COIN BASED MOBILE CHARGING SYSTEM

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ABSTRACT

There is a growing need for convenient and efficient charging solutions with the increasing use of mobile devices. In this project, we propose an approach to automating the charging times of a mobile device based on the value of coins inserted into the charging station. Our system uses Image processing and machine learning techniques implemented in Python to detect the value of coins placed in the charging station and sends this information to an Arduino microcontroller. The Arduino then calculates the appropriate charging time based on the value of the coins and initiates the charging process. This allows users to pay for and charge their mobile devices. The system consists of a webcam, a computer, an Arduino board, and a mobile charger. The image processing algorithm uses OpenCV library to preprocess and extract features from the images of the coins, and then uses a support vector machine (SVM) classifier to recognize the coins. The SVM classifier is trained on a dataset of Indian coin images. The Arduino board receives the coin value information from the computer and calculates the charging time based on the predefined charging rate. This makes it particularly useful in public places such as airports, train stations, and shopping malls, where users may not have access to their usual charging cables.

Key words: Arduino, Image Processing, Support Vector Machine, Charging time, Coin Detection.

I. INTRODUCTION

The widespread use of mobile devices such as smart phones and tablets has led to an increasing demand for convenient charging solutions. Traditional charging methods often require users to carry around their own charging cables and find available power outlets, which can be inconvenient and time-consuming, especially when on the go. To address this issue, we propose an approach to automating the charging process based on the value of coins inserted into a charging station. Our system uses Image processing and machine learning techniques implemented in Python to detect the value of coins placed in the charging station and sends this information to an Arduino microcontroller. The Arduino then calculates the appropriate charging time based on the value of the coins and initiates the charging process. The proposed coin-based mobile charger offers several advantages over traditional charging methods. Firstly, it eliminates the need for users to carry around their own charging cables, as the charging station provides the necessary charging cable for a wide range of mobile devices. Secondly, it allows users to charge their mobile devices in a convenient and automated way.

This makes it particularly useful in public places such as airports, train stations, and shopping malls, where users may not have access to their usual charging cables. In addition, our system can be easily adapted to accept different types of coins making it a versatile and scalable solution for charging mobile devices. This system is based on Image processing and machine learning techniques implemented in Python to detect the value of coins placed in the charging station. We use OpenCV library to preprocess and extract features from the images of the coins, and then uses a support vector machine (SVM) classifier to recognize the coins. The SVM classifier is trained on a dataset of Indian coin images. SVM recognizes the value of the coins from the images taken by a camera mounted above the charging station. The detected coin value information is then sent to an Arduino microcontroller, which calculates the appropriate charging time based on the value of the coins and initiates the charging process. In this paper, we present the design and implementation of the coin-based mobile charger system and evaluate its performance through a series of experiments. We begin by discussing related work in the field of automated charging systems and computer vision-based coin detection. We then describe the hardware and software components of our system in detail, including the camera, the coin detection algorithm, and the Arduino microcontroller. We also present the results of our experiments, which demonstrate the accuracy and effectiveness of our system in detecting coin values and initiating the charging process.
II. LITERATURE SURVEY

The proposed system involves the image processing techniques to recognize and classify images based on their visual features. The system uses Python program for image processing and Arduino board for controlling charging time. Image processing is a technique for manipulating and analyzing images using mathematical algorithms. The process involves converting an image into digital form and applying various operations to it to extract useful information. In this project, we trained SVM (Support Vector Machine) on a dataset of different images of Indian coins. This SVM helps in detecting the value of the coin from the photographs captured from the camera. Nethravathi P.S. and her team represented Coin based mobile chargers using a solar tracker (2021). This used solar power as a source for charging the mobile and used a MATLAB program for coin detection. MATLAB requires a license to use it is not an open-source software, and implementing it with solar panels is a bit costly.[1] P. Goyal and P. S. Sharma proposed a Coin Detection-based Mobile Charging System (2019). They implemented image processing through MATLAB, as MATLAB is not an open-source software, whereas python is an open-source programming language with extensive community support and rich libraries.[2] G. Chhabra, S. Kumar and P. Badoni proposed an Automatic gadget charger using coin detection (2015). They used MATLAB for coin detection using image processing. This MATLAB program extracts the coin edges and determines the coin value, and this can be fooled by using metals with the exact dimensions.[3] A. U. Tajane and his team proposed "Deep Learning Based Indian Currency Coin Recognition" (2018) to detect Indian coins using Deep learning and Convolutional Neural Networks (CNN). In this method, the model must be trained with a large dataset to give accurate results.[4] G. Farooque, A. B. Sargano, I. Shafi and W. Ali, proposed "Coin Recognition with Reduced Feature Set SIFT Algorithm Using Neural Network," (2016) to detect Pakistani currency using SIFT (Scale Invariant Feature Transform) and Artificial Neural Networks (ANN). We trained SVM for detection of coins.[5]

III. PROPOSED MODEL

The proposed coin-based mobile charger system is composed of two main components: the coin detection algorithm implemented in Python and the Arduino microcontroller, which controls the charging process based on the value of the coins inserted into the charging station and displays the charging time on the LCD display. In this section, we describe the methodology used to implement and evaluate these components.

Coin Detection Algorithm:

The algorithm consists of the following steps:
1. Capture the video stream from the camera.
2. Display the video stream.
3. If the ‘s’ key is pressed, capture the current frame and save it as a JPEG image named 'test.jpg'.
4. Load the image from 'test.jpg' and convert it to grayscale.
5. Resize the image to a 64x64-pixel size.
6. Convert the image to a numpy array and reshape it to be compatible with the SVM model.
7. Load the pre-trained SVM model.
8. Use the SVM model to predict the label of the image.
9. Send the predicted label to the Arduino board using serial communication.

**Arduino Microcontroller:**
The Arduino microcontroller is responsible for controlling the charging process based on the value of the coins inserted into the charging station. The microcontroller receives the coin value information from the Python script via a serial connection and calculates the appropriate charging time based on the value of the coins. The microcontroller then initiates the charging process by sending a signal to the charging circuit.

The charging circuit is composed of a power source, a charging cable, and a relay switch controlled by the Arduino microcontroller. The power source is connected to the charging cable, which is compatible with a wide range of mobile devices. The relay switch is used to control the flow of power to the charging cable based on the charging time calculated by the microcontroller.

**IV. RESULTS**

![Figure 1: Detection of 5 rupee coin](image1)

**Figure 1:** Detection of 5 rupee coin

![Figure 2: Charging for 5 rupee coin](image2)

**Figure 2:** Charging for 5 rupee coin
V. CONCLUSION

In conclusion, an inventive solution to the issue of mobile phone charging in public locations is the coin-based mobile charging system employing Arduino, image processing and machine learning techniques. This system offers a simple and secure way for individuals to charge their mobile phones while they are out and about by automating the charging process and including a payment function. By using image processing and machine learning technologies to detect and identify coins, only legitimate coins are accepted, lowering the possibility of fraud.

VI. FUTURE SCOPE

The project coin-based mobile charging system using Arduino and image processing techniques has a lot of potential for future development and expansion. The following are some of the potential areas where the project can be improved:

Wireless Charging:
The current project requires the user to connect their phone charger to the Arduino board, which may not always be feasible. Implementing advanced wireless charging technology could potentially simplify the user experience.

Improved Recognition System:
The current project uses image processing techniques to recognize and validate coins and paper currency. Implementing advanced machine learning and computer vision algorithms can significantly improve the accuracy and reliability of the recognition system.

Enhanced User Experience:
The project can be improved in terms of its user interface and user experience. Implementing a user-friendly interface, voice command recognition, and other intuitive features can make the system easier to use.
VII. References


