

Coin-Based Mobile Charger

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ABSTRACT

The rapid growth of public utility systems has increased the demand for efficient mobile charging solutions in public places. This project presents a coin-based mobile charging system using IoT concepts that automates the charging process. The system allows users to charge mobile phones by inserting coins in locations such as railway stations, bus stands, and shopping complexes. A coin recognition module is used to detect the inserted coin and generate a signal. The microcontroller processes the signal and controls the charging operation. An LCD display shows the remaining charging time for user convenience. The system provides a fixed charging duration of 5 minutes per coin and maintains a regulated 5V power supply. If an additional coin is inserted during charging, the time is extended instead of resetting. Overall, the system is simple, cost-effective, and suitable for public charging applications.

1.INTRODUCTION:

Coin-based mobile Coin-based mobile charging systems have become an essential part of modern public infrastructure due to the rapid increase in smartphone usage across the world. In today's digital age, mobile phones are no longer limited to communication; they are widely used for online banking, digital payments, navigation, education, social networking, and even emergency services. As people depend heavily on their mobile devices throughout the day, the need for reliable and easily accessible charging facilities in public places has grown significantly.

In earlier times, users mainly relied on personal chargers or direct access to wall sockets for charging their devices. However, in public environments such as railway stations, bus terminals, airports, colleges, and shopping malls, this approach is often inconvenient and sometimes unsafe. These places usually face challenges such as limited charging points, overuse or misuse of electrical outlets, lack of proper monitoring, and even risks of short circuits or device theft. As a result, there was a clear need for a more controlled and organized solution. users relied on traditional charging methods such as personal chargers or di

rect access to power outlets. However, these methods are not always feasible in public environments like railway stations, bus terminals, airports, and shopping malls. These locations often face issues such as limited power availability, misuse of charging ports, and lack of monitoring. To address these challenges, coin-based mobile charging systems were introduced as a practical and user-friendly alternative. These systems allow users to charge their devices for a specific duration by inserting a coin. This ensures fair usage among multiple users and helps prevent unnecessary power wastage. Since the service is paid, users tend to use it responsibly.

The core of the system is a microcontroller, which acts as the brain of the entire setup. It controls and coordinates all operations such as detecting the inserted coin, validating it, starting the timer, and supplying power to the charging port. Once a valid coin is inserted, the system activates a predefined charging duration (for example, 5 minutes per coin). After the time expires, the power supply is automatically cut off, ensuring controlled access and energy conservation. Another important component of the system is the coin detection mecha-

nism It ensures that only valid coins are accepted and prevents the use of fake or incorrect coins. This improves the reliability and security of the system. Additionally, voltage regulators and power supply units are used to provide a stable and safe charging output, protecting both the device and the system from electrical damage.

Modern coin-based charging systems also include LCD displays to enhance user interaction. These displays provide real-time information such as instructions, charging status, remaining time, and system messages. This makes the system easy to understand and use, even for first-time users. Some advanced systems may also include LED indicators, buzzers, or alerts to notify users about the charging process.

One of the major advantages of this system is that it reduces the need for manual supervision. Once installed, it can operate automatically with minimal human intervention, making it suitable for crowded public areas. It is also cost-effective, easy to install, and requires low maintenance. The modular design of the system allows individual components to be repaired or replaced easily, which increases its lifespan and adaptability.

From an energy management perspective, coin-based charging systems help in reducing unnecessary electricity consumption. Since charging is time-limited and controlled, there is less chance of power misuse. This contributes to efficient energy utilization and supports sustainable practices.

Looking ahead, these systems can be further improved by integrating advanced technologies. For example, digital payment options such as UPI, QR codes, or card payments can replace coins, making the system more convenient and modern. IoT-based monitoring can be used to track usage data, system performance, and maintenance requirements remotely. Additionally, the system can be powered using renewable energy sources like solar panels, making it eco-friendly and suitable for smart city applications.

With the increasing focus on automation and smart infrastructure, coin-based mobile charging systems play an important role in providing practical, scalable, and efficient public services. They not only solve the problem of mobile charging in public places but also promote responsible usage of resources.

Therefore, this project aims to develop a simple and practical coin-based mobile charging system that works efficiently and is easy for users to operate. It is designed to be reliable, low-cost, and suitable for public places with minimal maintenance. The system addresses the growing need for safe and convenient mobile charging in today's digital

world. It also promotes fair use of electricity by allowing controlled charging through coin insertion. Additionally, the design is flexible, making it easy to upgrade in the future and add new smart features when needed. Demand for public charging solutions in today's technology-driven world

2.LITERATURE SURVEY:

Ramesh et al. (2020) [1] proposed a coin-based mobile charging system built using Arduino UNO, a coin sensor, and a power management circuit. The system was designed to provide a simple and controlled way for users to charge their mobile devices in public places. An LCD display was included to show important information such as charging time and system status, which made the system more interactive and user-friendly. However, the system had some limitations. It supported only a single user at a time, and there was no provision to extend the charging duration when additional coins were inserted. This reduced its flexibility in real-world usage.

Lokesh et al. (2021) [2] introduced a more safety-oriented coin-based charging system using Arduino, a coin acceptor, a current sensor, and a relay module. The inclusion of a current sensor was a significant improvement, as it allowed continuous monitoring of the charging current, ensuring safe operation and protecting devices from over-current conditions. However, the system lacked user interface features such as an LCD display or real-time feedback. Due to this, users had limited information about the charging status, which affected the overall user experience and convenience.

Jaffer Sadiq et al. (2022) [3] developed a coin-based mobile charging system integrated with IoT technology using Arduino, ESP8266, and an LCD display. One of the main advantages of this system was its ability to support remote monitoring. This means that system usage and performance could be tracked from a distance, which is especially useful for maintenance and management in public areas. Despite these benefits, the system depended heavily on internet connectivity. This increased both the complexity and cost of the system, making it less suitable for simple or low-budget installations.

Naveen et al. (2023) [4] proposed an advanced IoT-enabled coin-operated charging system using Arduino and ESP32. This system was capable of providing real-time monitoring of charging parameters such as voltage, current, and usage time. It also offered improved performance and better control compared to earlier models. However, the use of advanced components like ESP32 increased the overall cost and power consumption of the system. Because of this, it may not be ideal for basic public charging stations where simplicity and cost-effectiveness are important.

3. PROBLEM STATEMENT:

In today's fast-moving world, mobile devices have become an essential part of everyday life. People rely on smartphones for communication, banking, navigation, education, and many other important activities. However, accessing reliable charging facilities in public places is still a major challenge. Many public areas either do not have proper charging stations or provide unmanaged charging points, which can lead to misuse and inefficiency.

Traditional charging methods in public places often require constant supervision. These systems can be easily misused, may lead to unnecessary power consumption, and sometimes even cause damage to devices due to unstable power supply. In addition, users are often unsure about how long they can use the charging facility, which leads to inconvenience and unfair usage among multiple users.

Existing systems also have several limitations, such as the lack of real-time feedback, limited control mechanisms, and poor user interaction. Some advanced solutions depend on internet connectivity, which increases both the complexity and cost of the system. This makes them less suitable for simple, low-cost, and widely deployable public charging solutions.

Another major issue is the absence of a proper billing or access control system. Without such control, charging usage becomes unregulated, reducing the efficiency and reliability of the system. This clearly shows the need for a better solution that can manage access, provide clear feedback to users, and ensure safe and efficient charging.

Therefore, there is a strong need to develop a simple, automated, and cost-effective mobile charging system that offers controlled access, reduces power wastage, and improves user convenience in public environments. Such a system would help users charge their devices in a fair and organized manner.

Moreover, the lack of reliable public charging infrastructure also affects user satisfaction, especially in busy places like railway stations, airports, and shopping centers. Many existing systems do not provide consistent performance, proper monitoring, or ease of use, which limits their effectiveness in real-world applications. The absence of clear feedback, such as remaining time or charging status, can also create confusion for users. There is a growing demand for charging systems that are not only efficient but also scalable, secure, and easy to maintain. A well-designed system should provide stable performance, be user-friendly, and require minimal maintenance, while also allowing

future upgrades and improvements. Hence, an improved solution is required to deliver reliable, efficient, and user-friendly charging services that meet the increasing demand in public spaces. Such a system should ensure safety, transparency, and optimal use of resources, ultimately providing a better experience for users and making mobile charging more accessible and convenient.

4. PROPOSED SYSTEM:

The proposed system is a simple and efficient coin-based mobile charging solution designed to provide controlled charging services in public places. It is built using a microcontroller, which acts as the main control unit of the system. The microcontroller manages all operations and ensures that the system works smoothly and reliably.

The working process of the system begins when a user inserts a coin into the coin recognition module. This module detects the coin based on its physical properties and generates an electrical signal. This signal is sent to the microcontroller, which verifies whether the coin is valid. Once the coin is accepted, the system proceeds to activate the charging process according to the programmed instructions.

After successful validation, the system supplies a regulated 5V output suitable for charging mobile devices. A proper voltage regulation mechanism is included to protect the connected devices from overvoltage, short circuits, and power fluctuations. This ensures safe and stable charging, which is essential in public environments.

To improve user interaction, an LCD display is integrated into the system. It provides real-time information such as the remaining charging time, system status, and other important messages. This helps users clearly understand the charging process and makes the system more transparent and user-friendly.

One of the important features of this system is the time extension capability. If a user inserts another coin while charging is in progress, the system automatically adds extra charging time instead of restarting the process. This allows continuous charging and improves user convenience.

The system is designed to be cost-effective, simple, and easy to install in public locations like bus stations, railway stations, and shopping areas. It reduces the need for manual supervision and helps in efficient use of electrical power. Overall, it provides a reliable and practical solution for public mobile charging needs.

In addition, the system can be further enhanced by adding features such as multiple charging ports, digital payment options, and remote monitoring. These improvements can make the system more advanced, flexible, and suitable for future requirements. Overall, this system offers a dependable, user-friendly, and scalable solution that meets both current and future public charging demands.

5.METHODOLOGY:

The methodology of the proposed system consists of a series of well-structured steps that ensure smooth, efficient, and fully automated operation of the mobile charging process.

a. Coin Detection

The process begins when the user inserts a coin into the coin recognition module. This module detects the coin based on its physical characteristics such as size and material. Once a valid coin is identified, the module generates an electrical signal and sends it to the control system for further processing.

b. Signal Processing

The generated signal is then received by the microcontroller, which acts as the brain of the entire system. The microcontroller analyzes the signal and checks whether the coin is valid. If the input is correct, it proceeds to the next step. This step ensures that only valid coins are accepted, improving the reliability of the system and preventing any false or invalid inputs.

c. Charging Control

After successful validation, the microcontroller activates the charging circuit. A regulated power supply provides a stable 5V output suitable for charging mobile devices. This ensures that the connected device is protected from voltage fluctuations, short circuits, and other electrical issues, allowing safe and reliable charging.

d. Time Monitoring

Once the charging starts, a timer is automatically activated. The system keeps track of the charging duration and continuously updates the remaining time on the LCD display. This gives the user clear and real-time information about the charging status, making the system more transparent and user-friendly.

e. Time Extension

If the user inserts an additional coin while the charging process is ongoing, the system recognizes the new input and extends the existing charging time instead of restarting the process. This feature

allows uninterrupted charging and provides greater flexibility and convenience to the user

f. Automatic Shutdown

When the timer reaches zero, the microcontroller automatically turns off the charging process by disconnecting the power supply. This helps prevent overcharging, protects the device, and ensures efficient use of electrical energy.

6. ALGORITHM:

COIN-BASED CHARGING ALGORITHM:

1. COIN DETECTION:

The system begins by detecting a coin using the coin recognition module. This module checks whether the inserted coin is valid and, once confirmed, generates an electrical signal to indicate successful detection.

2. SIGNAL PROCESSING:

The signal generated by the coin module is sent to the microcontroller. The microcontroller processes this input and verifies its validity. If the coin is accepted, the system proceeds to the next stage of operation.

3.TIMER START:

After successful validation, the system activates a timer for a fixed duration (for example, 5 minutes per coin). The microcontroller starts the countdown and continuously updates the remaining time. This helps in managing the charging duration efficiently and ensures controlled usage of the system.

4. CHARGING PROCESS:

Once the timer starts, the microcontroller activates the charging circuit and supplies a regulated 5V output to the mobile device. This ensures safe charging by protecting the device from voltage fluctuations and electrical issues.

5. TIME DISPLAY:

An LCD display is used to show the remaining charging time and system status. This provides clear feedback to the user and makes the system easy to understand and use.

6. TIME EXTENSION:

If the user inserts another coin while charging is already in progress, the system detects the new input and adds extra time to the ongoing session.

This allows continuous charging without restarting the process, making it more convenient for users.

7. SYSTEM MONITORING:

Throughout the charging process, the system continuously monitors the voltage and overall charging status. This helps ensure stable performance and protects both the system and the connected device from any faults.

8. SYSTEM STOP:

When the timer reaches zero, the microcontroller automatically stops the charging process by disconnecting the power supply. This prevents overcharging and ensures efficient use of electrical energy.

7.RESULTS:



The above diagram represents the hardware configuration of the proposed coin-based mobile charging system. It consists of an Arduino microcontroller along with essential components such as a coin recognition module, LCD display, power supply unit, battery setup, and a charging circuit. All these components are properly connected to ensure smooth and automated operation of the system.

The Arduino microcontroller acts as the central control unit of the entire system. It manages and coordinates all operations by processing the signals received from the coin recognition module and controlling the output devices based on the programmed logic.

This microcontroller plays an important role in handling key functions such as detecting coins, starting the timer, extending charging time, and controlling the charging circuit. Once a valid coin is detected, the system activates the charging pro-

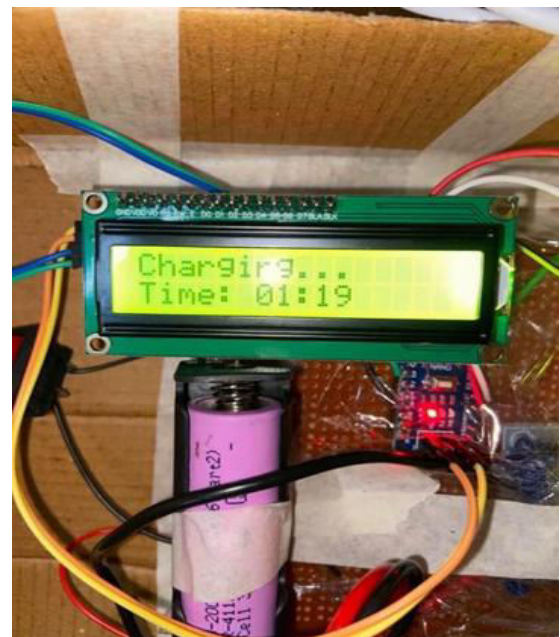
cess and supplies a regulated 5V output to the mobile device. This ensures safe and stable charging for the user.

To improve user experience, an LCD display is included in the system. It shows real-time information such as the remaining charging time and system status. This makes the system more interactive and helps users clearly understand how the charging process is progressing.

The system is powered using a stable power source through a USB connection, ensuring continuous and reliable operation. Proper voltage regulation is also included to protect the connected devices from voltage fluctuations and to maintain safe charging conditions.

By integrating all these components, the system becomes compact, cost-effective, and easy to use. It is suitable for deployment in public places such as railway stations, bus stands, shopping malls, and other crowded areas.

Overall, the hardware setup provides an efficient and practical solution for coin-based mobile charging, ensuring controlled access, energy efficiency, and better convenience for users.



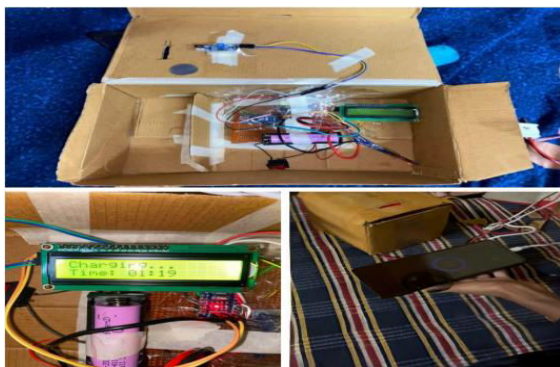
The above figure shows the LCD display output of the proposed coin-based mobile charging system during its operation. The display shows the message "Charging..." along with the remaining time, indicating that the system is currently supplying power to the connected device.

This confirms that the inserted coin has been successfully detected and processed by the system. The countdown timer shown on the screen represents the total time available for charging.

The LCD module is connected to the Arduino microcontroller, which continuously updates the display based on the system's internal timer and status. As the charging process continues, the remaining time decreases in real time. This gives the user clear and accurate feedback, making the system easy to understand and use.

In addition, the LCD acts as a communication link between the system and the user by showing different messages such as when charging starts, when it is in progress, and when the charging is completed. The consistent and stable display output also indicates that the system's power supply and control mechanisms are working properly.

Overall, the figure highlights the successful operation of the system and demonstrates how it provides a simple, user-friendly, and efficient charging experience.



The above figure shows the complete implementation of the proposed coin-based mobile charging system, including both the hardware setup and its working condition. The system consists of essential components such as an Arduino microcontroller, a coin recognition module, an LCD display, a battery unit, and a charging circuit, all arranged in a compact and well-organized structure. The images clearly represent both the internal connections and the external appearance of the system during operation.

The LCD display shows the charging status along with the remaining time, confirming that the system is working properly after detecting a valid coin. The mobile device connected to the system demonstrates its real-time application, where charging is provided in a controlled and regulated manner. The internal wiring and arrangement of components highlight how different modules are

integrated to achieve smooth and automated operation. The system effectively converts a simple physical action, such as inserting a coin, into a controlled electrical output for charging the mobile device. The stable performance of both the display and the charging process shows that the hardware components and the microcontroller are working in proper coordination.

Overall, the figure represents a well-designed, efficiently implemented, and user-friendly coin-based mobile charging system that is suitable for real-time use in public places.

8. CONCLUSION:

The proposed coin-based mobile charging system is an efficient and reliable solution for providing charging facilities in public places. It automates the entire charging process by detecting coin insertion and controlling the power supply through a microcontroller. This reduces the need for manual intervention and minimizes errors, ensuring smooth and consistent operation, which makes the system suitable for real-time use.

The system properly validates the inserted coin and starts charging for a fixed duration. It also supports time extension when additional coins are inserted, making it more flexible and user-friendly. The integration of an LCD display allows users to clearly see the remaining charging time, which improves transparency and helps users manage their charging more effectively.

In addition, the system provides a stable and regulated power supply, ensuring safe charging of mobile devices. It protects devices from voltage fluctuations and other electrical issues. The automatic shutdown feature, which stops charging once the timer ends, helps save energy and prevents overcharging, thereby improving both safety and efficiency.

The system is also designed to be simple, cost-effective, and easy to maintain, making it suitable for public places like railway stations, bus stands, and shopping areas. Its compact design and efficient performance help reduce power wastage and ensure controlled usage, which is important for public utility systems.

Overall, the proposed system is a practical, user-friendly, and economical solution for modern mobile charging needs. It improves accessibility, enhances user experience, and shows how embedded systems can be effectively used to solve real-world problems. The system also has good potential for future improvements and large-scale implementation in smart infrastructure. It provides a reliable way to ensure fair usage of

charging services in busy public places. In addition, it can be easily upgraded with new features to meet future technological needs.

9.FUTURE SCOPE:

The proposed coin-based mobile charging system can be further improved by adding advanced features such as variable charging time based on different coin values. This would give users more flexibility and better control over their charging needs. The system can also be upgraded to support multiple devices at the same time, making it more efficient and suitable for crowded public places like railway stations, bus stands, and shopping malls.

In addition, integrating IoT technology can enable remote monitoring and control of the system. This allows service providers to track usage, analyze performance, and carry out maintenance more easily, thereby improving the overall reliability of the system. The inclusion of digital payment options such as UPI, QR codes, and contactless payments can further modernize the system and remove the need for physical coins.

Future improvements may also include the development of a mobile application that provides real-time updates on charging status, notifications when charging is complete, and user history. This will enhance user convenience and make the system more interactive and user-friendly. Furthermore, using renewable energy sources like solar panels can make the system more eco-friendly and reduce dependence on conventional power.

Advanced safety features such as overload protection, short-circuit protection, and automatic fault detection can also be added to improve system security. Features like smart energy management, dynamic pricing, and data analysis can help optimize system performance and efficiency. The system can be designed in a modular way, allowing easy upgrades and expansion in the future.

Additionally, features like voice guidance, multi-lingual support, and an improved user interface can be included to make the system more accessible to a wider range of users. These enhancements will make the system more intelligent, flexible, and suitable for modern technological needs. Overall, this system has strong potential to be used in smart city infrastructure, providing a reliable, efficient, and sustainable public charging solution.

The system can be enhanced with smart monitoring and predictive maintenance, where issues are detected early and automatically reported, reducing downtime and improving reliability. efficient, and sustainable public charging solution.

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