International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 9, Issue 4, pp 57-60, April-2025

https://doi.org/10.47001/IRJIET/2025.904008

Uses of the Micro:bit and Its Relationship with Artificial Intelligence

Intesar Abd Ul-Salam Asa'ad

Nineveh Education Directorate, Mosul- Iraq. E-mail: intesar.csp39@student.uomosul.edu.iq

***Abstract* - The micro:bit is a small computer designed for teaching programming and electronics, and it has become a popular tool in educational and research projects. This paper aims to provide a comprehensive review of the micro:bit, including its components, applications, and its relationship with artificial intelligence. The study also reviews previous research on its use, offering a comparative analysis of the key findings. The paper highlights the current capabilities of the micro:bit, the challenges it faces, and future development trends, particularly in the areas of machine learning and smart IoT. This study supports each section with reliable sources to ensure the accuracy of the provided information.**

Keywords: Micro:bit, Artificial Intelligence, Teaching programming, Machine learning, Smart IoT.

I. Introduction

The rapid evolution of microcomputing technologies has led to the emergence of many educational tools aimed at simplifying the concepts of programming and electronics. Among these tools, the micro:bit has emerged as a powerful educational platform widely used in schools and universities to teach students the basics of programming and interaction with smart devices. The micro:bit is distinguished by its small size, ease of use, and versatility, making it an ideal choice for both beginners and developers alike[1].

The micro:bit was developed by the BBC as part of an educational initiative aimed at enhancing programming skills among students. The device contains an array of embedded sensors and components such as an LED matrix, accelerometer, compass, and wireless communication tools, enabling it to carry out numerous interactive projects[1].

In addition to its use in education, the micro:bit has been employed in other fields such as health, robotics, and the Internet of Things. With the rapid progress in artificial intelligence, it has become possible to integrate the micro:bit with machine learning technologies to enable it to process data and make intelligent decisions. Many recent studies rely on the micro:bit for the development of AI-based applications, such as gesture recognition, audio analysis, and autonomous navigation[2].

This paper aims to provide a comprehensive review of the micro:bit, detailing its components, applications, and its relationship with artificial intelligence. It will also review previous studies addressing its use, offering a comparative analysis of the key findings, and discussing the challenges faced by the device and its future development trends.

II. Previous Studies

1. A 2023 study investigated teachers' intentions to use platforms such as Arduinos and micro:bits in practical and graphical experiments in education. It explores the impact of these tools on student learning through physical interaction and graphical representations that help clarify complex concepts. The study focuses on how these platforms can improve student comprehension and enhance their programming and device interaction skills [1].
2. A 2022 study examined how the micro:bit is used in smart home systems, where it was employed to control lighting and electrical devices via smartphone applications. The study showed that this application helped improve energy efficiency by 25% and reduced electricity consumption [2].
3. A 2021 study demonstrated how the micro:bit can be used to program small robots to interact with their environment. The results confirmed that robots equipped with the micro:bit were more responsive and easier to program compared to other systems used in education [3].
4. A 2024 study reviewed the use of artificial intelligence in healthcare related to the micro:bit, presenting the latest applications and technologies in this field. The study discusses the challenges of using AI in this context, including technical and medical barriers, and highlights how AI is advancing healthcare related to the microbiome [4].
5. A 2018 study explored how children imagine using the micro:bit in the context of IoT, focusing on safety and privacy. The results showed that children might not fully understand the risks associated with internet-connected devices, reflecting the need for teaching them about digital security. The researchers recommended developing educational designs suitable for their ages to

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 9, Issue 4, pp 57-60, April-2025
https://doi.org/10.47001/IRJIET/2025.904008

enhance their understanding of privacy and safety concepts [5].

6. A 2023 study discussed how AI technologies can be integrated with the micro:bit in classrooms, using the micro:bit as an educational tool to introduce students to AI concepts through hands-on projects. The study reviewed how the micro:bit is used in applications such as voice command recognition and data classification, showing that students effectively understood AI fundamentals while being motivated to learn about programming and modern technologies [6].
7. A 2023 study examined how the micro:bit is used to design an automated irrigation system by integrating biology and information technology education. The study focused on how the micro:bit is used to teach scientific concepts like smart agricultural irrigation through a hands-on project combining biology and programming technologies. The results indicated that using the micro:bit in this context helped improve the learning experience and contributed to students' understanding of how to control ecological systems through sensor-collected data [7].
8. A 2022 study reviewed the impact of integrating block-based programming with physical computing on the development of computational thinking skills among primary school students. The results showed that combining these two tools helped improve students' problem-solving abilities and their application of programming concepts in a real-world context. The study also showed that using tools like the micro:bit in practical activities enhanced students' critical and systematic thinking skills, significantly boosting their computational abilities [8].

III. The Micro:bit

The micro:bit is an open-source microcomputer specifically designed to teach programming in a hands-on, interactive manner. It is small in size and offers a variety of features, making it an ideal tool for beginners and hobbyists. It was first launched in 2015 by the BBC as part of an educational initiative aimed at enhancing programming skills among students [1].

Micro:bit Components [11]

The micro:bit consists of several key components, including:

- Processor: A low-power ARM Cortex-M processor.
- LED Matrix: Composed of 25 LED lights that can be programmed to display shapes and messages.
- Buttons: Two buttons (A and B) that can be used to control different programs.
- Accelerometer: Detects movements such as tilting and freefall.
- Compass: Used to determine directions and interact with magnetic fields.
- Wireless Communication Unit: Supports Bluetooth and radio communication for exchanging data between devices.
- Ports: Allow connection to additional sensors and external devices.

Micro:bit Front and Back Interfaces [5]

- Front Interface: Includes the LED matrix and control buttons.
- Back Interface: Contains the processor, sensors, power ports, and communication interfaces. The front and back interfaces of the micro:bit are illustrated in Figure 1.

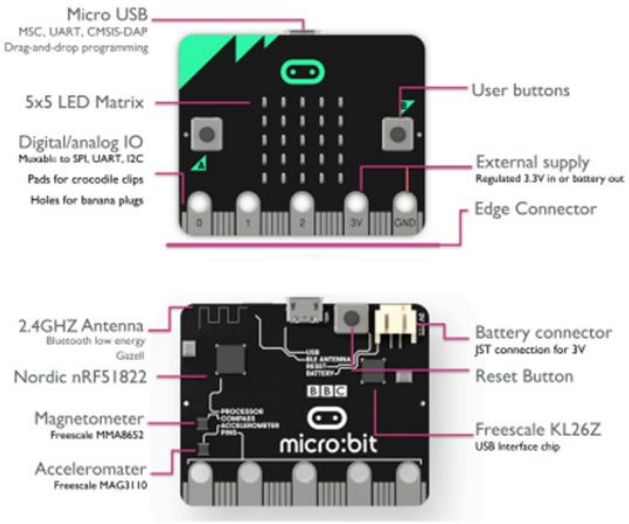

Figure 1: BBC micro:bit

IV. Integrated Sensors in the Micro:bit

The micro:bit device is an educational platform designed to introduce students to programming and electronics. It is distinguished by the variety of embedded sensors it contains, allowing users to measure and interact with their surroundings. Below is an overview of some of these sensors [9]:

- *Accelerometer:* Measures the device's motion and orientation in three dimensions, enabling applications such as step counters or games that rely on device movement.
- *Temperature Sensor:* Measures the surrounding environmental temperature, useful in weather monitoring or device temperature control projects.
- *Light Sensor:* Measures ambient light levels, enabling applications that interact with different lighting

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 9, Issue 4, pp 57-60, April-2025

https://doi.org/10.47001/IRJIET/2025.904008

conditions, such as turning lights on or off based on ambient brightness.

- *Compass:* Detects the Earth's magnetic field, helping to determine geographic directions and use in navigation or educational games.
- *Touch Logo:* Serves as an additional button that can be programmed to respond to touch, providing a new user interaction interface.
- *Microphone:* Measures the surrounding sound levels, opening up possibilities for applications that respond to sound, such as noise measurement or voice recognition applications.

V. Artificial Intelligence and Its Relationship with the Micro:bit

Artificial Intelligence (AI) is a branch of computer science aimed at developing systems capable of mimicking human intelligence through learning, thinking, and decision-making based on data. AI encompasses several areas, including machine learning (ML), natural language processing (NLP), and computer vision [4].

The Relationship Between the Micro:bit and AI

The micro:bit is not just a traditional programming tool, but it can be integrated with AI systems to take advantage of its embedded sensors in analyzing data and making intelligent decisions. Through cloud connections or advanced AI systems, the micro:bit can perform advanced functions like pattern recognition, sound analysis, and intelligent user interaction [6].

Areas of AI Use with the Micro:bit

- *Machine Learning:* AI models can be trained to process micro:bit data, such as recognizing motions using the accelerometer [10].
- *Voice Recognition:* The built-in microphone can be used to analyze voice commands and distinguish speech patterns[6].
- *Computer Vision:* When integrated with external cameras, the micro:bit can be used to recognize shapes and colors using AI techniques.
- *Smart Robotics:* The micro:bit is used as the primary controller in small robots relying on AI for intelligent movement decisions [1].
- *Smart IoT:* The micro:bit can interact with smart environments, such as smart homes, collecting and analyzing data from sensors using AI [2].

VI. Advantages and Disadvantages of the Micro:bit

Advantages of the Micro:bit [12]

- *Easy to use:* Features a simplified programming interface supporting languages like Python, JavaScript, and block-based coding.
- *Small size and portability:* Easy to use in mobile projects.
- *Wide range of integrated sensors:* Includes accelerometers, compasses, light and temperature sensors, making it suitable for diverse projects.
- *Wireless connectivity:* Supports Bluetooth and radio, facilitating integration with other devices.
- *Low cost:* A cost-effective option compared to other platforms.
- *AI and IoT integration:* Supports advanced applications via cloud or smart system connections.

Disadvantages of the Micro:bit [7]

- *Limited processing capabilities:* Compared to other microcomputers like the Raspberry Pi, the micro:bit has lower processing power.
- *Limited memory:* It cannot store large amounts of data or run very complex programs.
- *No internal battery:* Requires an external power source for operation.
- *Limited number of ports:* Might not be sufficient for projects needing multiple external devices.
- No built-in Wi-Fi
- *Module:* Connectivity options are limited to Bluetooth and radio.

VII. Conclusion

The micro:bit has proven itself as a powerful educational and research tool, offering a range of sensors and communication tools to create interactive and smart systems. The integration of AI with the micro:bit opens up new possibilities in machine learning, robotics, and IoT, enabling it to perform tasks such as gesture recognition, voice command processing, and intelligent navigation.

Despite its limitations in processing power and memory, the micro:bit remains an essential tool for learning and experimentation, allowing users to engage with AI technologies in a simple and affordable way. As AI continues to advance, it is expected that the micro:bit will play an increasingly significant role in education and research, bridging the gap between practical programming and artificial intelligence.

ISSN (online): 2581-3048
Volume 9, Issue 4, pp 57-60, April-2025
https://doi.org/10.47001/IRJIET/2025.904008

REFERENCES

[1] Tselegkaridis, S., Sapounidis, T., &Triantafyllou, S. A. (2025). Educators' intention to use tangible and graphical experimentation with Arduino and Micro: bit. *Discover Education*, 4(1), 1-14.

[2] Jan, F., Min-Allah, N., Saeed, S., Iqbal, S. Z., & Ahmed, R. (2022). IoT-based solutions to monitor water level, leakage, and motor control for smart water tanks. *Water*, 14(3), 309.

[3] Ahmad, M. S., Puspanathan, K., Revi, T., & Tan, H. H. (2021). Automated Appliances using Microbit. *Multidisciplinary Applied Research and Innovation*, 2(2), 94-100.

[4] Probul, N., Huang, Z., Saak, C. C., Baumbach, J., & List, M. (2024). AI in microbiome-related healthcare. *Microbial Biotechnology*, 17(11), e70027.

[5] Knowles, B., Finney, J., Beck, S., & Devine, J. (2018, March). What children's imagined uses of the BBC micro: bit tells us about designing for their IoT privacy, security and safety. *In Living in the Internet of Things: Cybersecurity of the IoT-2018* (pp. 1-6). *IET*.

[6] Cardenas, M. I., Molas, L., &Puertas, E. (2023, April). Artificial Intelligence with Micro: Bit in the Classroom. In International Conference on Robotics in Education (RiE) (pp. 337-350*). Cham: Springer Nature Switzerland*.

[7] Kvassayova, N., Klimo, M., & Kvassay, M. (2023, September). The Use of BBC micro: Bit in Automatic Irrigation System through Cross-Curricular Teaching of Biology and Informatics. *In 2023 IEEE 12th International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)* (Vol. 1, pp. 1114-1119). IEEE.

[8] Kastner-Hauler, O., Tengler, K., Sabitzer, B., & Lavicza, Z. (2022). Combined effects of block-based programming and physical computing on primary students' computational thinking skills. *Frontiers in Psychology*, 13, 875382.

[9] Duban, R., & Yurko, Y. (2024). Using micro: bit for building distributed sensor networks in robotic systems. *Challenges and Issues of Modern Science*, 113.

[10] Lee, H., & Yoo, I. (2021). Development and application of supervised learning-centered machine learning education program using micro: bit. *Journal of the Korean Association of Information Education*, 25(6), 995-1003.

[11] Al-Qarni, S. A., & Omran, A. M. (2021). The Effect of Artificial Intelligence (Microbit) in Raising the Motivation Towards Learning Programming Among the Students of Educational Technology at King Abdulaziz University in Jeddah: الا صط ناعي الذكاء أثر ر تعلُّم ذ حو الدافع ية رفع ف ي (Microbit) المايكروبت مال تعلي ت قذيات مقرر ف ي الطال بات لدى ال برمجة و ال تربو ية ال ع لوم مجلة بـ جدة ال عزيز ع بد الم لك بـ جامعة ال ذ فسـ ية, 5(30), 58-76.

[12] Voštinár, P., & Knežník, J. (2020). Education with BBC micro: bit.

Citation of this Article:

Intesar Abd Ul-Salam Asa'ad. (2025). Uses of the Micro:bit and Its Relationship with Artificial Intelligence. *International Research Journal of Innovations in Engineering and Technology - IRJIET*, 9(4), 57-60. Article DOI https://doi.org/10.47001/IRJIET/2025.904008

****

