Automatic Battery Cut-off Charger

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BACKGROUND

As we are currently facing pollution and global warming due to various reasons, our team has decided to create a more sustainable charger to eliminate electricity waste, to reduce overcharging to your phone battery, and to assist those who have visual or hearing problems.

Overcharging your phone battery is a very common problem. Constantly doing this will wear and tear your battery and cause it to decrease in performance. It is better to monitor how long your phone is charging for and unplug it once it reaches 100%. But that is impractical to do and keep track of. And for those who are visually/audibly challenged, it'll be even harder. With these problems taken into consideration, we wanted to implement an aid, or a signaling system to alert the user the status of a charger that will automatically stop charging. A buzzer, LED, and timer are a great way to help solve those problems.

Figure 2

Figure 3

Figure 1
android

Credit: Android Logo

PROPOSED SOLUTION

Our proposed solution consists of designing a phone charger that will stop charging your phone once the timer is done, along with the implemented LED/buzzer system. For our design, the user will be able to set an amount of time using a dial switch (rotary encoder) to set the timer in [hour(s), minute(s), second(s)]. This will all be displayed on the liquid crystal display (LCD). Once the timer is set, the charger will charge the phone, and the LED will turn on to indicate that the phone is charging. When the timer is up, the charger will stop charging the phone, the LED will turn off, and the buzzer will sound to signal the user that the phone is done charging.
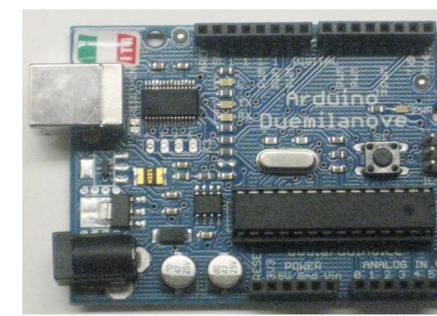
Figure 4
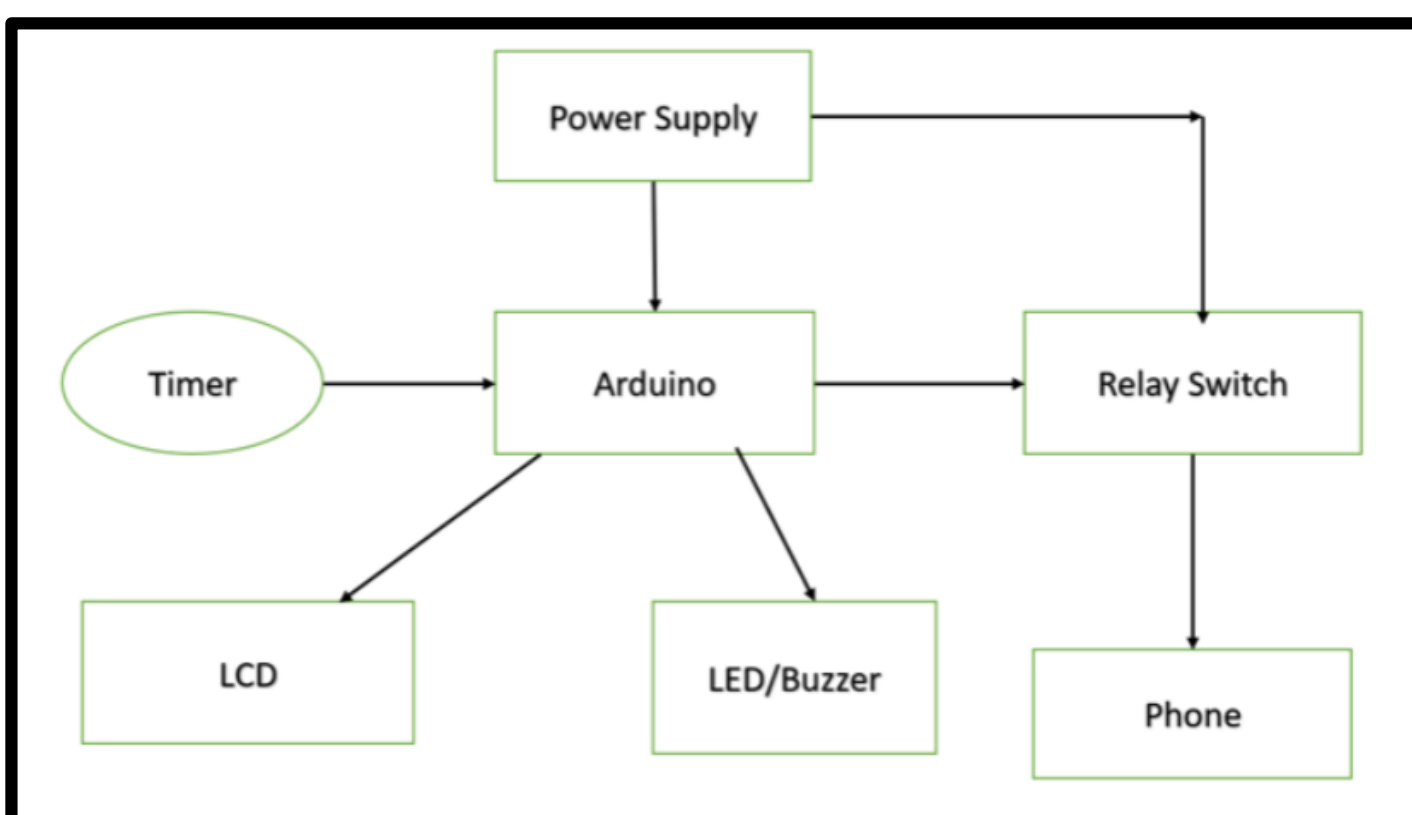
SYSTEM DESIGN

Arduino UNO Board
Arduino UNO board allows easy pin connections to the LCD and rotary encoder along with a free download Arduino IDE software to write and program Arduino code.
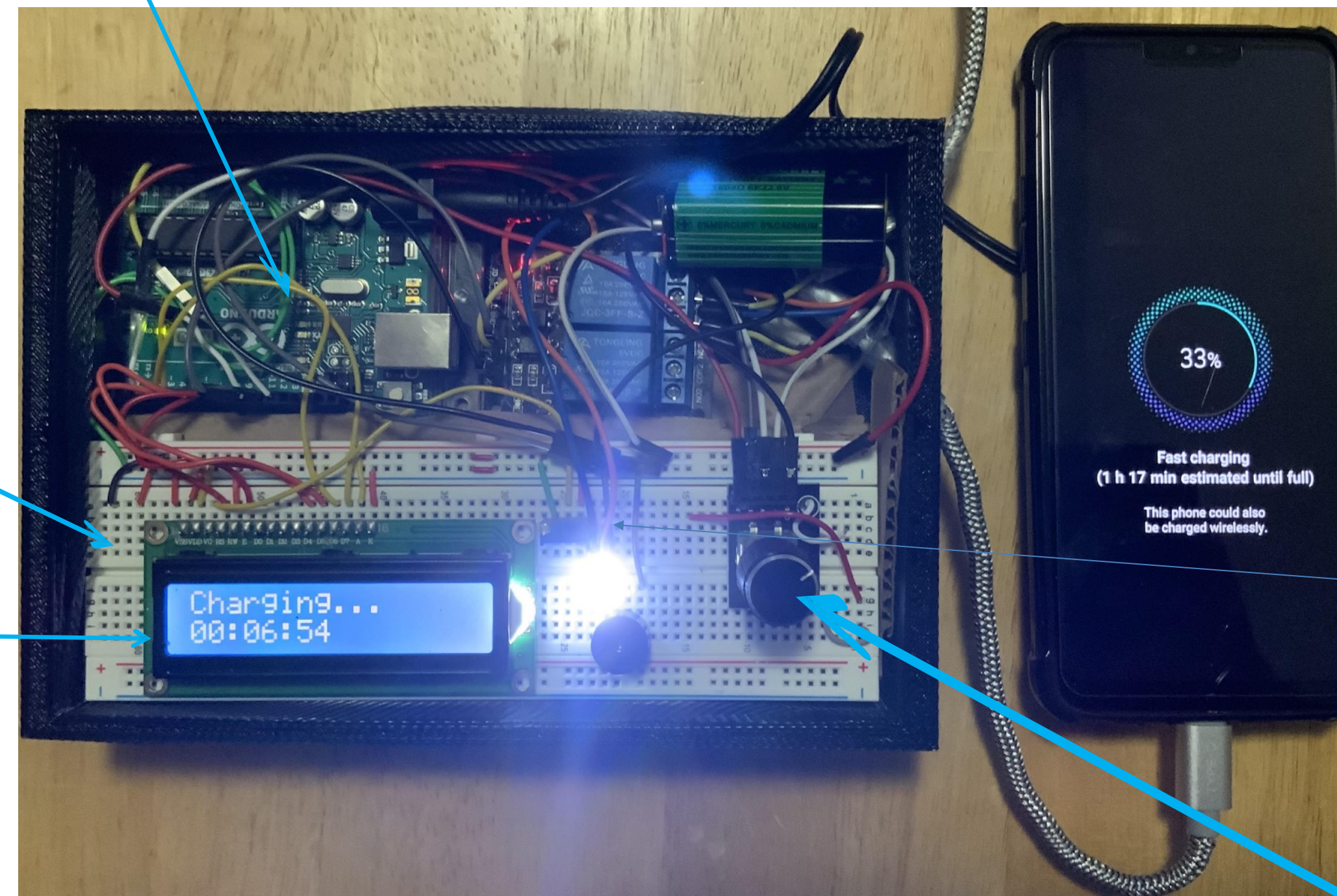
Type C charging cable
This type C charging cable is why this design will only work for Android phones as Apple has their own charging cable. The cable is cut and soldered into the 5V relay module.

Phone charger adapter
Cannot be seen in the picture, but the Type C charging cable is connected to the phone charger adapter to plug into the wall for power to charge the phone.

Figure 5

12V Power Supply/9V Battery
For this instance, we used a 12V power supply to power the Arduino/LCD. But could alternatively use a 9 Volt battery.

Breadboard
Serves as the connection point between the Arduino and the various components. Allows for easy swap in/out of faulty components making repairs in the future easy.

5V Relay Module
The 5V relay module is used to switch on/off the charging process of the charger.

16x2 LCD
The liquid crystal display pins are connected to the Arduino UNO board with jumper wires and allows for the user to see the time left of charging set by them.

Potentiometer
This 10K potentiometer is used to vary the resistance between the LCD and Arduino connection. The knob on these makes it easy to rotate and vary resistance to get the perfect resistance value connection.

Buzzer/LED
Notify the user the current status of the battery charger.
LED on, buzzer off = charging
LED off, buzzer on = not charging

Phone
An Android phone is used to test the prototype.

Rotary encoder
The rotary encoder is connected to the Arduino and is used to set the [hour(s), minute(s), second(s)] of the timer.

FUTURE DIRECTION

- Explore wireless charging so user doesn't have to plug charger into phone
- Reduce size of prototype box to make it easier to carry

ACKNOWLEDGEMENTS

REFERENCES

https://core-electronics.com.au/guides/use-lcd-arduino-uno/
https://lastminuteengineers.com/rotary-encoder-arduino-tutorial/

CONTACT INFORMATION

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