International Journal of Computer Techniques–IJCT Volume 12 Issue 6, November 2025

Open Access and Peer Review Journal ISSN 2394-2231 https://ijctjournal.org/

SMART VENDING MACHINE FOR ELECTRONIC COMPONENTS

AUTHOR NAME: Vaishnavi Joshi Prof. S.S.Godage Siddhi Kharad Prof.K.V.Fale Vedika Damkondwar

JSPM'S

RAJARSHI SHAHU COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS &TELECOMMUNICATION

ABSTRACT:

The distribution of electronic components in labs and workshops is often done by hand, which can cause delays, mistakes, and wasted time. To overcome these problems, we designed a smart vending machine made especially for electronic parts like resistors, capacitors, LEDs, and ICs. The system uses a conveyor belt divided into sections and driven by a stepper motor, allowing it to release one component at a time with high accuracy. Users can choose the needed part using a 4×4 keypad, and an LCD screen shows the selection and current operation. This setup saves time, reduces human effort, and minimizes errors. In the future, it can also be upgraded with IoT features for automatic inventory tracking. The machine is affordable, reliable, and easy to expand, making it suitable for use in colleges, electronics shops, and manufacturing units.

INTRODUCTION:

The need for small electronic parts is very high in engineering colleges, training laboratories, and industries. Students often require components such as resistors, capacitors, and integrated circuits for their experiments, but collecting them from the storeroom or staff takes up valuable time. Manual handling can also lead to mix-ups or incorrect quantities, reducing overall efficiency and increasing workload. Automating this process can make component distribution quicker, more precise, and easier to use. A vending machine designed specifically for electronic parts offers an effective solution. Unlike common vending machines for snacks or drinks, this model is built to manage fragile components safely and accurately. It uses a stepper-motor-controlled conveyor belt with dedicated slots to release each part precisely, without the need for complex sensors. The setup combines simplicity and accuracy, making it an affordable and practical choice for educational institutions and small industrial environments.

LITRATURE SURVEY:

Recent years have seen increased research on vending machines, with various technologies being explored to improve automation and user interaction.

According to a 2021 study published in IRJET, an Arduino-controlled vending machine was developed for dispensing passive components. The design operated with coins and used a gear-and-rack mechanism. Although it successfully dispensed basic items, it lacked flexibility, accuracy, and inventory management features.

In IJIRT (2019), researchers presented an IoT-based vending system that supported cashless payments and remote monitoring. However, their focus was mainly on transaction and connectivity features rather than precise mechanical dispensing for small components.

A more advanced study published in IEEE Access (2025) integrated artificial intelligence and multimodal fusion using YOLOv8 for object recognition and smart

dispensing. While highly effective, such systems are complex and costly, making them impractical for smaller laboratories.

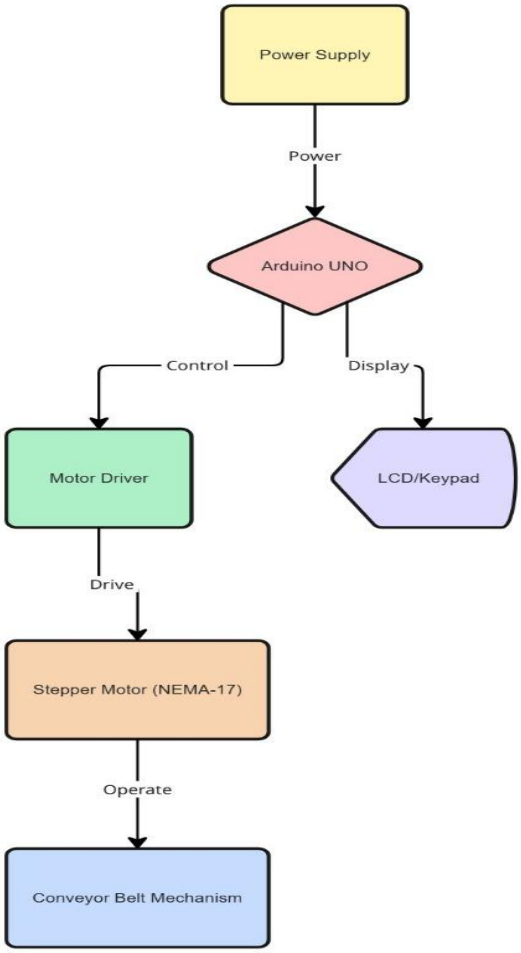
Other works, including IJSRCSEIT (2024) and IJNRD (2023), adapted vending concepts for distributing items like sanitary products or stationery. These models typically relied on sensors, DC motors, and coin mechanisms, which are unsuitable for handling fragile or diverse electronic components.

From reviewing these studies, it is evident that current vending solutions are either too basic—lacking precision and tracking—or overly complex and expensive due to AI and IoT integration. The vending machine proposed in this work aims to fill this gap with a cost-effective, accurate, and scalable system specifically designed for electronic component distribution.

METHODOLOGY:

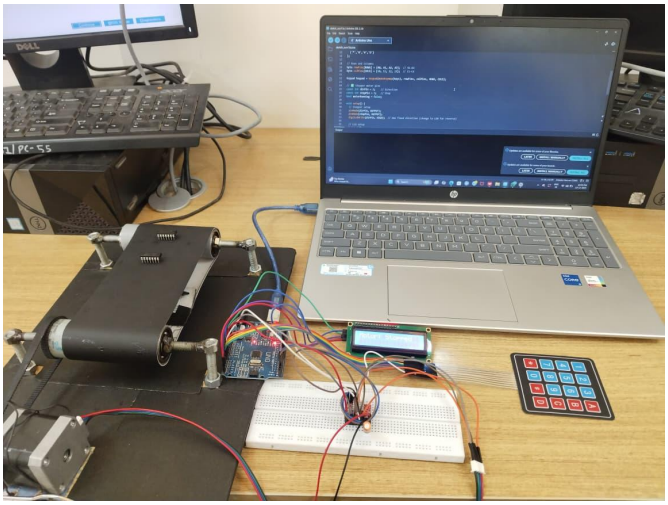
The vending machine operates through seamless coordination between its hardware and software components. The process begins when the user enters a code for the required component using a 4×4 keypad. This input is processed by the Arduino microcontroller, and the selected item is displayed on an LCD screen to provide confirmation and guidance to the user. Once the selection is verified, the microcontroller determines the exact number of steps needed for the stepper motor to rotate the conveyor belt until the appropriate slot aligns with the dispensing outlet. The partitioned conveyor then releases a single unit of the chosen component into the output tray, ensuring precise delivery without relying on additional sensors. A stable power supply maintains smooth operation of both the microcontroller and the stepper motor. By removing unnecessary sensors, the design remains simple yet efficient, while careful calibration of the stepper motor guarantees accuracy in every cycle. Moreover, the modular structure allows for easy future upgrades, such as adding IoT-based inventory tracking or automatic low-stock notifications.

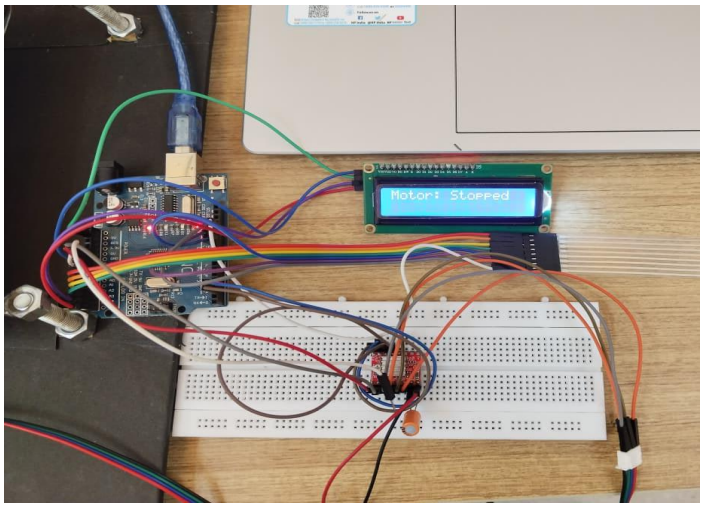
BLOCK DIAGRAM:



RESULTS:

The smart vending machine prototype successfully demonstrated precise and reliable dispensing of electronic components. In lab tests, it quickly responded to keypad inputs and accurately released the selected items, with the LCD providing clear user guidance. Compared to manual distribution, the system saved time and minimized errors — tasks that took minutes manually were completed in seconds. The stepper motor–driven conveyor proved more accurate than gear or DC motor systems. Although IoT features were not included, the design supports easy future upgrades such as online stock monitoring and low-inventory alerts.





CONCLUSION:

The smart vending machine for electronic components offers an efficient and innovative way to overcome distribution challenges in labs, workshops, and stores. Its microcontroller-based system, combined with stepper motor control, ensures precise and reliable dispensing. The setup saves time, minimizes human errors, and improves component management. Unlike earlier designs that were either too simple or overly complex, this model provides a balanced solution that is affordable, dependable, and easy to upgrade. With future integration of IoT features for inventory tracking, the project demonstrates how basic automation can significantly enhance everyday operations in both educational and industrial systems.

REFERENCES:

1. Food Vending Machine | IEEE Xplore. Available at: https://share.google/HojYem7dhdFtiM4DO

2. Vending Machine – Google Scholar. Available at: https://share.google/vaibyl5oXjf84NpaV

3. Vending Machine – Wikipedia. Available at: https://share.google/qV17vPyKb2ZuL7wTF

4. IRJET (2021). Automatic Passive Component Vending Machine.

5. IJIRT (2019). Smart Computerized Vending Machine Enhanced with IoT Technology.

6. IEEE Access (2025). AI-Based Smart Vending Machines for Electronic Component Management.

7. IJSRCSEIT (2024). Smart HygieneMate Hub: A Smart Vending Machine.

8. IJNRD (2023). Stationery Vending Machine.