

BATTERY FREE SMART HOME



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PURPOSE & OBJECTIVE

Home automation has been there for a while. However, most applications of IoT projects implement the use to batteries which tends to be tedious and expensive, not to mention, causes a some environmental pollution. The objective of this project is to design an IoT system which implements sensors that generate their own power and therefore removes the need for batteries.



SUPERCAPACITORS

Batteries must be replaced after a certain amount of charging cycles. Capacitors theoretically have an infinite lifespan



MULTIPLE SENSORS

Ultra-small form factor, low power consumption, high precision with stability



AUTHENTICATOR

Secure garage door authenticator that uses personalized NFC tags

Method

The design of the Battery Free Smart Home can be broken down into three sections. The first is the energy harvesting. The sensors can be powered using solar cells, and excess power can be charged into a supercapacitor which allows the sensors to run even in low-light settings. Next is the sensors, various different sensors will be used to automate the home using the energy harvesting method. Finally, the last section is the authentication of the garage door. This will be done using personalized NFC tags which will only allow registered users to enter and exit the garage. The system is integrated and automated with the Home Assistant software.

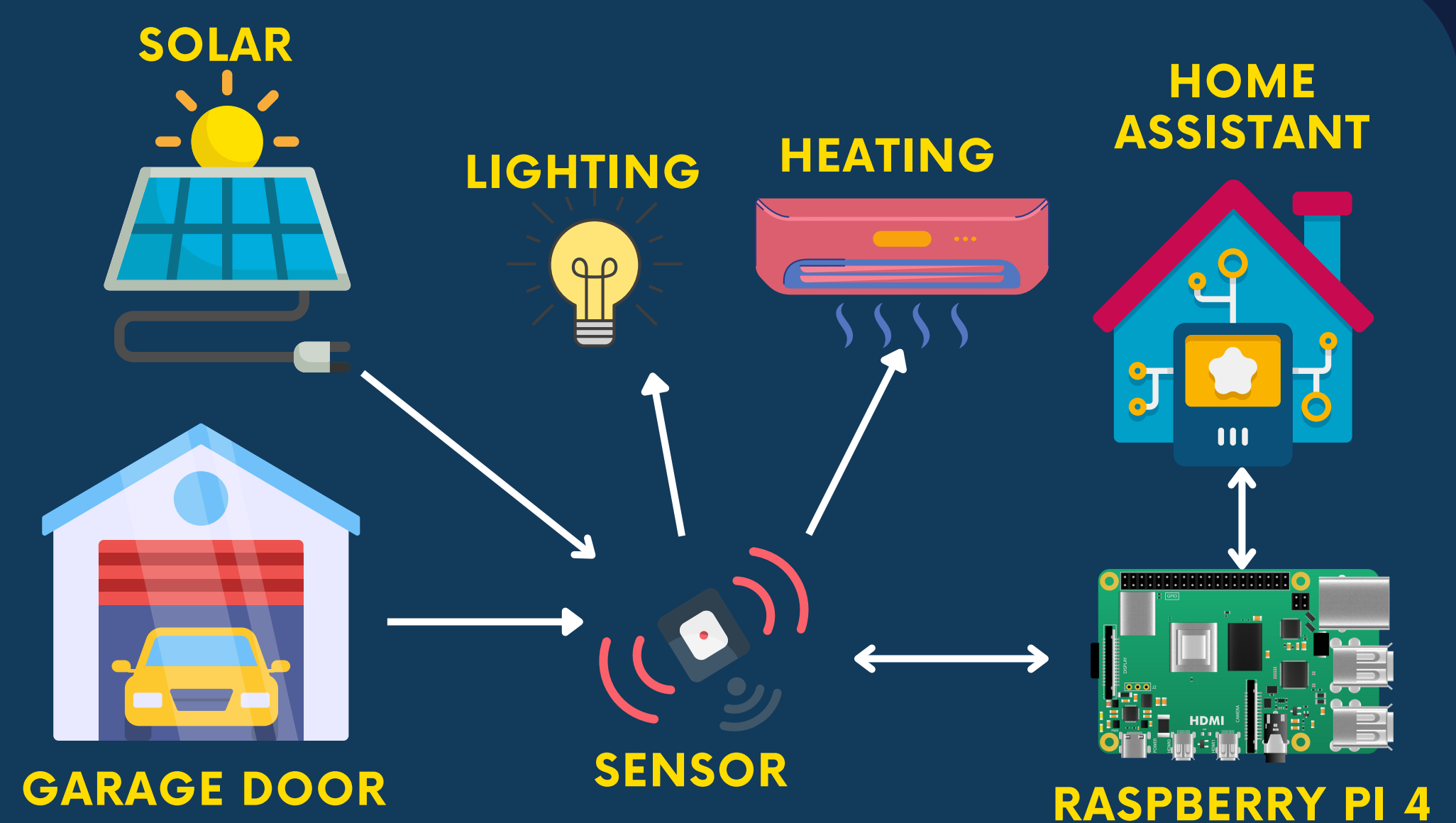


FIGURE 1: BLOCK DIAGRAM

Wiring

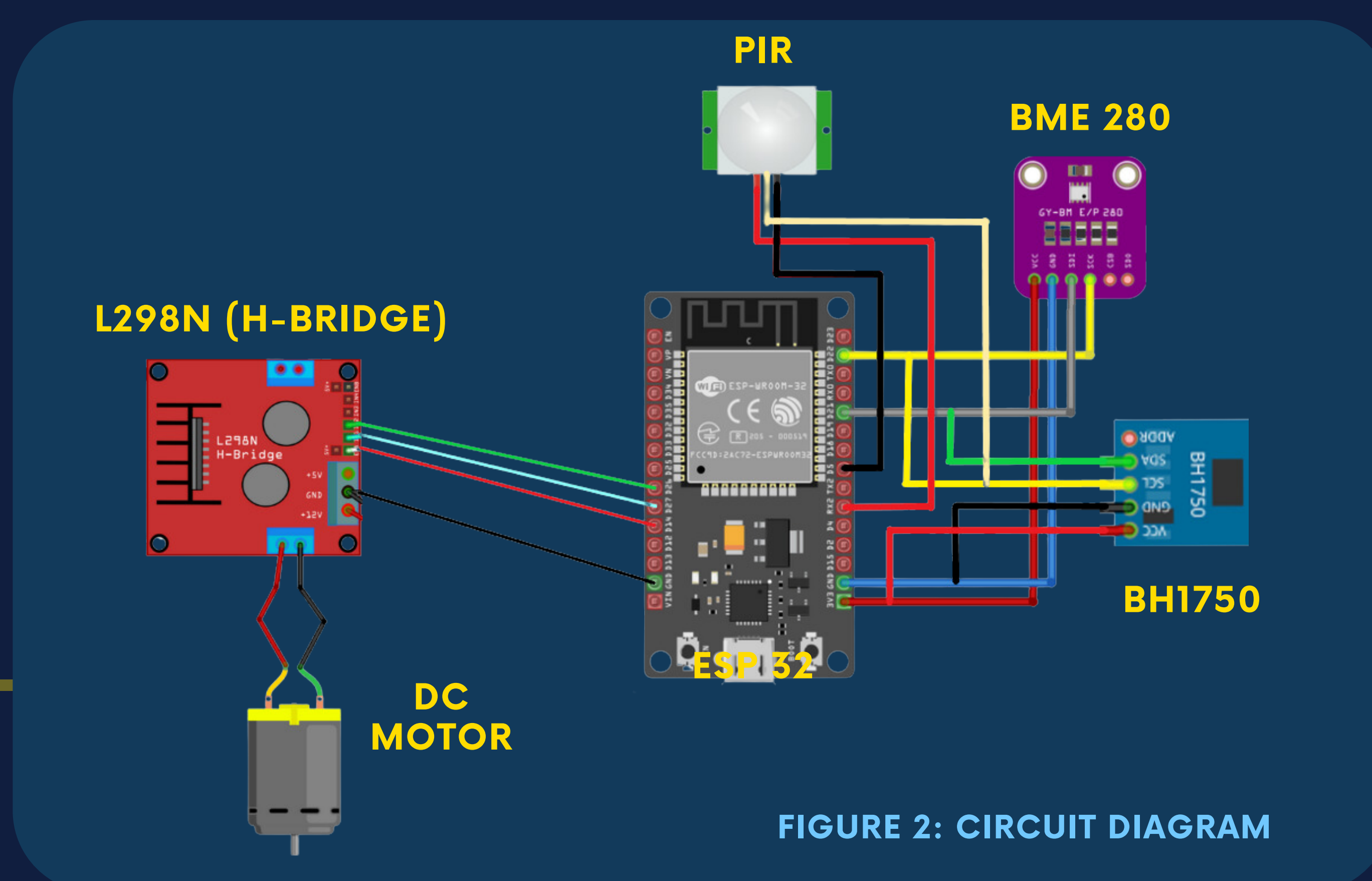


FIGURE 2: CIRCUIT DIAGRAM

Home Assistant

Home Assistant is an open source automation software that acts as a central hub. The program is run using Yml syntax and combines different devices to create custom automations. Using a Raspberry Pi, the program can integrate with smart devices over both bluetooth and Wifi network.

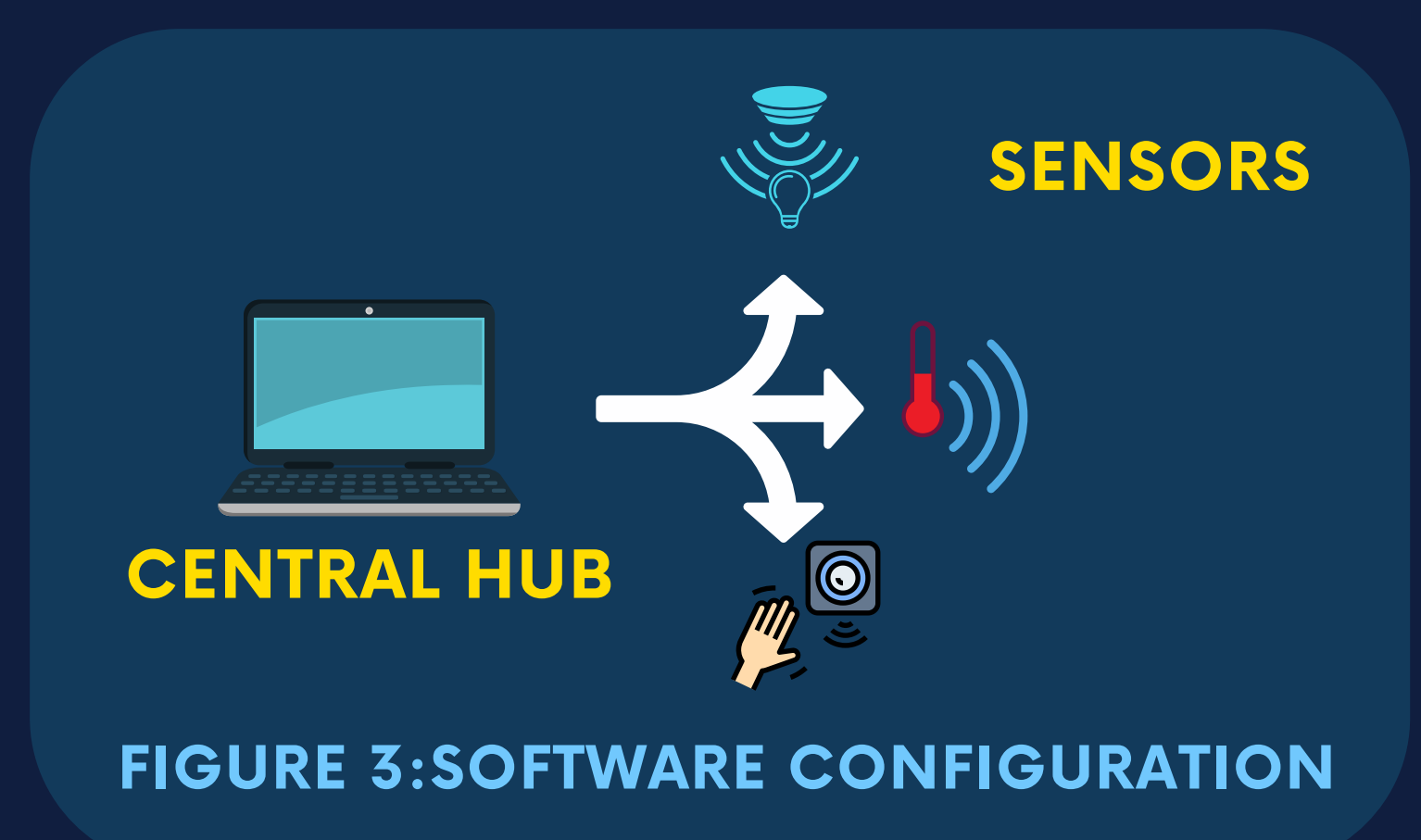


FIGURE 3: SOFTWARE CONFIGURATION

RESULTS & CONCLUSIONS

The proposed solution implements a fully functional IoT Smart Home. Each sensor provides their own power through the use of solar cells and supercapacitors. Moving forward this product can be adapted to utilizing many more sensors and functions.