

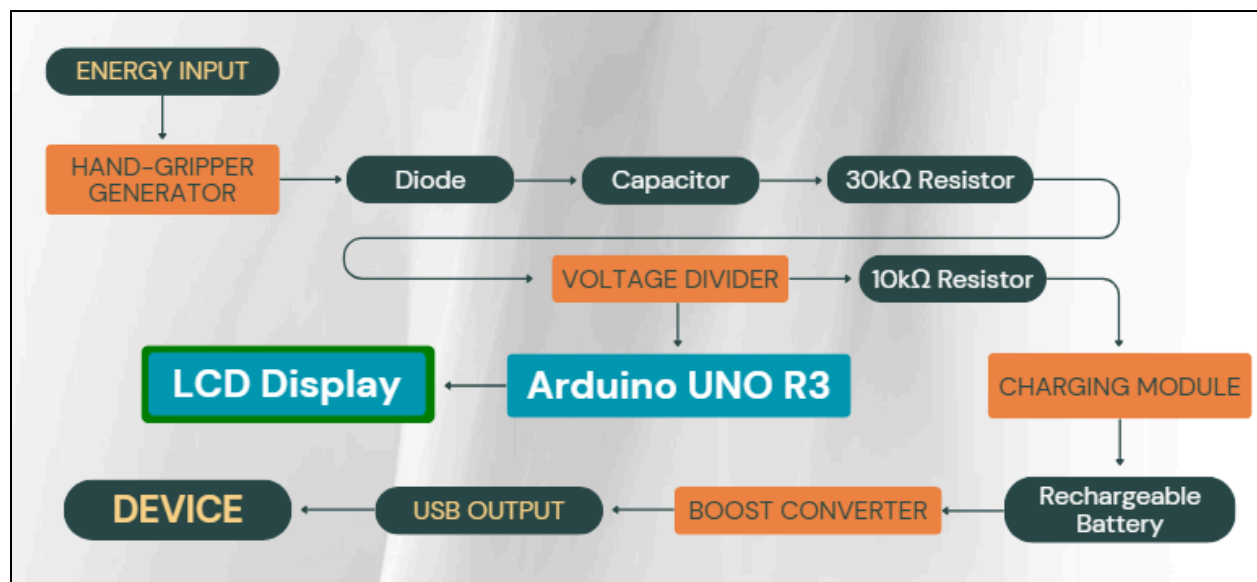
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## System Architecture:

### Project Title: EcoCrank - Exercise Hand Crank Power Bank

Project Start Date	11/16/24
Project End Date	01/18/25
Project Manager	Denille Rylie C. Galas
Team Members	Josiah R. Bucas, Jade D. Penales, Anthony Lee Aleister Ortiz

### System Architecture Diagram



This system converts mechanical energy into electrical energy using a hand-crank generator, which is then processed through various components to provide a stable power source for charging electronic devices. The electrical output first passes through a diode (1N4007) to prevent backflow and a capacitor (100μF) to smooth out voltage fluctuations. A voltage divider reduces the voltage to a safe level for measurement by an Arduino UNO R3, which monitors the system and displays real-time information, such as voltage and charging status, on a 16x2 LCD.

The energy is managed by a TP4056 charging module, ensuring safe and efficient charging of a 5V lithium-ion rechargeable battery. The stored energy is then stepped up to a usable level by a boost converter (MT3608) for output through a USB port. This setup enables the system to function as a power bank, delivering stored energy to charge smartphones or other USB-powered devices.

## PART BY PART & STEP BY STEP OF COMPONENTS & THEIR USES:

### 1. Energy Input (Hand-Crank Generator)

- The process begins with manual energy input by operating the hand-crank generator. This converts mechanical energy into electrical energy.

### 2. Diode (1N4007)

- The electrical output from the generator passes through a diode. The diode ensures that current flows in only one direction, preventing backflow of electricity to the generator.

### 3. Capacitor (100uF)

- The capacitor temporarily stores the electrical energy and smooths out fluctuations in the generator's output, providing a more stable voltage.

### 4. Voltage Divider (30kΩ and 10kΩ Resistors)

- A voltage divider circuit, consisting of a 30kΩ resistor and a 10kΩ resistor, reduces the voltage to a level that can be safely measured or processed by the Arduino UNO R3.

### 5. Arduino UNO R3

- The Arduino UNO R3 microcontroller processes the voltage data from the voltage divider. It might monitor the voltage levels and control other components in the system.

### 6. LCD Display (16x2 Display)

- The LCD display connected to the Arduino shows relevant information, such as the voltage level, charging status, or any other real-time data.

### 7. Charging Module (TP4056)

- The charging module is connected to the rechargeable battery. It manages the charging process, ensuring the battery is charged safely and efficiently.

### 8. Rechargeable Battery (5V Lithium Ion)

- A rechargeable battery stores the electrical energy for later use. It is charged by the output of the charging module.

### 9. Boost Converter (MT3608)

- The boost converter steps up the voltage from the rechargeable battery to a level suitable for USB output (e.g., 5V).

### 10. USB Output

- The USB output is where the stored energy is supplied to charge devices like smartphones or other USB-powered gadgets.

### 11. Electronic Device

- Finally, the connected device (e.g., a phone charger or other small electronic device) receives the stored energy via the USB output, completing the system's functionality as a power bank.