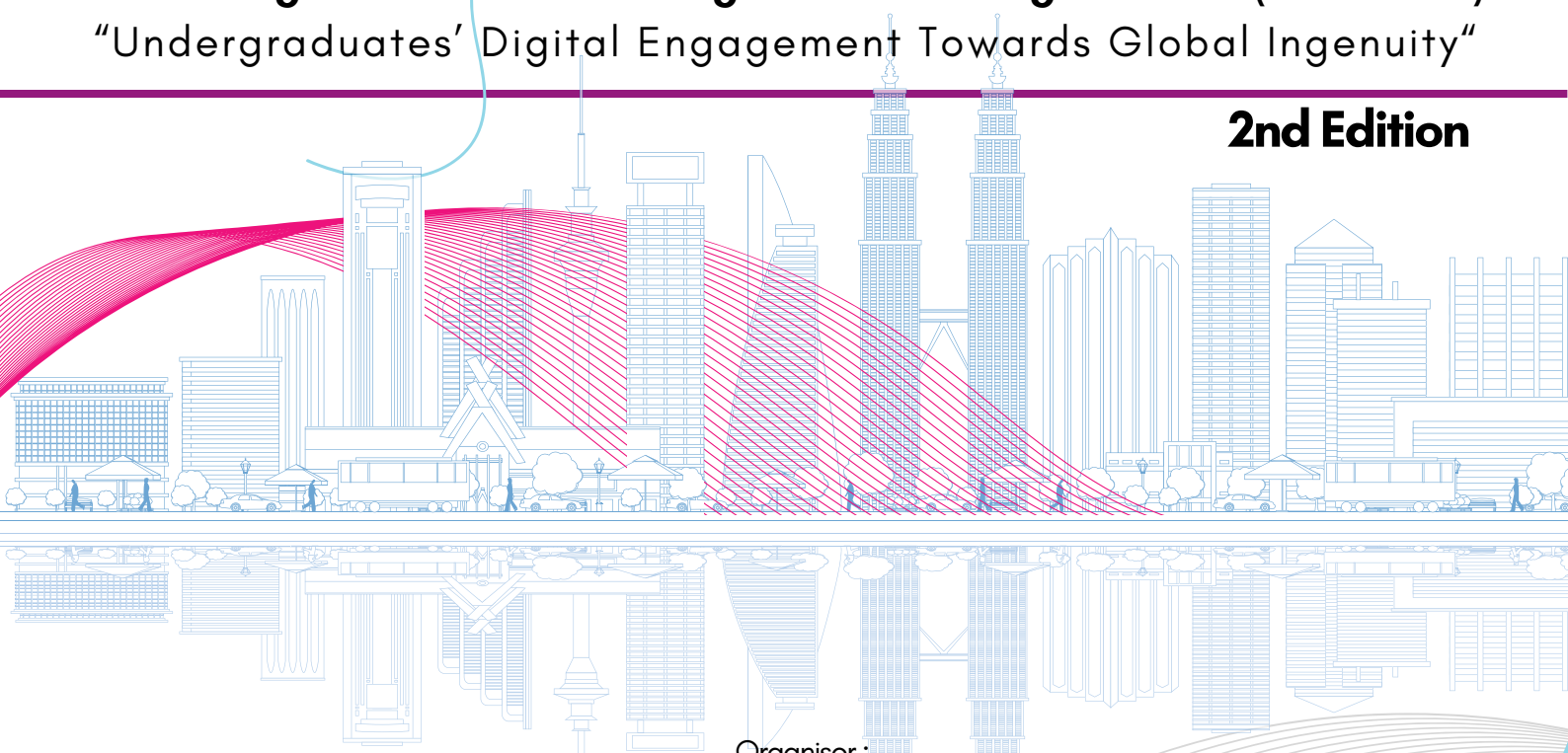
e - Proceedings

IUGeT

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

2nd Edition



Organiser :

Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch

Co-organiser :

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

Bauchemic (Malaysia) Sdn Bhd

Universitas Sebelas Maret

Universitas Tridinanti (UNANTI)

Publication date :

November 2024

e - Proceedings

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

Organiser :

Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch

Co-organiser :

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

Bauchemic (Malaysia) Sdn Bhd

Universitas Sebelas Maret

Universitas Tridinanti (UNANTI)

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN: 978-967-2776-42-0

Cover Design: Muhammad Anas Othman
Typesetting : Arial

e-ISBN: 978-967-2776-42-0

iVUTI 2024 Committee

Project Leader
Ts Muhammad Naim Mahyuddin

Assistant Project Leader 1
Dr Ezzat Fahmi Ahmad

Assistant Project Leader 2
En Mohd Fadzli Mustaffa

Secretariat 1
Syahmimi Ayuni Ramli

Secretariat 2
Nur Afiqah Anuar

Treasurer
Dr Izrahayu Che Hashim

Registration Team
Dr Asmaa' Che Kassim
Dr Fatin Syazwina Abdul Shukor
Dr Suwaibatul Islamiah Abdullah Sani

Certification Team
Ts Nurul Huda Abdul Hadi
Ir Raja Nurulhaiza Raja Nhari
Dr Siti Jamiah Tun Jamil

Graphic Team
Mohammad Fitry Md Wadzir
Jannatun Naemah Ismam,
Nor Azizah Talkis
Wan Nur Hanani Wan Abdullah

Promotion Team
Nurulanis Ahmad@Mohamed
Najma Azman
Ts Sr Dr Asmat Ismail

Evaluation Team
Dr Suzanah Abdullah
Haslina Hashim
Azlizan Adila Mohamad
Noorsazwan Ahmad Pugi
Gs Dr Munirah Radin Mohd Mohktar
Mohd Najib Husain

Publication Team
Nur'Ain Ismail (Head)
Siti Nurhayati Hussin (Chief)
Dr Nuramira Anuar (Sub-chief)
Dr Paul Gnanaselvam A/L Pakirnathan
Noorlinda Alang
Norasyikin Abdul Malik
Halimatussaadiah Iksan
Nurdiyana Mohamad Yusof
Syaza Kamarudin
Dr Wan Nordiana Wan Ali
Dr Ida Nianti Mohd Zin
Dr Nurul Sahida Fauzi
Dr Noor Rizallinda Mohd Ishak
Dr Lizawati Abdullah
Iza Faradiba Mohd Patel
Nurfatima Wahida Nasir
Nazirul Mubin Mohd Noor

Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)
Undergraduates' Digital Engagement Towards Global Ingenuity
e-ISBN: 978-967-2776-42-0

IBS CONNECTION DETECTION MACHINE

Badrul Amin Baharuddin[1*], Noor Rizallinda Ishak[2]

[1 2]Department of Built Environment Studies and Technology,
College of Built Environment, Universiti Teknologi MARA Perak Branch,
Seri Iskandar Campus, 32610, Seri Iskandar, Perak, Malaysia

*2022793447@student.uitm.edu.my

Abstract

Innovation drives progress by pushing boundaries, particularly in the construction industry through Industrialized Building Systems (IBS). Recent advancements in digital technologies, automation, robotics, and Building Information Modeling (BIM) have created new opportunities. Key innovations in IBS include integrating robotics and automation enhancing accuracy, efficiency, and safety, thus increasing IBS adoption in Malaysia. Automation improves manufacturing and assembly processes, minimizing human intervention and improving precision and productivity. Specifically, robotics can automate repetitive tasks, boosting quality control and efficiency. This aligns with Sustainable Development Goal (SDG) No. 9, focusing on industry, innovation, and infrastructure. The development of the IBS Joint Connection Detection Machine aims to address challenges in the construction industry, such as low productivity and reliance on foreign labor. Objectives include identifying issues in precast connections, developing a detection machine using Arduino Uno R3, and demonstrating its market potential. The study focuses on automation in construction, specifically detecting improper precast joint connections. The project ensures the machine's alignment with IBS principles of cost-saving and sustainability, with simulations to demonstrate effectiveness. By addressing industry challenges, this innovation promises to improve productivity and precision in the installation of precast panels.

Keywords: *Industrialized Building System (IBS), Automation, Robotics, Connection, Accuracy*

1. INTRODUCTION

Innovation mainly drives progress and pushes the boundaries of what is possible. In the context of the construction industry, innovation in IBS involves the development and application of new technologies, processes, materials, and design approaches. One of the significant areas of innovation in IBS is the integration and implementation of automation such as robotics.These integrations not only improve in terms of accuracy, consistency, and efficiency but also the opportunity to improve the construction industry regarding productivity, safety, and quality and increase the implementation rate of IBS in Malaysia (Rashid et al., 2019). Robotic systems can be used to automate repetitive and labour-intensive tasks such as cutting, drilling, and fastening, improving precision and reducing manufacturing time (Wasim, 2023). Additionally, robotics can be used in assembly processes to enhance efficiency and quality control. Furthermore, implementing automation and robotics in IBS would achieve one of Sustainable Development Goals (SDGs) No. 9. Generally, SDG No. 9 seeks to build resilient infrastructure, promote sustainable industrialization, and foster innovation.

This innovation aims to improve the quality of joint connections, especially between the precast wall-to-wall panels after the assembly process. The objectives for this innovation are to identify the issues and problems related to the precast connection, develop an early detection machine to detect improper precast connection using the Arduino Uno R3 system and demonstrate the marketability potential of the IBS Joint Connection Detection Machine.

e-ISBN: 978-967-2776-42-0

The relatively low productivity level reflects the industry's need to adopt modern technologies, materials, and practices, and reduce its belief in low-skilled (Akashah, 2017). Therefore, IBS Joint Connection Detection Machine has been developed where it consists of several components according to the electrical circuit diagram as shown in Figure 1.

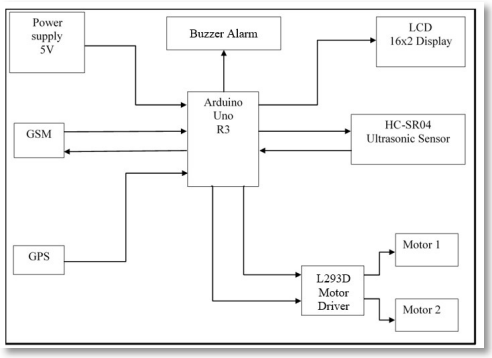


Figure 1. The electrical circuit diagram of the IBS Joint Connection Detection Machine

2. MATERIALS AND METHODS

The method adopted in this study consists of the research design followed by its framework and data collection. This study adopts a methodology that involves data collection through literature review and desk study where it will be used to discover issues and problems, comparison from existing products, and examine the suitable material to be used for the IBS Connection Detection Machine. The data then will be analyzed through descriptive analysis. Descriptive analysis is a sort of data research that aids in describing, demonstrating, or helpfully summarizing data points (Villegas, 2022). Next, a 3D modeling design has been used to simulate the proposed design, assembly process, and most importantly operational process Lastly, an expert validation through presentation. The panel consists of academicians such as lecturers from the Building department and lastly contractors. An experimental research design for experimenting was created as shown in Table 1 below.

Table 1 Research design of the Project Innovation

Phase	Method	Analysis	Research Objective	Expected Outcome
Phase 01	Background Study ⇩ Problem Statement	Descriptive Analysis	To identify the current issues related to precast connection	List all the current issues that have arisen in recent years
Phase 02	Literature Review ⇩ Simulation	3D Modelling Design	To develop an early detection machine to detect inadequate IBS joint connection using Arduino Uno R3 system	Clear visualization of concepts more effectively and identify potential issues early in the design phase,
Phase 03	Performance of the product ⇩ Potential Marketability	Expert Validation	To demonstrate the marketability potential of the IBS Joint Connection Detection Machine	Develop the potential of the product in the construction industry

e-ISBN: 978-967-2776-42-0

3. RESULTS AND DISCUSSION

Performance of Proposed Innovation Product

Evaluating performance of the innovation product helps determine whether the innovation effectively solves the identified problem and meets the intended objectives. Significant to the analysis and comparison to the existing similar product, it allows for benchmarking unique features provides evidence of the innovations of its functionality and effectiveness to the end-users and industry players. Table 2 shows the comparison of IBS Joint Connection with other detection machine that industry already have and manual detection.

Table 2 Comparison of IBS Joint Connection with Other Detection machines

Items	IBS Joint Connection Detection Machine	Ultrasonic Pulse Velocity	Manual Detection by Labour
Detection Range	up to 1,000 meters or more	0.5 to 100 meters	Inconsistent detection
Speed of Data Acquisition	Fast and real-time	Fast	Slow and take time
Manpower	1 operator	2 operators	Intensive labour use (2-3 operator and workmen)
Cost Saving	Reduces labor costs through Automation	Reduces labor costs through Automation	Labor costs contribute to expenses
Flexibility	Versatile, suitable for various applications	Limited by material and thickness of precast	Limited by material and thickness of precast

4. COMPONENTS OF IBS JOINT CONNECTION DETECTION MACHINE

Figure 2 below shows the dimensions and components of the IBS Joint Connection consist of body part, rubber wheel complete with lcd screen for display the detection information

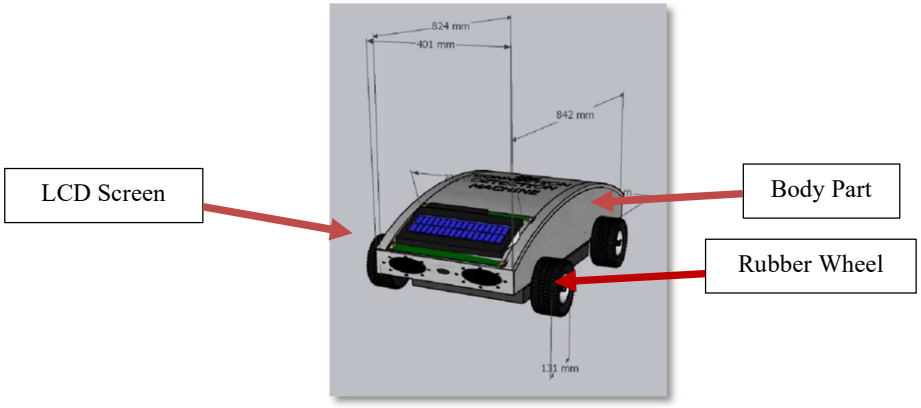


Figure 2. The dimensions and components of the IBS Joint Connection Detection Machine

Meanwhile, Figure 3 and 4 shows the detailed components of the base and in-body part of the IBS Joint Connection Detection Machine consisting of wheel base, steel frames, suction cups, battery casing, 3 of rechargeable battery of 2A, Arduino uno R3, GSM, GPS , buzzer alarm and ultrasonic sensor

e-ISBN: 978-967-2776-42-0

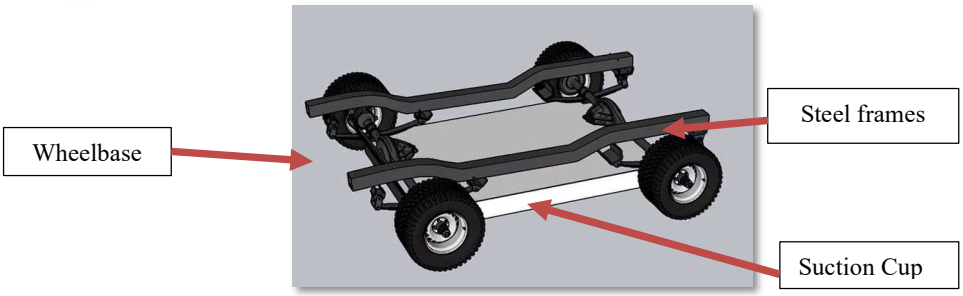


Figure 3. Detailed component base for IBS Joint Connection Detection Machine

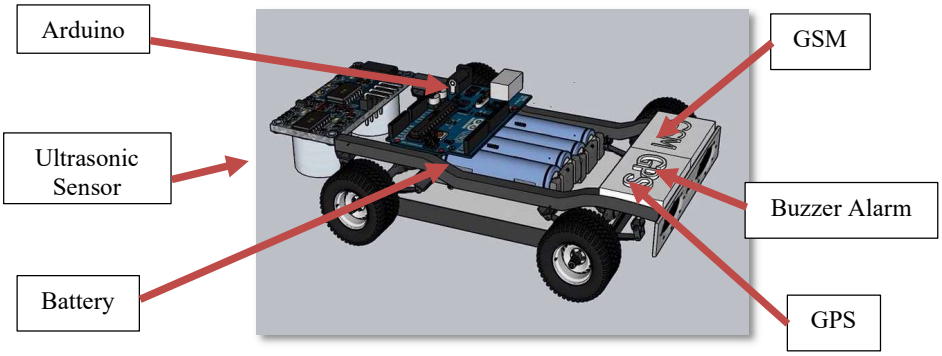


Figure 4. Detailed component in body for IBS Joint Connection Detection Machine

5. CONCLUSION

The IBS Connection Detection Machine exemplifies the growing use of robotics and automation in the construction industry, aimed at improving structural quality, productivity, and reducing reliance on foreign labor. This Arduino Uno R3-based machine enhances the quality of joint connections in precast panels, minimizing human error and waste while optimizing resource use. Its development supports modern technological adoption and aligns with global sustainability efforts, particularly Sustainable Development Goal (SDG) No. 9, which focuses on resilient infrastructure, sustainable industrialization, and innovation..

6. ACKNOWLEDGMENT

Special thanks to the International Virtual Undergraduates Competition on Technological Innovation (iVUTI 2024) committee for creating a platform for students to share their knowledge and build up networking.

7. REFERENCES

Akashah, M. A. B. (2017). Productivity Of Construction Projects With Industrialized Building System (IBS) Technology Adoption

CIDB. (2022). A Guide To Design For Manufacturing And Assembly (Dfma) In Precast Concrete System. Cidb Technical Publication. Concrete.pdf

Rashid, M. N. A., Abdullah, M. R., Ismail, D., & Saberi, M. H. (2019). Automation and Robotics in Industrialized Building System (IBS): The Potential Criteria for Measurement. *International Journal of Academic Research in Business and Social Sciences*, *9*(7), 1020–1034.

Villegas, F. (2022, August 30). Descriptive Analysis: What It Is + Best Research Tips. QuestionPro. https://www.questionpro.com/blog/descriptive-analysis/

Wasim, H. (2023, May 5). Robots in the Manufacturing Industry: Types and Applications. Wevolver. https://www.wevolver.com/article/robots-in-the-manufacturing-industry- types-and-applications

Pejabat Perpustakaan
Librarian Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023

UNIVERSITI TEKNOLOGI MARA PERAK
TERIMA
25 JAN 2023
Tindakan
Universiti Teknologi MARA Perak
PEJABAT REKTOR

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak

Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR