

# A Coin Acceptor - Mobile Battery Charging using Solar Panel



Ammu Anna Mathew, Anoop J R, S. Vivekanandan

**Abstract:** A mobile phone charging system based on a coin acceptor system connected with solar panel and battery system is a great service to the public at open places. The coin acceptor thus also provides a great profit to the provider and we can install this in any places easily where people gather more such as railway stations, bus terminals, malls, etc. as this system is portable. The energy is obtained from solar panel, so the running cost is also very low. The system is designed with ARDUINO ATMEGA 32 microcontrollers, thus the input pulses while coin acceptor is active is sent to the battery module and mobile phone can be charged. The system will work even in cloudy days because a battery is also included in it.

**Keywords:** ATMEGA 32 microcontroller, battery, coin acceptor, PV panel, solar panel

## I. INTRODUCTION

Various technologies are now developing in the field of electronics. One of the main technologies in our world is mobile phones. Nowadays it has become common among our people and the world can't think about a globe without mobile phones. People are using different types of mobile phones from different companies with various specifications as needed by the customer. One of the common factors between all the mobile phones is the power needed for the life of mobile phones [1]. Some manufacturers are entering the mobile market with portable chargers, but not all are functioning in the same way as their competitors.

The emerging technologies in electronics give smart phones with sophisticated technology having better battery power which will work for two or three days. But due to the heavy use by the customers, most of them last only for six to seven hours. So here a technique for charging the mobile phones while we are away from our home or office. In case of energy it is also depleting from day to day, so we are using solar energy for this purpose. Solar mobile chargers are devices that can charge your mobile phone with the sunray [2]. Batterystuff.com has a good overview of the different types of solar chargers available on the market. The solar

charger is a charger that has voltage and current regulation for different applications with different power levels to meet the requirements, and also covers the battery and its controller with a solar system of up to 500 watts. An example of a solar charging circuit used to charge a lead-acid Ni-CD battery with solar energy is mentioned. This circuit charges a 6 Volt 45% battery with different voltages. The main components used in that project are solar panel, battery charger and the DC / DC converter. The solar-powered battery chargers have a photovoltaic panel (PV) to convert solar energy into electricity and a DC converter to control the voltage and current regulation of the batteries and their controller. The output voltage can become unstable as the light radiation that falls on the solar module can vary. The electricity from the solar module is fed to a charge controller, which is then fed to the output battery to store the energy. The output of the battery is connected to an inverter, which provides the user with an outlet to access the stored energy. The world's first model is the Strawberry Tree public solar charger, invented by the Strawberry Energy Company. Solar panel, battery and inverter can be purchased as shell parts, while the MPPT charge controller is designed and built by a Solar Knight [3]. In this project, the concept of a coin-based mobile battery charger working with the main power of the solar energy and its potential for the use in a variety of applications are discussed. Solar-powered charging stations are designed to charge devices outdoors in an environmentally friendly way. These systems convert solar energy into electricity and are available in several of forms such as solar panels, solar cells etc. This article describes a mobile charger that uses a coin-based solar tracking system with a solar panel and a battery pack. This paper describes a mobile charger with an electric battery and the use of coin-based solar tracking systems. The mobile phone business is currently in the midst of a major shift away from the traditional use of batteries for mobile phones towards a more efficient and cost-effective solution. The technique is charging mobile phones in the public places by inserting a coin and the energy is taken from sun. By using the solar panels, light energy is converted and it can be used for the supply and vending machine for collecting coins. As we are installing it in public places it will give a profit to the government. The people now are addicted to mobile phones so a coin based mobile charging portable system is an efficient and profit enabling technique. The coin based system will be working based on the programmed ARDUINO ATMEGA 328 and this system can be introduced in kiosks. This is a coin-based mobile phone charger that takes the form of a mobile phone that can be recharged in public places by inserting coins. The mobile charging circuit is the device that can charge the cell phone battery in a short time for only a few cents per charge.

Revised Manuscript Received on April 21, 2020.

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This system can charge a mobile phone for a certain amount of time by inserting the right coins in the right place

and at the right time, without the need for battery charger. Mobile phones have great

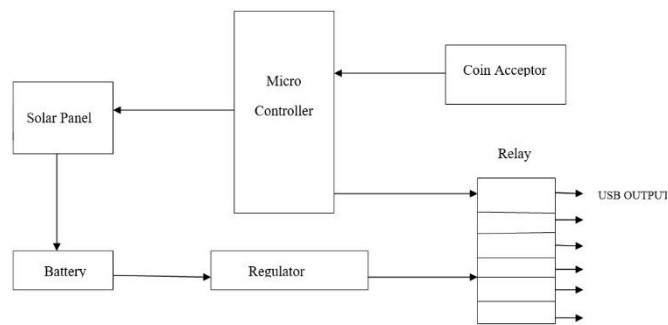


Fig.1. Block Diagram

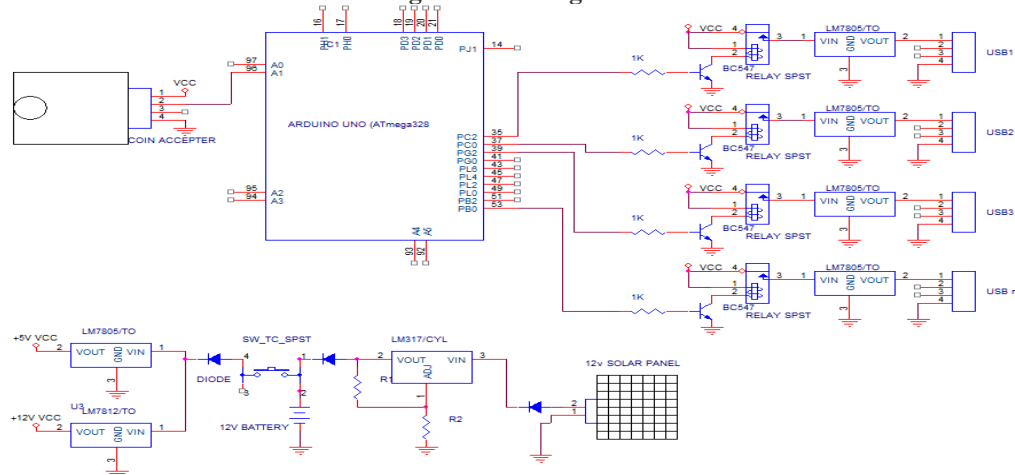


Fig.2. Circuit Diagram

value in today's market and have become an important source of business and personal communication [4].

The mobile phone business is currently worth billions of dollars and supports millions and it has become one of the most important business areas in the world [5]. The system includes a coin-based mobile solar charger which charges the mobile phone via a solar panel on the roof of a house or via small solar panels on the roof. The battery of phone gets drained at favorable times when access to a standard charger is not possible. A universal mobile battery-based charger with a coin was designed and developed on a paper by researchers at the University of California, Berkeley's Department of Electrical Engineering and Computer Science. To solve this problem, they developed a novel solar charger for mobile phones with a battery capacity of 1 kilowatt-hour. The device was a vending machine where the user plugs the phone into one of the adapters, inserts the coin and plugs it into the solar panel with a 1 kilowatt-hour battery capacity of 1 kWh. The problem statement was to create a charger that does not need an electrical outlet under any circumstances as we know the difficulties of finding outlets to charge their phones, but also the difficulties of recharging a mobile battery at the kiosk. The coin-based mobile phone charger is very useful for the public as this is a place to recharge mobile phones at any time. If you use your mobile phone at home or in the office under charging conditions, it can be very helpful for you. It is also very beneficial for a person if the coin is used to charge the constant current for a

certain period of time, because it is used to charge a mobile battery at the kiosk [6].

## II. BLOCK DIAGRAM

The block diagram consists of a solar panel, micro controller, regulator, battery, coin acceptor and a relay. The energy from solar panel is converted and stored in the battery. The stored energy from the battery is converted by using a regulator. The whole working is controlled by a micro controller ARDUINO ATMEGA. The main part is the coin acceptor where it collects the coins and will give start signal to the micro controller.

## III. CIRCUIT DIAGRAM

The circuit works as follows: the coin is placed on the vending part of the coin based mobile charging system as shown in fig. 2. The main components of the system are a solar panel, 12V battery, ARDUINO ATMEGA 328, coin acceptor, resistors, diodes, transistors, relays and USB ports. The 12V battery is charged with the help of a solar panel. The transistors, diodes and voltage regulator regulate the voltage from the 12V battery.

This system can be placed at public places, thus everyone can access the mobile charging facility [7]. The system consists of a coin recognition module that recognizes the valid coins and then generates a signal to the ARDUINO ATMEGA 328 for further action.

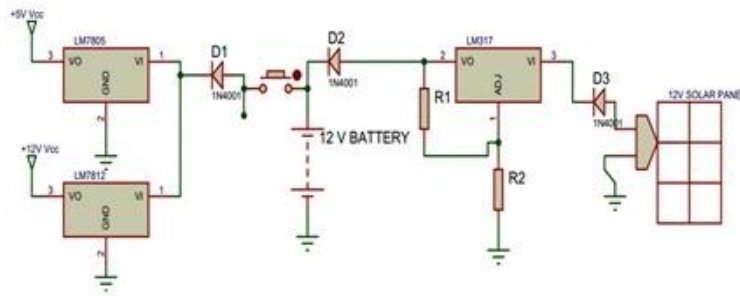


Fig.3. Circuit Diagram for the Solar Panel Module

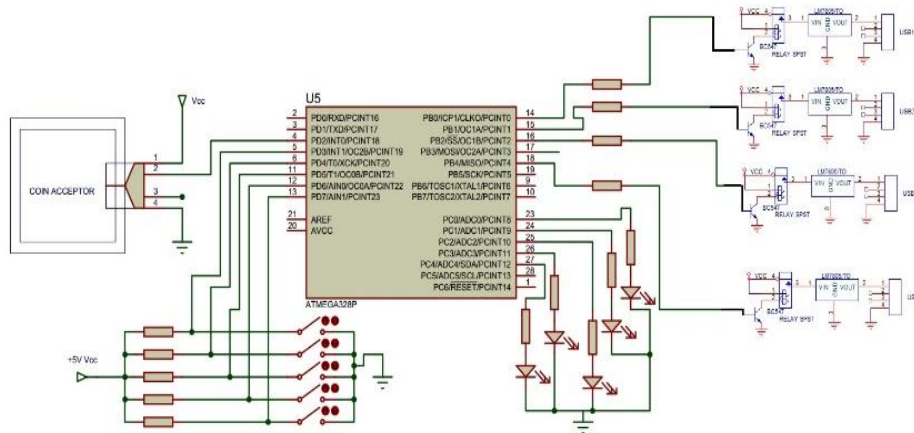


Fig.4 Circuit Diagram of Coin Acceptor with Switches

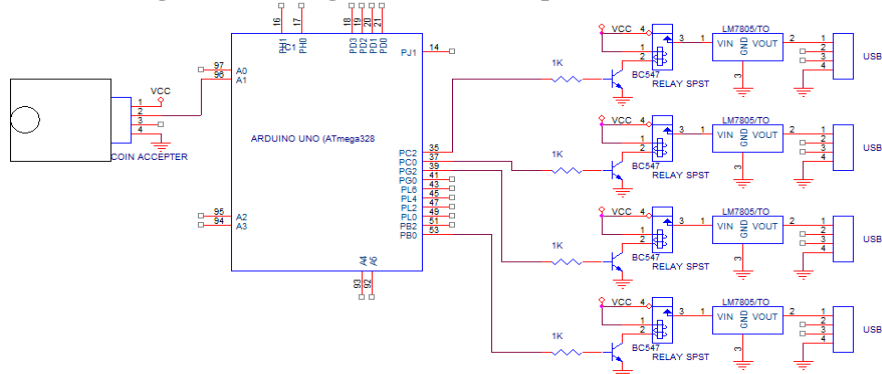


Fig. 5 Circuit Diagram of Coin Acceptor without Switches

When the valid coin is recognized, it will provide a 5 V supply to the mobile phones. Once the charging starts, the ARDUINO starts a reverse countdown timer to display the charging time for that mobile phone. If the customer needs more power, another valid coin has to be inserted to the system thereby making the ARDUINO controller to add extra time to the system for charging. This system can be placed in public places for the use of everyone and it can be a profitable earning for the provider [8].

Circuit diagram for the solar panel voltage regulator and battery unit is shown in figure 3. The sun rays falling on the panel are converted to energy and it is passed through a LM317 regulator IC and also is stored in a battery. The specialty of this circuit is that if the solar energy is sufficient then it can be directly used by passing through the regulator. If solar energy is not sufficient for charging we can take the energy from the battery. For this switching process, a change over switch is also provided.

The main circuit diagram for the coin based system is designed in two ways. In first circuit, a direct is given to the USB ports from battery and microcontroller. In the second

circuit, the energy for the USB ports is given by separate switches. The circuit for the coin acceptor with separate switches is shown in the fig. 4. The circuit diagram for the coin based solar mobile phone charging without switches are shown in figure 5.

## IV. COMPONENTS

### A. Coin Acceptor

The coin acceptor mainly works on the basis of the diameter of the coin which will be placed as shown in fig.6. The standard diameter of coin is between 10.8 mm to 25.1 mm in diameter and this can be done by programming. This works when a registered



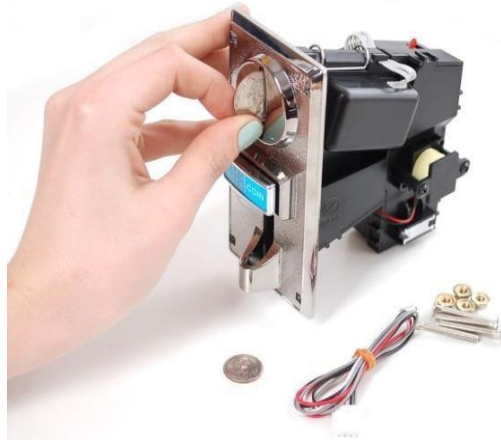


Fig. 6 Coin Acceptor

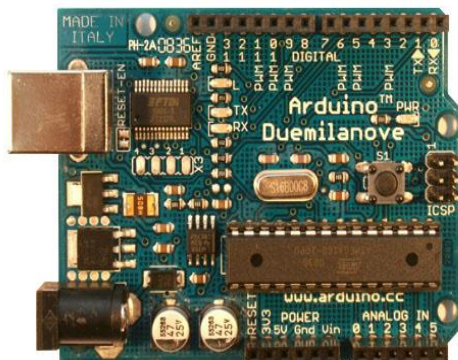


Fig 7. ARDUINO Duemilanove



Fig.8. ARDUINO UNO R3

coin is placed in the system. Once the coin is inserted a signal in the form of pulse wave for 15 to 70 milliseconds will be produced and it can be changed [9].

The system also monitors the size of the coin, solidity and the speed the coin which is placed. The current peak is 25milli ampere and the peak current for the solenoid is 350 mA and hence it can be programmed for one coin. This will never works for the coins with hole.

## B. Arduino Uno R3 (Atmega 328)

The former version of ARDUINO Uno R3 is Duemilanove as shown in fig. 7. The variation of the Uno R3 is that it has sophisticated USB connector and an interface. The ARDUINO Uno R3 in fig. 8 can be used for sensing purposes in the circuits because we can receive a different input from various sensors and it can be well controlled in this system. The programming is also very simple in the case of ARDUINO. The ARDUINO board has a weight of 26 gm and dimensions are as follows: length 2.98inch, width 2.23inch and thickness 0.5inch.

The operating voltage for the board is 5V DC but we can give an input voltage of 6 to 12 Volts and can be a maximum up to 20 V. The UNO board contains a total of 14 digital ports and 6 analog ports with a clock speed 16 MHz

## C. Voltage Regulators

Every electronic circuit requires a regulated power supply for its proper working and safety. The purpose is that all the electronic devices comprises of semiconductor devices therefore it requires a regulated supply and the variations in the supply can be controlled by using the voltage regulators. Here in this circuit we are using LM7805, LM7812, and LM317.

## V. RESULT AND DISCUSSION

A novel technique for outside mobile charging with the coin acceptor module is explained. The block diagram for the entire system and the microcontroller Arduino ATMEGA working are discussed. The circuit diagram for the system with two modes of operation, one circuit without switches can be installed at any locality with unlimited charging and common ports, while the latter circuit with switches provides separate control for each port. If a timer switch is used, then the system can be made more automatic. The main highlight is this module works with direct sunlight energy by using a solar panel. Circuit for solar panel energy conversion with voltage regulators gives a regulated supply for the module. If it is cloudy we get the power from the battery, so the system is cost-efficient and energy-efficient.

## VI. CONCLUSION

A novel method for mobile phone charging based on a coin acceptor is designed and will be of great use to the public. The circuit is mainly controlled by an ARDUINO microcontroller and the system is designed for the charging of five mobile phones at a time. The circuit diagram for the designed prototype and the main components are also discussed above. The circuit diagram for two different modes is also included.

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