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Is the AC on?

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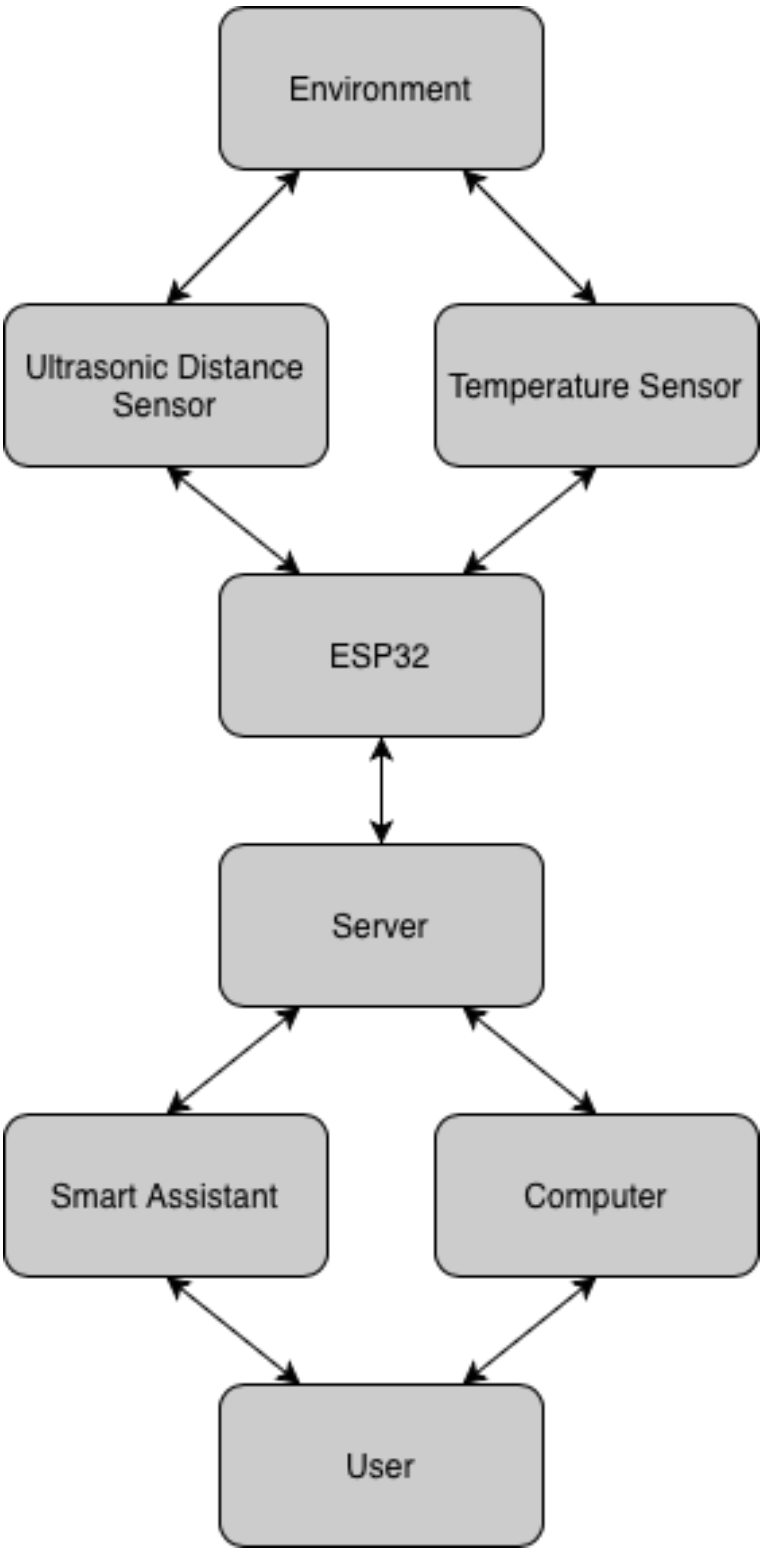
Introduction

The ESP32 is a versatile platform that can be used for a wide range of applications. The aim of this project is to develop a sensor system that works with an ESP32 microcontroller. By combining it with a temperature sensor, we can create a simple yet effective system for monitoring and controlling temperature remotely. In this project, we will interface the ESP32 with a temperature sensor, acquire temperature data, and transmit it wirelessly to a computer or mobile device for further processing and analysis. The ESP32 will be linked to an AWS LightSail server which will be used to access it remotely and store the data collected by the sensors. We will then display the stored data via a Node RED dashboard so the user can monitor its behavior at a specific point in time.

Logical View

The following diagram (*Figure 1*) shows the logical interactions that happen within the key components of this project.



Environment

Represents the data to be collected by the two sensors.

Temperature Sensor

The analog temperature sensor goes through a sampling process to determine the current ambient temperature.

Ultrasonic Distance Sensor

Emits a wave to the receiver, whenever the receiver detects a change in frequency it marks that an object crossed the threshold.

ESP32

Handles all communications between user and sensors, converts the collected data into a readable format determined by the user.

Server

Expands the reach of the ESP32 allowing for remote controlling of the system and simultaneously stores the data for when a backwards analysis is needed.

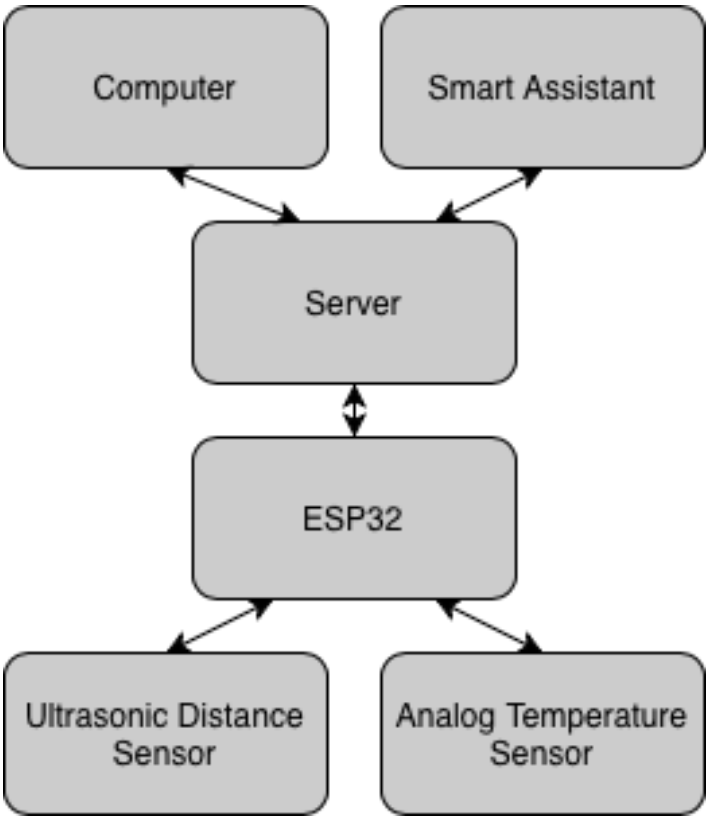
Computer

A method for the user to access the ESP32 system and assign tasks & instructions.

Smart Assistant

Another method where the user can tether with the server and ask for specific data collected by the ESP32 system.

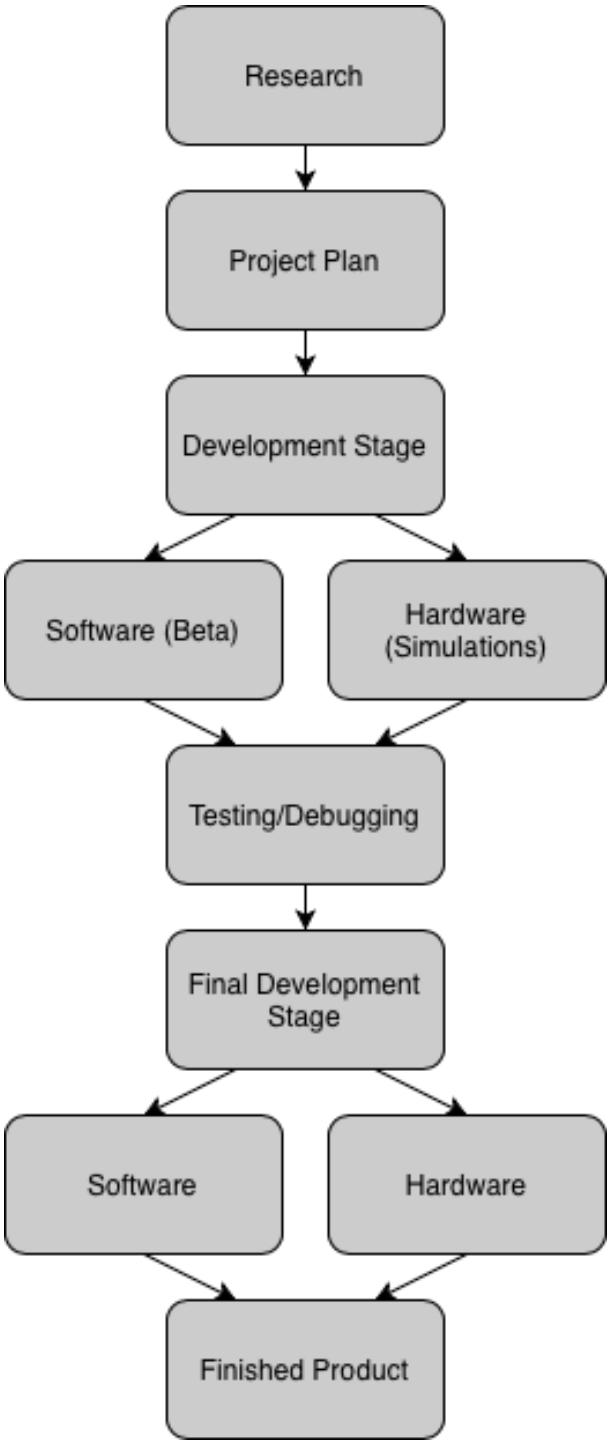
Process View



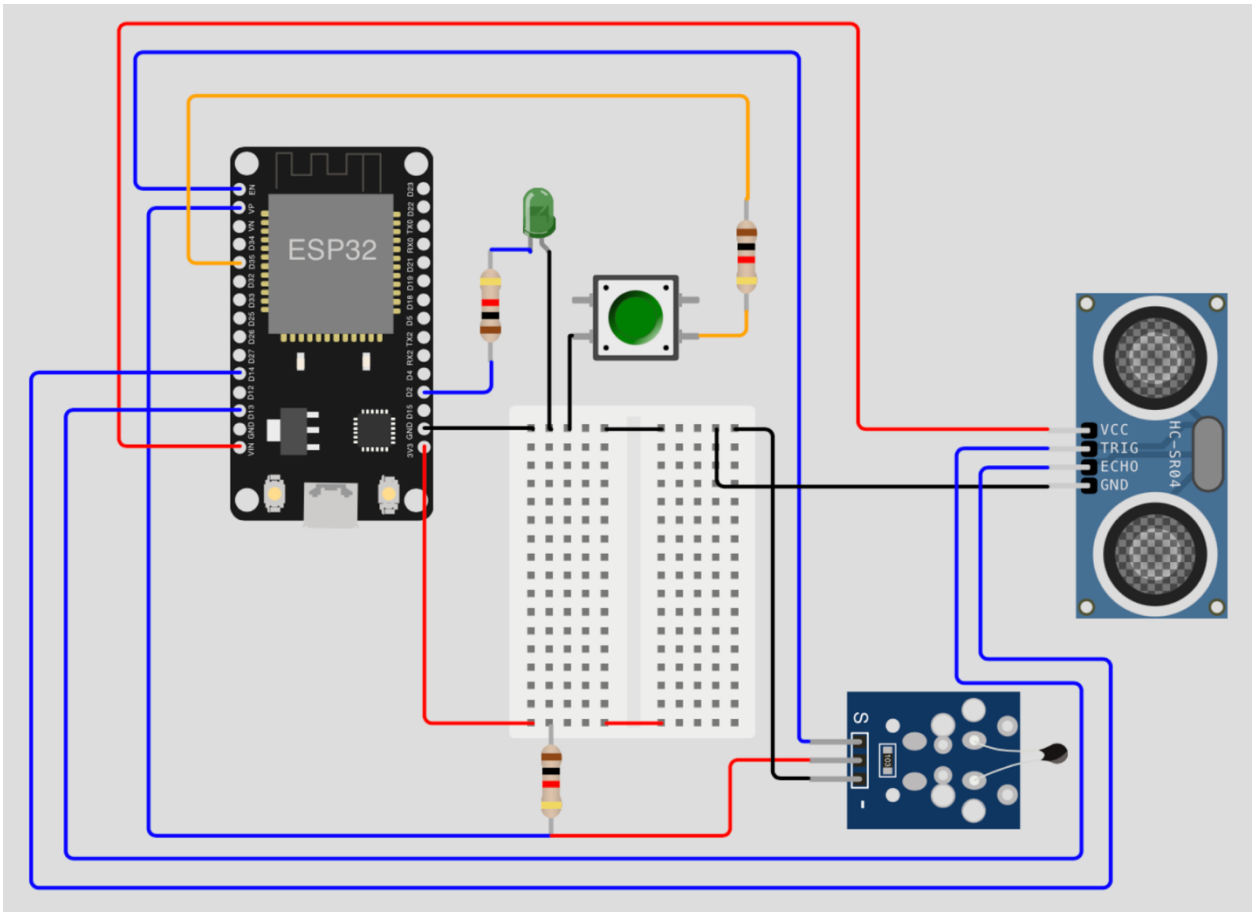
The diagram above (*Figure 2*) shows the processes that happen between each component of the system. At the top we have the computer and the smart assistant, both are manipulated by the user to communicate with the ESP32 by tethering to the server. Depending on the user input, the server will then send a signal to the ESP32 to get the room temperature in the specified unit or the room capacity. If the user input asks for the room temperature, then the analog sensor circuit will power on and thanks to the variable resistance inside it can determine the room temperature based on default parameters. Otherwise, if the user input asks for room capacity, then the ultrasonic distance sensor circuit will power on and keep track of the sound wave frequency detected by the receiver.

Development View

The diagram on the right (*Figure 3*) represents the development process used for this project. The first step required doing extensive research on every topic involved. After enough information was acquired, we proceeded creating a project plan to organize our progress effectively. We then began developing the beta software and conducted various simulations to observe the behavior of the microcontroller in different scenarios. After completing the initial development stage, we analyzed the results and ironed out the kinks with more testing and debugging. Once the testing phase concluded, we began the final stage of development to finally achieve a finished product.



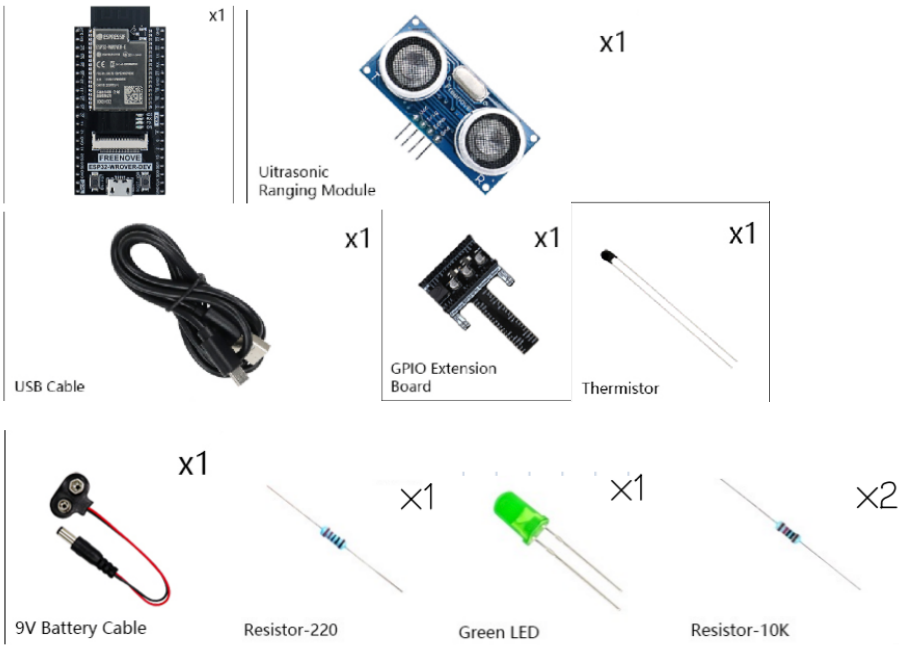
Physical View



The main part of the physical aspect for the project includes the ESP32 microcontroller and a breadboard to interconnect all the components. These components include a thermistor, resistors, LED indicator lights, extension cables, ultrasonic ranging module and a few others that have a minor role in the project. These will compose the required circuits which will then be tethered with a server so they can be accessed remotely. Additionally, we will incorporate support for smart assistants such as Siri and Google as an accessibility feature.

Hardware

Materials



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