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Automatic Stamping Machine using Arduino

Rehan Shaikh[1], Pranav Shelke[2], Shivam Chavan[3], Vedant Sutar[4], Sharmila Bhosale[5]
Students Department of Mechatronics Engineering[1,2,3,]
Lecturer , Department of Mechatronics Engineering[4]
Marathwada Mitra Mandal's Polytechnic, Thergaon, Pune, Maharashtra, India

Abstract: *Automation has become an essential part of modern industrial and office applications to improve efficiency, accuracy, and productivity. This project presents the design and development of an Automatic Stamping Machine using Arduino Uno, aimed at reducing manual effort involved in repetitive stamping tasks. The system is developed as a low-cost, compact, and user-friendly solution suitable for small-scale industries and office environments.*

The proposed system utilizes an Arduino Uno microcontroller as the main control unit, which coordinates the operation of various components such as sensors, motor/actuator, stamping mechanism, and suction unit. The working principle is based on detecting the presence of a document using a sensor, after which the microcontroller activates the motor to perform the stamping operation automatically. A fan-based suction mechanism is incorporated to stabilize the document and ensure smooth operation.

The system ensures consistent stamping pressure, proper alignment, and repeatability, thereby improving the overall quality of output while minimizing human errors. The hardware and software integration allows controlled and synchronized operation of all components. Experimental results show that the system operates reliably for multiple cycles with good accuracy and efficiency, especially for lightweight materials such as paper and cardboard.

This project demonstrates the effective use of embedded systems in automating repetitive processes. It provides a cost-effective alternative to conventional pneumatic systems and highlights its potential applications in offices, packaging industries, and small-scale manufacturing units. Future enhancements such as conveyor integration, IoT-based monitoring, and increased stamping force can further improve the system's capability and scalability

Keywords: Arduino Uno, Automatic Stamping Machine, Embedded Systems, Industrial Automation.

I. INTRODUCTION

Automation plays a vital role in modern industries by improving efficiency, accuracy, and productivity [2] [5]. Many industrial and office processes still rely on manual operations, which are time-consuming and prone to human error. One such process is stamping, which is widely used in offices, industries, packaging units, and documentation systems.

The Automatic Stamping Machine using Arduino is designed to automate the stamping process with precision and consistency. The system uses a microcontroller to control the stamping mechanism, reducing manual effort and increasing operational speed [1] [3]. By integrating components such as motors, actuators, and control circuits, the machine can perform repeated stamping operations efficiently. This project focuses on developing a low-cost, user-friendly, and reliable stamping system that can be used in small-scale industries and offices [2] [3]. The automation ensures uniform stamping pressure and positioning, improving the quality of output. Compared to pneumatic systems, microcontroller-based systems are more cost-effective and easier to maintain for small- scale applications [4]. The implementation of this system demonstrates how embedded systems and automation can simplify repetitive tasks and enhance productivity in real-world applications [5].

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II LITERATURE SURVEY

S. Kumar et al. [1] presented the design and development of an automatic stamping machine using a microcontroller. The proposed system employs a motor-driven mechanism to perform stamping operations automatically based on programmed instructions. The study primarily focuses on improving the accuracy, repeatability, and speed of the stamping process. Experimental results indicate that automation significantly reduces human effort while enhancing productivity. However, the authors also reported that the system requires proper alignment and periodic calibration to maintain consistent stamping quality during long-term operation.

R. Sharma et al. [2] investigated the application of embedded systems in automating operations within small-scale industries. The study demonstrates that microcontrollers such as Arduino can effectively automate repetitive tasks including stamping, labeling, and packaging. The authors emphasized that embedded automation offers several advantages, such as reduced operational costs, improved efficiency, ease of implementation, and minimized human errors. Furthermore, the research concluded that such automation solutions are highly beneficial for small-scale industries with limited financial and technical resources.

P. Singh et al. [3] proposed an Arduino-based industrial automation system by integrating sensors, actuators, and a microcontroller to develop an efficient control system. The paper highlights Arduino's low cost, flexibility, and ease of programming, making it suitable for various industrial applications. The study further demonstrates that Arduino-based systems can be easily customized for different automation requirements, including automatic stamping machines. The authors concluded that Arduino provides a practical and scalable platform for developing reliable industrial automation systems.

M. Patel et al. [4] presented the design and implementation of a pneumatic stamping machine that utilizes compressed air to generate the force required for stamping operations. The proposed system delivers high-speed performance along with strong and consistent stamping pressure, making it suitable for large-scale industrial applications. However, the authors pointed out several limitations, including higher installation and maintenance costs, increased system complexity, and dependence on pneumatic components. Consequently, the system is less suitable for small-scale industries when compared with electrical and microcontroller-based alternatives.

A. Verma et al. [5] discussed the automation of repetitive industrial tasks using microcontroller-based systems. The research emphasizes the importance of automation in improving reliability, consistency, and operational efficiency. According to the study, microcontroller-based automation effectively reduces manual intervention, minimizes human errors, and enhances overall productivity. The authors also highlighted that such systems can be designed as cost-effective and user-friendly solutions, making them applicable to a wide range of industrial processes, including automatic stamping operations.

A. Reaearch Gap

The literature review indicates that significant progress has been made in the development of automatic stamping systems using microcontrollers, embedded systems, and pneumatic mechanisms. However, several research gaps still exist. Most of the existing automated stamping machines are designed for large-scale industrial applications and involve high implementation costs, making them unsuitable for small-scale industries and office environments. Although pneumatic stamping systems provide high stamping force and speed, they require compressed air infrastructure, complex installation, and regular maintenance, which increases the overall operational cost. In addition, limited research has focused on developing compact, portable, and low-cost stamping machines that are easy to operate and maintain. Some existing systems also lack flexibility, user-friendliness, and adaptability for different stamping applications. Therefore, the present work aims to address these limitations by developing a simple, economical, and efficient Arduino-based automatic stamping machine that provides reliable and consistent stamping performance while being suitable for small industries, educational institutions, and office applications.

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B. Objective

The primary objective of this project is to design and develop a low-cost, compact, and efficient Automatic Stamping Machine using Arduino Uno that automates repetitive stamping operations with minimal human intervention. The system aims to improve the accuracy, consistency, and speed of the stamping process while reducing manual effort and human errors. The project focuses on integrating an Arduino Uno microcontroller, sensors, actuators, and a suction mechanism to achieve synchronized and reliable operation. It also aims to develop an embedded control algorithm that ensures precise timing, proper alignment, and uniform stamping quality. Furthermore, the proposed system provides a cost-effective and user-friendly alternative to conventional pneumatic stamping machines, making it suitable for small-scale industries, offices, and educational laboratories. The project also serves as a foundation for future enhancements, including conveyor-based material handling, IoT-enabled monitoring and control, automatic object detection, and improved stamping force for advanced industrial applications.

III. PROPOSED METHODOLOGY

The methodology adopted for the development of the Automatic Stamping Machine using Arduino Uno follows a systematic engineering approach comprising system design, component selection, hardware integration, embedded programming, testing, and performance evaluation. The objective is to develop a compact, economical, and reliable automated stamping system capable of performing repetitive stamping operations with minimal human intervention. The Arduino Uno microcontroller serves as the central control unit, coordinating the operation of sensors, actuators, and the stamping mechanism. The methodology ensures synchronized operation, consistent stamping quality, reduced manual effort, and improved productivity.

A. System Design Approach:

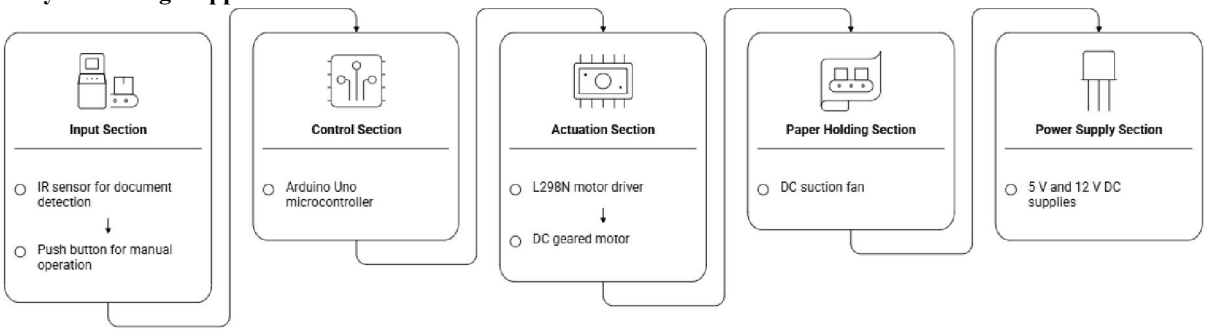

Fig. 1 Block Diagram of Automatic Stamping Machine

The proposed system follows a modular design approach consisting of the following functional blocks: Input Section: IR sensor/push button for document detection or manual operation. Control Section: Arduino Uno microcontroller for processing input signals and generating control outputs. Actuation Section: L298N motor driver controlling the DC geared motor that drives the stamping mechanism. Paper Holding Section: DC suction fan to hold the paper firmly during stamping. Power Supply Section: Regulated 5 V and 12 V DC power supplies for Arduino and actuators. The modular architecture simplifies integration, maintenance, and future expansion of the system.

B. Hardware Components:

Arduino Uno: The Arduino Uno is the primary controller used in the proposed automatic stamping machine. It is based on the ATmega328P microcontroller and operates at a voltage of 5 V with a recommended input voltage of 7–12 V. The board features 14 digital input/output pins, including 6 PWM outputs, 6 analog input pins, and operates at a clock frequency of 16 MHz In the proposed system, the Arduino Uno processes input signals from the IR sensor and

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push button, executes the embedded control program, and generates output signals to control the motor driver, ensuring synchronized and reliable operation of the stamping mechanism.

Fig 2 Arduino UNO

IR Sensor Module

IR Sensor Module: This employed to detect the presence of a paper or document before initiating the stamping process. It operates at a supply voltage of 3.3–5 V DC and provides a digital output to the Arduino Uno upon detecting an object. The sensor consists of an infrared transmitter and receiver with an adjustable detection range of approximately 2–30 cm. By automatically sensing the document, the IR sensor minimizes manual intervention, improves operational accuracy, and ensures that stamping is performed only when the document is correctly positioned.

Fig 3 IR Sensor Module

L298N Motor Driver Module: This used to interface the Arduino Uno with the DC geared motor. Since the Arduino cannot directly supply the current required by the motor, the L298N module acts as a power amplifier and motor controller. It operates with a motor supply voltage ranging from 5 V to 35 V DC, supports a maximum output current of 2 A per channel, and utilizes a dual H-Bridge configuration to control the motor's direction and speed. In this project, the motor driver receives control signals from the Arduino and drives the DC motor to perform the stamping operation with precise forward and reverse movement.

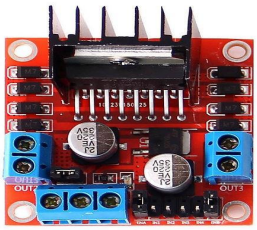

Fig 4 L298N Motor Driver Module

DC Geared Motor: The DC Geared Motor serves as the actuator responsible for driving the mechanical stamping mechanism. It operates at a rated voltage of 12 V DC and is equipped with a metal gearbox that provides high torque at a low rotational speed, typically ranging from 30 to 100 RPM, depending on the gear ratio. The geared motor converts electrical energy into controlled mechanical motion, enabling the stamping unit to move downward for stamping and

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retract to its initial position after the operation. The use of a geared motor ensures smooth movement, consistent stamping pressure, and reliable performance during repeated stamping cycles.

Fig 5 DC Geared Motor

C. Circuit Design:

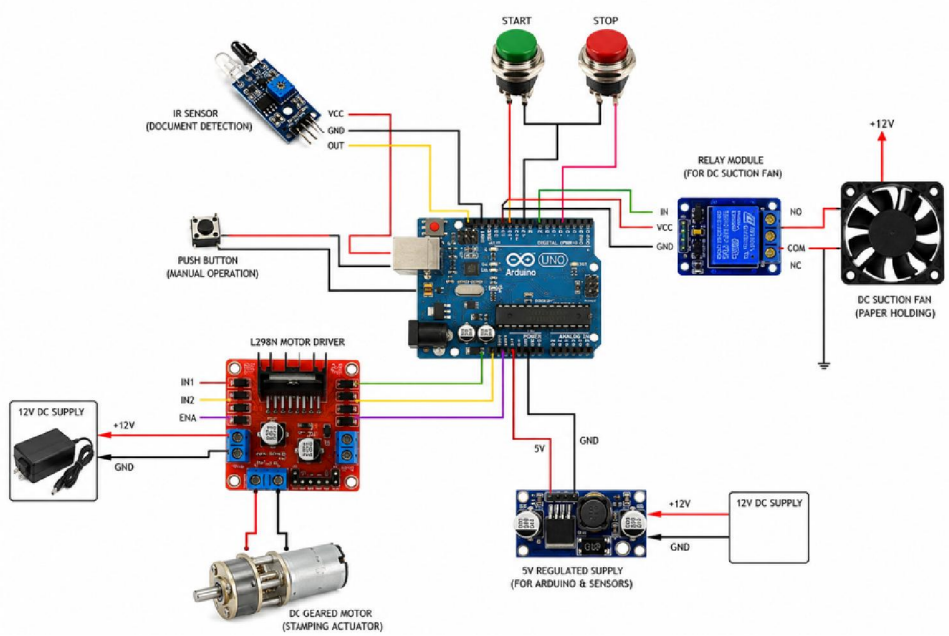

Fig.6 Circuit Diagram of Automatic Stamping Machine

The circuit diagram illustrates the Automatic Document Stamping System controlled by an Arduino Uno, which acts as the central processing unit of the system. The Arduino receives input signals from the IR sensor, Start button, Stop button, and manual push button, and controls the operation of the DC geared motor and DC suction fan accordingly. The IR sensor is powered by a regulated 5 V supply and continuously monitors the document placement area. When a document is detected, the sensor sends a signal to the Arduino, indicating that the document is ready for the stamping operation.

Once the document is detected and the Start button is pressed, the Arduino energizes the relay module, which switches ON the 12 V DC suction fan. The suction fan securely holds the document on the platform, preventing any movement during the stamping process. Simultaneously, the Arduino sends control signals to the L298N motor driver module, which drives the 12 V DC geared motor connected to the stamping mechanism. The motor rotates in the required direction to move the stamping actuator, allowing the stamp to press onto the document with sufficient force. After completing the stamping cycle, the Arduino stops the motor and deactivates the relay, turning OFF the suction fan so that the stamped document can be removed.

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The system also includes a manual push button that enables the operator to perform the stamping action manually without relying on document detection. Additionally, a Stop button is provided as a safety feature to immediately halt the operation whenever required. The entire system is powered using a 12 V DC power supply, while a 5 V voltage regulator module steps down the voltage to safely power the Arduino, IR sensor, and relay module. A common ground is maintained between all components to ensure reliable communication and stable operation. This integrated circuit provides an efficient, accurate, and automated document stamping solution by combining sensing, control, actuation, and document holding mechanisms into a single system.

IV. WORKING PRINCIPAL

The automatic document stamping system works on the principle of sensor-based detection and microcontroller-controlled automation. The Arduino Uno acts as the central controller, coordinating the operation of all input and output devices. Initially, the system remains in standby mode, continuously monitoring the IR sensor for the presence of a document. When a document is placed on the stamping platform, the IR sensor detects its presence by sensing the reflected infrared light and sends a digital signal to the Arduino. After the Start button is pressed, the Arduino activates the relay module, which switches ON the 12 V DC suction fan. The suction fan creates a vacuum that firmly holds the document in position, preventing any movement during the stamping operation.

Once the document is securely held, the Arduino sends control signals to the L298N motor driver, which drives the DC geared motor connected to the stamping mechanism. The geared motor converts electrical energy into controlled mechanical motion, moving the stamping actuator downward to apply the stamp onto the document with the required pressure. After the stamping action is completed, the Arduino stops the motor and deactivates the relay, thereby switching OFF the suction fan. The document is then released and can be removed, allowing the system to return to standby mode for the next stamping cycle.

The system also includes a manual push button that enables manual operation of the stamping mechanism whenever automatic detection is not required. A Stop button is provided as a safety feature to immediately interrupt the operation in case of an emergency or malfunction. The entire system operates using a 12 V DC power supply, while a 5 V voltage regulator provides a stable supply to the Arduino, IR sensor, and relay module. By integrating sensing, control, and actuation, the system ensures accurate, reliable, and efficient document stamping while minimizing manual effort and improving productivity.

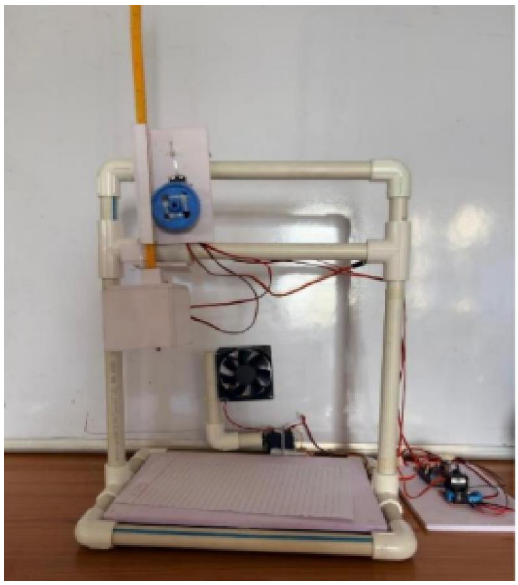

Fig. Developed Automatic Stamping Machine

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V. RESULTS & DISCUSSION

The developed Automatic Document Stamping System was successfully designed, fabricated, and experimentally evaluated under laboratory conditions. The experimental results demonstrate that the proposed system performs the document detection, holding, and stamping operations accurately and reliably. Upon activation of the Start push button, the Arduino Uno executed the embedded control algorithm and continuously monitored the IR sensor for document detection. When a document was detected, the relay module activated the DC suction fan, which securely held the document in position. Subsequently, the Arduino controlled the L298N motor driver to operate the DC geared motor, enabling the stamping actuator to complete the stamping operation automatically. After completion of the stamping cycle, the motor stopped, the suction fan was switched OFF, and the system returned to the standby state, ready for the next document.

The integration of the Arduino Uno, IR sensor, L298N motor driver, relay module, DC geared motor, DC suction fan, and regulated power supply ensured stable and reliable operation throughout the experimental trials. The LM2596 voltage regulator provided a constant 5 V supply to the Arduino and sensing circuit, while the 12 V supply powered the motor driver and suction fan without noticeable voltage fluctuations. The prototype demonstrated smooth and repeatable stamping operations with reliable synchronization between the sensing, control, and actuation units. The developed system validates the feasibility of implementing a low-cost, automated document stamping platform suitable for office automation, educational laboratories, and small-scale industrial applications.

The experimental investigation confirms that the proposed system:

- Successfully detects document presence using the IR sensor.
- Accurately performs automatic document holding using the DC suction fan.
- Achieves reliable control of the stamping mechanism through the Arduino Uno and L298N motor driver.
- Demonstrates stable and synchronized operation of sensing, holding, and stamping mechanisms.
- Provides a compact, modular, and cost-effective solution for automated document stamping applications.

Table 1 Functional Validation of the Developed Prototype

Sr. No.	Function Tested	Expected Outcome	Observed Outcome
1	Power Supply	Stable power to all components	Stable operation observed
2	Arduino Program	Execute programmed stamping sequence	Executed successfully
3	IR Sensor	Detect document presence	Document detected accurately
4	Relay Module	Control suction fan	Relay switched successfully
5	DC Suction Fan	Hold document firmly	Effective document holding observed
6	L298N Motor Driver	Drive DC geared motor	Reliable motor control observed
7	DC Geared Motor	Perform stamping action	Smooth stamping motion observed
8	Start Push Button	Initiate operation	Responded correctly
9	Stop Push Button	Stop system operation	Successfully stopped system
10	Complete Automation Cycle	Automatic document detection, holding, and stamping	Successfully completed

Table 2 Functional Validation of the Developed Prototype

S. NO.	Hardware Component	Performance	Remark
1	Arduino Uno	Excellent	Stable controller operation
2	IR Sensor	Excellent	Accurate document detection
3	L298N Motor Driver	Excellent	Reliable motor control

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4	DC Geared Motor	Excellent	Smooth stamping actuator movement
5	Relay Module	Excellent	Reliable fan switching
6	DC Suction Fan	Good	Effective document holding
7	LM2596 Buck Converter	Excellent	Stable 5 V voltage regulation
8	12 V Power Supply	Good	Continuous and stable operation
9	Arduino Uno	Excellent	Stable controller operation

VI. FUTURE SCOPE

The proposed Automatic Document Stamping System can be further enhanced by integrating a conveyor mechanism for continuous document feeding and high-speed operation. Advanced sensors or vision-based systems can be incorporated to improve document detection and alignment accuracy. The system can also be upgraded with IoT-based monitoring for remote operation and real-time performance tracking. Additionally, the use of servo or pneumatic actuators can provide higher precision and stamping force, while a touchscreen HMI can offer a user-friendly interface for system control. An automatic document counting and data logging feature can further improve productivity, making the system suitable for modern office automation and Industry 4.0 applications.

VII. CONCLUSION

This paper presented the design and implementation of an Arduino-based Automatic Document Stamping System for automating the document stamping process. The proposed system integrates an Arduino Uno, IR sensor, L298N motor driver, DC geared motor, relay module, and DC suction fan to achieve automatic document detection, holding, and stamping. Experimental results demonstrated that the system operates reliably with accurate document detection, smooth stamping action, and stable overall performance. The developed prototype offers a cost-effective, compact, and user-friendly solution that reduces manual effort, improves stamping consistency, and enhances operational efficiency. The proposed system is suitable for office automation, educational institutions, and small-scale industrial applications, and provides a strong foundation for future enhancements using advanced automation and Industry 4.0 technologies.

REFERENCES

[1] S. Kumar, R. Patel, and A. Mehta, “Design and Development of Automatic Stamping Machine using Microcontroller,” *International Journal of Engineering Research*, vol. 8, no. 4, pp. 245–250, 2019.
[2] R. Sharma, P. Gupta, and N. Verma, “Automation in Small Scale Industries using Embedded Systems,” Proceedings of the IEEE International Conference on Automation and Computing, pp. 112–117, 2020.
[3] P. Singh, K. Yadav, and M. Joshi, “Arduino-Based Industrial Automation System,” International Journal of Advanced Research in Engineering and Technology, vol. 12, no. 6, pp. 78–84, 2021.
[4] M. Patel, S. Desai, and H. Trivedi, “Design and Implementation of Pneumatic Stamping Machine,” International Journal of Mechanical Engineering and Technology, vol. 9, no. 5, pp. 321–326, 2018.
[5] A. Verma, D. Kulkarni, and S. Rao, “Automation of Repetitive Tasks using Microcontroller Systems,” Proceedings of the International Conference on Automation and Smart Systems, pp. 55–60, 2022.
[6] M. Banzi and M. Shiloh, *Getting Started with Arduino*, 4th ed. Sebastopol, CA, USA: Maker Media, 2022.
[7] J. Axelson, *Arduino for Embedded Systems: Using MATLAB and Simulink*, 2nd ed. Lakeview Research LLC, 2019.
[8] K. Ogata, *Modern Control Engineering*, 5th ed. Upper Saddle River, NJ, USA: Pearson Education, 2010.
[9] B. K. Bose, *Modern Power Electronics and AC Drives*. Upper Saddle River, NJ, USA: Prentice Hall, 2002.
[10] S. Mackay, E. Wright, J. Park, and D. Reynders, *Practical Industrial Data Communications: Best Practice Techniques*. Oxford, U.K.: Newnes (Elsevier), 2004.