Smart Portable Charger: Charged through Solar Panels, Measuring Battery Level, Displaying data on Web and App

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Abstract: For this product it was proposed the creation of a portable charger using a suitable 18650 battery with 3.7V and between 5 and 20 Kiloampere (KA) and connecting it to a remote database to monitor that the battery and the devices are working correctly, in order to store the data Browse Firebase (version 10.11.0 for JavaScript and 9.2.0 for Java) was utilised in addition to JavaScript (version 1.5) and Java (version 17) .

Introduction: Introducing a smart portable battery and charging station equipped with solar panels, Type-C and Type-A USB ports for charging respectively, both the portable battery and external devices. Additionally, it features an LCD display screen that shows the battery level percentage upon button click, while all data is accessible through a dedicated web interface and mobile application.

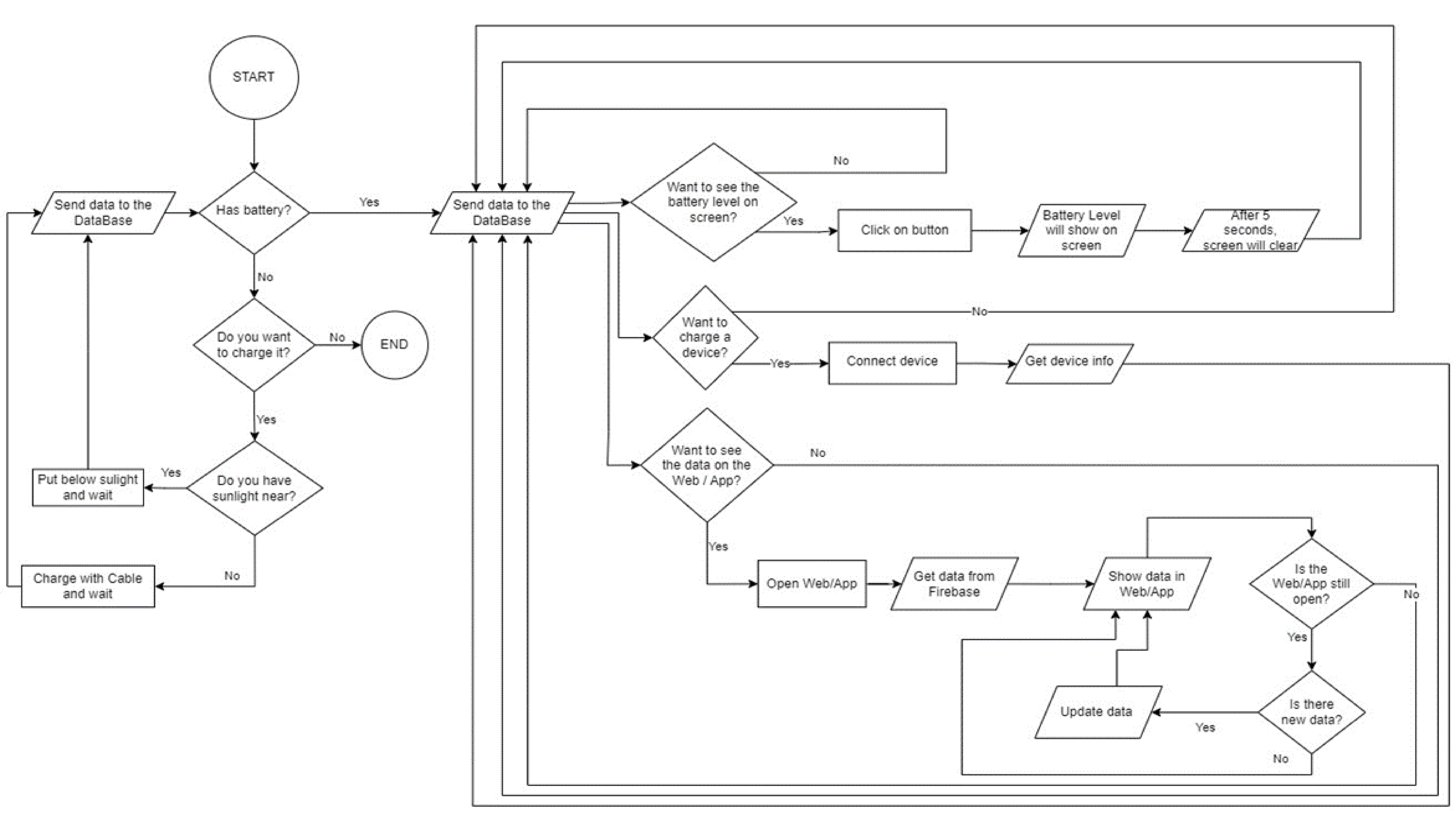
Methodology: The progression vision of the smart battery is shown is given in the flowchart. Arduino IDE (version 1.8.19) was used to program the micro controller alongside with Java (version 17) to program the app in Android Studio (version 2023.3.1) and JavaScript (version 1.5) in addition to HTML5 to create the web page. The total tension the charger can handle was calculated using the Ohm's Law.

Ohm's Law

$V = I \times R$

$I = V / R$

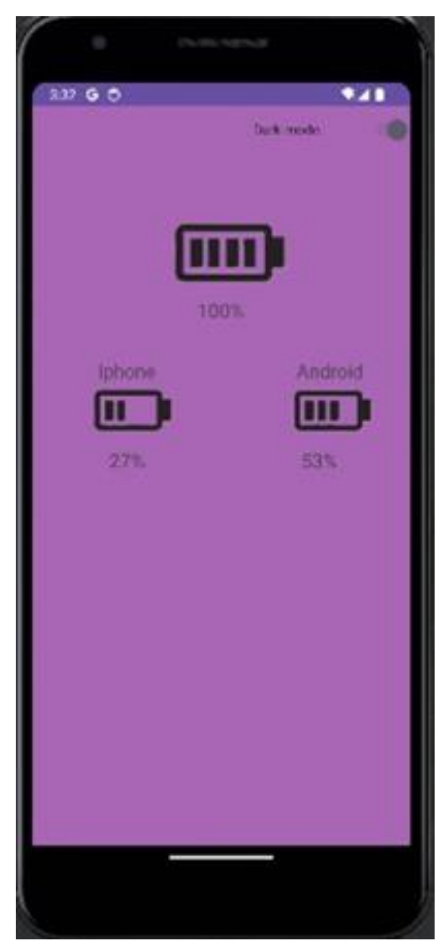
$R = V / I$

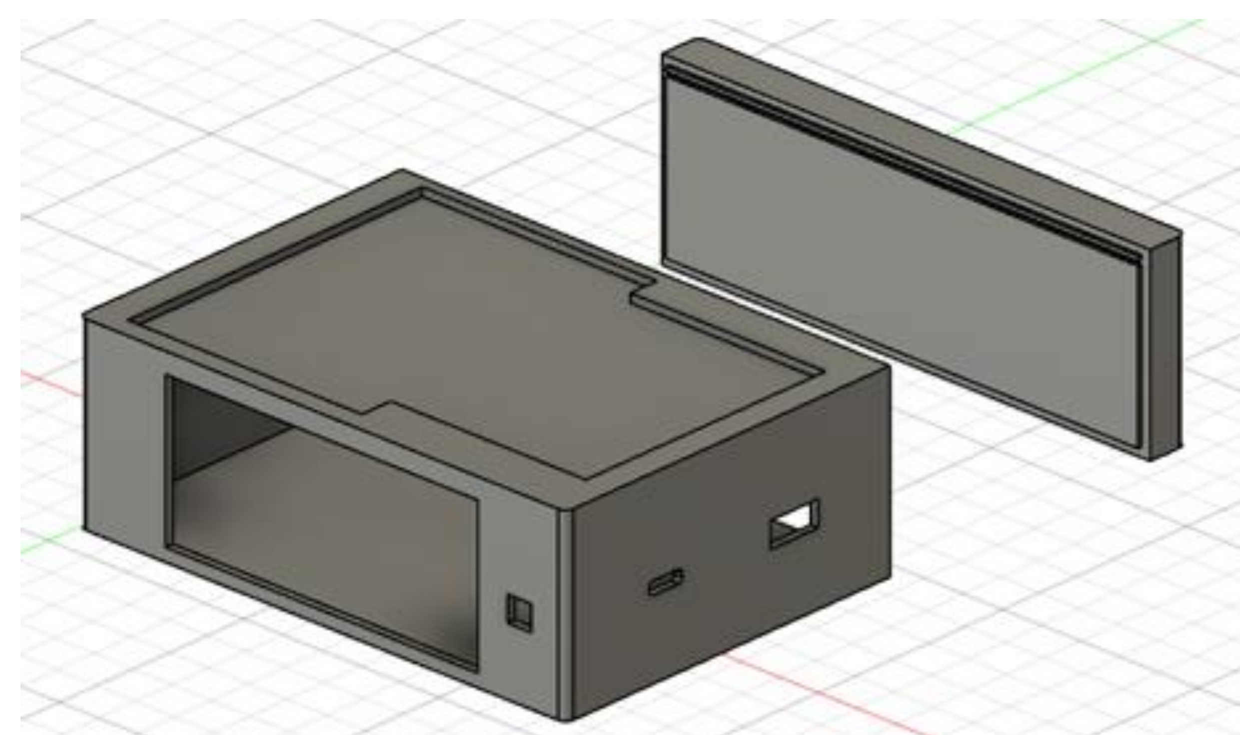


Logical progression of the functionalities of the project

Results and Discussion: The obtained result is a portable charger capable of being charged using solar panels and the electrical grid. This was verified through the application and the webpage, as the device's battery level increased when exposed to sunlight or when connected to a power plug and remained unchanged when not receiving energy from these sources.

Regarding device charging, it was able to charge a mobile device successfully with the controller connected to the computer, but not using solely the battery as a power source. Therefore, it is unclear whether the device was charged through the portable charger or the computer.





Conclusion: A portable charger was proposed to use solar panels and a USB type C for charging, and a USB type A for charging devices. Additionally, the battery percentage of the charger was to be displayed on a screen and through a web and an app. After conducting tests, it was found that the device was capable of recharging through the two proposed methods. Furthermore, the battery information was displayed in real-time on all platforms intended for this purpose. The proposed device was observed to function well.

Future Work: For future developments, we aim to enhance the web interface to achieve a more professional appearance. Additionally, we plan to print our customized 3D case. Another significant advancement will be the integration of NFC charging, allowing users to charge their devices wirelessly. Furthermore, we intend to implement an automatic stop charging feature, which will cease charging both the device and the charging station once it reaches its 100% capacity. Moreover, we aspire to enhance battery monitoring and management capabilities. This includes providing users with insights into the battery's chemistry and condition, tracking charge/discharge cycles, and monitoring temperature levels.