# Intelligent Machine Inspirational Project

## Stamp Calculator


***vCognitives***

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# Declaration

We declare that this Project Report is our own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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# Abstract

Motivation behind our project :

The postal industry is facing several challenges when it comes to processing mail and packages, especially with the increasing volume of shipments worldwide. There is a growing demand for postal facilities that can provide fast and accurate calculation of postage fees while being cost-effective and easily available. As a solution, our project aims to develop a stamp calculating machine that can automate the process of calculating postage fees for different types of mail and packages, reducing the workload on postal workers, and improving efficiency in the industry. Here we develop the small level stamp calculating machine for the industry.

Existing Machine and intelligent feature of the machine:

We looked at how this postal service is carried out by employees and other significant register post details, and we came up with a number of clever features that we could include in our stamp calculating device. These include the capability to determine postage costs depending on the weight of various kinds of shipments. We determined that the stamp calculation machine required a user-friendly interface, display with a keypad for managing and observing its operations.

Approach to Design and Implementation:

The postal workers served as our design and implementation inspiration, but we included elements that make the stamp calculation device more contemporary, effective, and user-friendly. The design is made up of many components, such as weight and postage computation modules. Human input is used to connect and control these modules through a keypad that incorporates all the required algorithms to run the machine's operations.Both postal employees and customers will utilize the stamp calculator. The kind of postal service will be entered into the machine, and the outputs will be the weight of the mail and the postage fee calculation. The system uses sophisticated algorithms to generate an appropriate postal cost while continuously monitoring the input data. The stamp-calculating device will streamline the calculation of postage costs, lower errors, and boost postal industry productivity.

Evaluation and Implications:

Our stamp calculator is being evaluated on a number of fronts in order to determine how successful it is. In order to assure accurate results, we first place a high priority on accuracy by checking the computed postage fees with manual calculations. We also assess the machine's effectiveness by calculating the time and labor savings over the conventional manual approach. Another critical factor is user-friendliness, and we collect user feedback to assess the machine's user-friendly interface and keypad design. Stress testing is carried out to

make sure the machine can perform large volumes of calculations without malfunctioning or losing accuracy because reliability is of the utmost importance.

The postal sector will be significantly impacted by the use of our stamp calculator. First, it increases efficiency by automating the calculation of postage fees, freeing postal employees to concentrate on other crucial activities and accelerating package processing. The device also reduces mistakes that are frequently made when performing manual calculations, resulting in exact mailing costs. Because of the quicker and more accurate fee calculations that benefit clients, the postal process is smoother and more convenient as a result of the increased accuracy. Additionally, by maximizing resource usage and lowering operating costs, automation of postage rate computations can result in cost savings for postal corporations. The stamp calculator represents a step forward in the modernization of the postal sector by integrating cutting-edge technology, showcasing its capacity to adjust to shifting demands and welcome novel solutions. Overall, by streamlining operations, increasing accuracy, and raising customer happiness, the stamp calculation machine has the potential to transform the postal sector and lead to a more effective and affordable postal service.

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# 1. Introduction

The evolution of machines has been a long and complex process that has spanned centuries. Machines have played a crucial role in human civilization, allowing us to accomplish tasks that would have been impossible without them. The history of machines can be traced back to simple tools like the wheel and axle lever (seven simple machines) which were used by our ancestors to perform basic tasks. Over time, these tools evolved into more sophisticated machines like the water wheel, windmill, and steam engine, which powered the Industrial Revolution and transformed the way work was done.

Machines have played a significant role in advancing various fields, including manufacturing, transportation, communication, healthcare, and many others. They continue to evolve and improve as technology advances, leading to new possibilities and applications in different industries.Any machine can be seen with four components, namely, input, output, process, and power.John Kay's invention of the flying shuttle has been considered as a breakthrough in the evolution of machines.Following that event, in 18th-century industrial revolution started .[1]

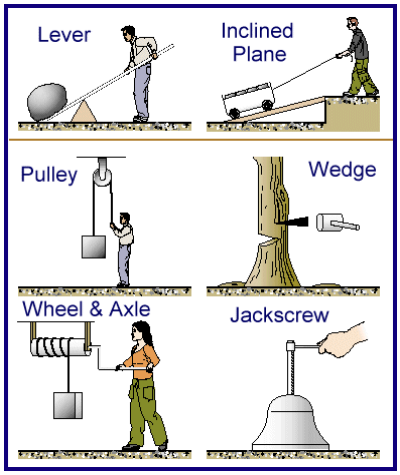



Figure 1.1 Seven simple machines

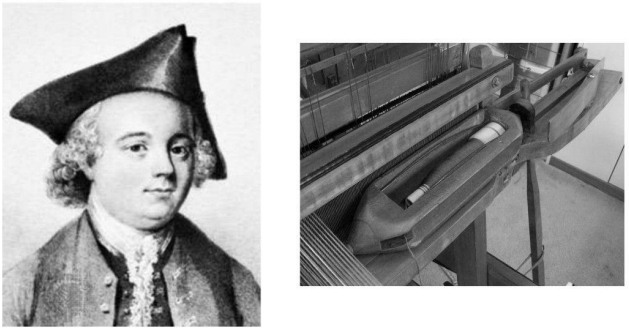


Figure 1.2 John Kay and Flying Shutter

This report presents our project to develop a Stamp calculator .Here we have developed a stamp machine to reduce calculation error and reduce human interference by replicating the action of a customer and officer at the post office. The objectives of the project are as follows

- Reduce human interference while posting a post.
- Reduce manual calculating error while calculating the price of stamps.
- Conserve the time and work easily.
- Reduce the burden on officers.
- Reduce the burden on customers.

A project report will be written to document the entire process and outcomes of the project

## 2.Development of stamp calculator

Our team has developed a suggestion for a stamp calculation device that might be installed at post offices. Letters are subject to a tariff rate in the postal system based on their individual weights. However, the typical weighing scales used in general stores are inappropriate for post offices because the measuring range for postal mail starts at grams. Instead, to precisely weigh letters and determine the proper postal fare, high-precision weighing equipment is needed.Electronic weighing equipment are being used in post offices to meet this need. These tools make it possible to measure weights in grams, ensuring precise calculation of the postal tariff. However, the method of figuring out how much money the postal service will need still involves human interaction, using mathematical equations and knowledge.Due to this, our team has developed a system that combines the process of weighing with the determination of mailing costs. The suggested stamp calculator will show the letter's weight as well as the appropriate stamp value that should be used. This procedure will be automated in an effort to improve efficiency at post offices and give clients a simple and effective way to calculate postage costs.

It is made up of a number of parts and modules that work together to carry out the necessary calculations. The machine's architecture and individual parts are described in detail below

1) User interface :

   The front-end element of the stamp calculator is the user interface, which offers a method for users to enter data and obtain calculated results. Usually, it has a keypad and a display screen. Users of the user interface can choose the kind of postal service, enter the stamp value, and examine the calculated postage costs.

2) Weight Measurement Module:

   The weight measurement module is responsible for accurately measuring the weight of the post. Here we use load cells to detect and quantify the weight. The measured weight is then passed on to the calculation module for further processing.

3) Display Module:

   The display module shows the user the calculated post costs. It has an LCD screen that displays the outcomes in an easily visible manner. The user receives feedback from the display module in the form of confirmation messages or input prompts.

4) Stamp Dispensing Mechanism:

   A stamp dispensing mechanism is built into the construction of some stamp

calculators. Based on the computed postal costs, this component is in charge of dispensing the necessary quantity and value of stamps. It makes sure the employee may quickly get the stamps they need for their letter.

The stamp calculator machine has a number of features that make computing postal costs easier. Its main job is to precisely determine postage costs based on the chosen postal service and the post's weight. By automating this procedure, the device does away with the necessity for manual computations and lessens the likelihood that the right postage amount will be calculated incorrectly.The device has an intuitive UI that makes it simple to use for both postal workers and customers. Users can easily input the required data, and a clear display of the calculated postage costs is provided. Customers can easily compute the necessary mailing fees using the interface's practical and effective design without having to perform laborious manual computations.

## 3.Intelligent stamp calculator

The evolution of machines leading to the birth of intelligent machines has been a fascinating journey marked by key milestones and breakthroughs.It encompasses the development of classical machines with limited intelligence to the emergence of today's advanced intelligent machines powered by artificial intelligence(AI) technologies.The Industrial Revolution ,which began in the 18th century,marked the shift from manual labor to machine-based production.This period saw the invention of machines like the spinning jenny,steam engine,and power loom,which revolutionized manufacturing processes.

The development of mechanical calculators in the 19th century,such as Charles Babbage's Analytical Engine,laid the foundation for computational machines.However,it was the advent of electronic computers in the mid-20th century,like the ENIAC and UNIVAC,that set the stage for the digital age.

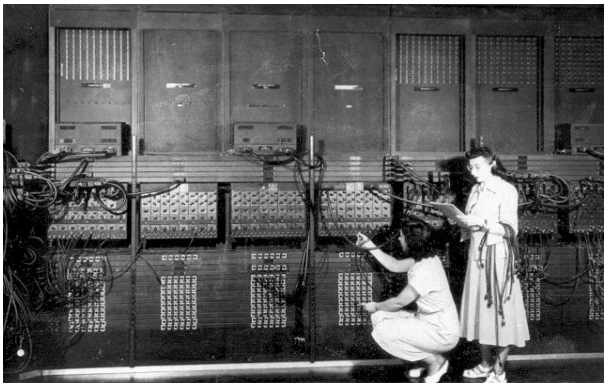


Figure 3.1 ENIAC

Figure 3.2 UNIVAC

The invention of the transistor in 1947 and the subsequent development of integrated circuits in the late 1950s paved the way for miniaturization and the creation of more powerful and compact electronic devices.This advancement enabled the construction of faster and more efficient computers.

The field of AI emerged in the 1950s with the goal of creating machines capable of human-like intelligence.Early AI systems were rule-based and lacked the ability to learn from data.However,the advent of machine learning in the 1980s and the subsequent development of neural networks and deep learning algorithms significantly enhanced the capabilities of AI systems.The exponential growth of digital data and the development of cloud computing platforms in the late 20th century provided the infrastructure and resources required to process and store vast amounts of information.This advancement fueled the training and deployment of complex AI models,enabling them to analyze and make sense of large datasets.

The IoT revolutionized the connectivity and communication between machines and everyday objects.With the proliferation of sensors and smart devices,vast amounts of real-time data became available,enabling intelligent machines to interact with and respond to their environment.The integration of AI, machine learning,and robotics led to the development of intelligent machines capable of performing complex tasks with advanced sensors,computer vision,and natural language processing have found applications in various industries,from manufacturing and healthcare to agriculture and logistics.

The advancements in NLP have played a crucial role in the development of intelligent machines capable of understanding and generating human language.Technologies like speech recognition,sentiment analysis,and machine translation have enabled machines to communicate and interact with humans in more natural ways.

Cognitive computing combines AI,machine learning,and advanced analytics to simulate human thought processes.This approach aims to create machines that can reason,learn,and understand complex situations,leading to the birth of intelligent systems capable of decision-making,problem-solving,and providing personalized experiences.Deep learning ,a subset of machine learning,focuses on training artificial neural networks with multiple layers to perform intricate tasks.The breakthroughs in deep learning algorithms,fueled by the availability of massive computing power and large datasets,have significantly improved the accuracy and capabilities of intelligent machines.

The evolution of machines has been a gradual process ,with each milestone building upon the advancements of the previous era.Today, we stand on the brink of a new era,witnessing the birth of intelligent machines that possess the ability to learn,reason,adapt, and potentially exhibit human-level intelligence in various domains.

Figure 3.3 ENIGMA machine at the Alan turing institute

## 4.Approach -Stamp calculator

We have developed a stamp calculating machine which can reduce human intervention while calculating money for stamps.. The machine we developed is named Stamp calculator.

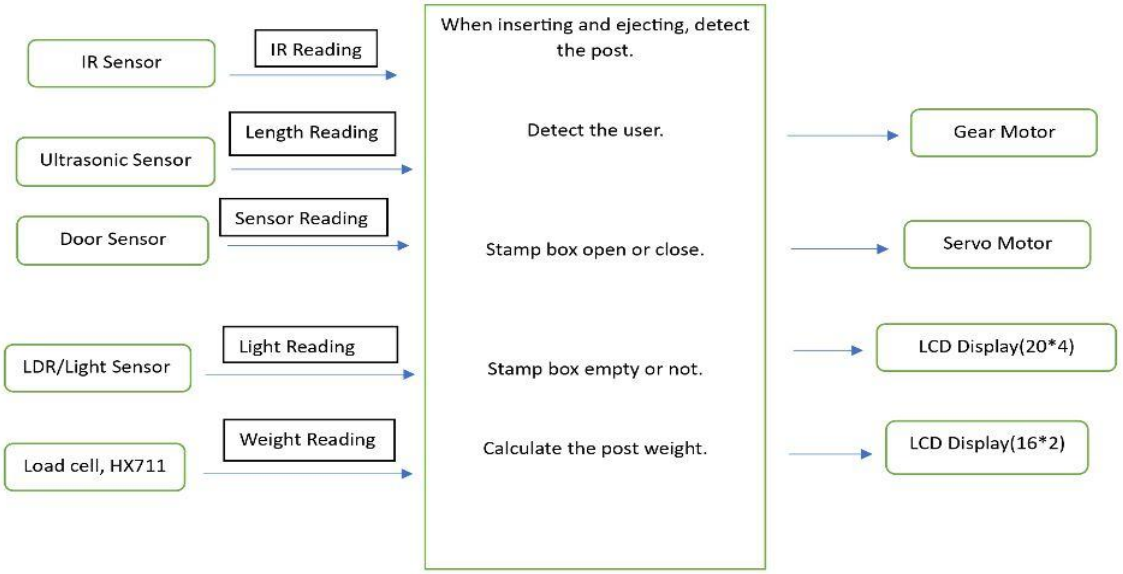
The real-world inspiration for the project is how an experienced person calculates the amount of money needed for the postal service by using mathematical equations and knowledge.And also they need to differentiate the service type whether it is a stamp service or QR service.And also self-service postage kiosks found in post offices or shipping centers.These kiosks allow customers to weigh their packages,calculate the postage required,and print the shipping labels-all in a self service manner.

The stamp calculating machine could draw inspiration from these kiosks by providing a similar self-service experience for stamp-based transactions. Instead of weighing packages, the machine would focus on calculating the appropriate stamp quantities based on the transaction type (with or without existing stamps) and displaying the amount to be paid. The machine could also incorporate separate stamp boxes, similar to the self-service kiosks, where users can access different stamp denominations.

Figure 4.1 Calculating money

Figure 4.2 Self-service postage kiosks.

# 5.Design of Stamp calculator



# 6.Implementation of Stamp Calculator

1.Customer Detection Module:

- Hardware: Ultrasonic sensor
- Algorithm: Use an appropriate ultrasonic distance measurement algorithm to detect the presence of a customer.

2.Front Gate Control Module:

- Hardware: Servo motor
- Algorithm: Use a servo motor control algorithm to open and close the front gate door based on the customer detection signal.

3.Letter Detection Module:

- Hardware: IR sensor
- Algorithm: Utilize an algorithm to detect the presence of a letter using the IR sensor.

4.Gear Motor Operation Module:

- Hardware: Gear motor
- Algorithm: Develop a control algorithm to activate the gear motor for letter placement and movement.

5.Letter Placement Module:

- Hardware: Gear motor
- Algorithm: Design an algorithm to accurately position the letter in the correct place using the gear motor.

6.Transaction Type Selection Module:

- Hardware: User interface (buttons, keypad, etc.)
- Algorithm: Implement a user interface algorithm to allow the customer to select the transaction type (stamp-based or QR-based).

7.Stamp-Based Transaction Module:

- Algorithm: Develop an algorithm to handle the different types of stamp-based transactions, considering the customer's selection and amount specified.

8.Weight Calculation Module:

- Hardware: Load cell
- Algorithm: Use appropriate load cell algorithms to measure and calculate the weight of the letter accurately.

9.Display Modules:

- Hardware: Two displays (one for the customer, one for the officer)
- Algorithm: Develop algorithms to update and display the calculated stamp amount and relevant information on both displays.

10.Stamp Box Opening Module:

- Hardware: Stick, servo motor
- Algorithm: Design an algorithm to open the correct stamp boxes based on the calculated stamp amount using the stick and servo motor.

11.Letter Delivery Module:

- Hardware: Stick, servo motor
- Algorithm: Implement an algorithm to push the letter out of the box using the stick and servo motor.

12.Stamp Box Status Module:

- Hardware: Door sensor
- Algorithm: Utilize the door sensor and an algorithm to determine whether the stamp box is opened or closed.

13.Front Gate Control (After Transaction) Module:

- Hardware: Servo motor
- Algorithm: Develop a servo motor control algorithm to open the front gate again for the next transaction, based on the status of the stamp box door

14.Buzzer System:

- Hardware: Buzzer
- Algorithm:Implement an algorithm to activate the buzzer system to alert the officer when the stamp boxes are ready.

Overall, the implementation of the intelligent multitasking assisting bed involves a combination of various hardware components, software systems, and technologies, along with specific algorithms tailored to each module's functionality. etc

# 7.Evaluation

1) User-Friendly Interface

User acceptance testing and usability testing can be used to evaluate the user interface. Usability testing entails watching users engage with a product and getting their comments. This makes it easier to spot any usability problems, such as poor instructions or confusing or deceptive design elements. User acceptance testing entails getting input from a group of unbiased users who assess the interface's overall usability and efficiency. This testing makes sure that the user experience is seamless, the interface is straightforward, and it is simple to navigate.

2) Calculation of Postage Fees

A variety of test cases can be created to evaluate the precision of the postage fee computations. These test cases ought to include a range of conditions, including multiple postal services, weight categories, and pricing regulations. The predicted posting charge for each test instance can be calculated manually, and the machine's calculated fee can then be contrasted with it. For the calculations to be accurate and reliable, test cases should cover both typical and edge circumstances.

3) Keypad Input

Different scenarios can be simulated in order to test the functionality of the keypad input. Entering various values, such as postal codes, and confirming that the machine interprets and processes the input appropriately are examples of this. Valid and invalid inputs should both be tested, as well as input validation and error handling. To ensure trustworthy user input, the keypad's precision and responsiveness should also be evaluated.

4) Accuracy of Weight Measurement

Precision weights can be used as reference standards to test the weight measuring module's accuracy. The weights can be placed on the weighing equipment, and the machine's measurement can be compared to the known weight. This testing should include a variety of weights in order to assess the device's accuracy across different weight categories. Additionally, the repeatability and consistency of measurements should be checked to ensure trustworthy and precise weight readings.

5) Connectivity and External Services

Simulating connections to the relevant systems allows the connectivity module and integration with external services to be tested. This can include creating test environments or utilizing dummy services. Scenarios such as collecting updated postal service information, confirming secure communication protocols, and processing digital payments should be included in the testing. The machine's ability to establish and maintain connections, exchange data, and respond to external service demands should be thoroughly assessed.

# 8.Conclusion

The development of a stamp calculating machine that incorporates both stamp based and QR-based transactions represents a significant advancement in the field of intelligent machines. This machine offers customers the flexibility to choose between stamp-based transactions, where envelopes with stamps are used, and QR-based transactions, which utilize digital codes for payment.

With stamp-based transactions,the machine intelligently calculates the required amount of stamps , taking into account whether the envelope already contains stamps or not. If stamps are present, the machine deducts the appropriate amount from the total to be paid and displays the remaining balance. If no stamps are present, the machine eliminates the need for subtraction and proceeds to display the full amount to be paid.

To enhance convenience and efficiency,the machine is equipped with separate boxes containing different amounts of stamps. Through intelligent automation, the machine identifies the calculated stamp amount and automatically opens the corresponding box,ensuring a seamless transaction process for the customer.

For QR based transactions,the machine provides a dedicated QR box that opens when this payment method is chosen.This feature allows customers to scan the QR code provided, facilitating quick and secure digital transactions.

By incorporating intelligent algorithms, precise calculations, and automated stamp box openings, this stamp calculating machine demonstrates the evolution of machines towards intelligent systems that simplify and streamline transaction processes. It not only provides convenience for customers but also showcases the convergence of physical and digital payment methods in a user-friendly and efficient manner.

Future Improvements:

1. Integration with digital payment system
2. Enhanced security Measures
3. Machine Learning for predictive stamp qualities
4. Real-time update and connectivity
5. Integration with mobile Apps.

In summary, this stamp calculating machine represents a significant step forward in the evolution of intelligent machines, leveraging both traditional stamp-based transactions and modern QR-based payment methods. It embodies the intersection of advanced technologies and customer-centric design to meet the evolving needs of individuals and businesses in an increasingly digital world.

## References

[1]Analysis, Design and Evaluation of Man – Machine Systems *Proceedings of the IFAC/IFIP/IFORS/IEA Conference, Baden-Baden, Federal Republic of Germany, 27-29 September 1982*

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