IoT Smart Hub

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Background

IoT or Internet of Things is used to describe interconnected sensors, embedded systems, databases, data analytics, and much more working together to create smart environments. This could range all the way from a toaster to the entire infrastructure of a city. Any engineered product or service could be injected with IoT to enable smart capabilities. Evidently, it's projected that by 2025, we will have more than 75 billion IoT devices to help make our world smarter[1].

Purpose

The purpose of the project is to design and implement an IoT Smart Hub. The project serves as a proof of concept IoT device to gain some hands-on experience developing an IoT system. The product overlays a system capable of turning on or off devices with relays, monitoring temperature and humidity, and monitoring motion, all remotely controlled via the cloud and an App. To develop this, a Raspberry Pi, Google Firebase, an Android App, a Relay Module, a Temperature & Humidity Sensor, and an Infrared Motion Sensor were used.

System Architecture Overview

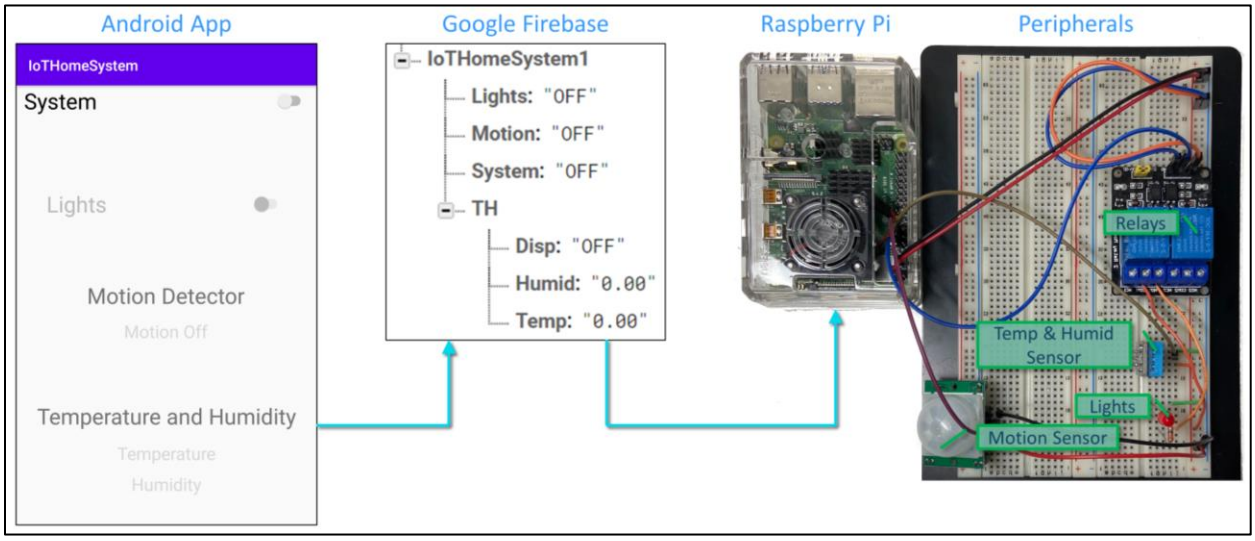

Fig 1. Overview Diagram

The overall system consists of a simple Android App built using Android Studio, a mini real time cloud database on Google Firebase, and an embedded system of a Raspberry Pi, a relay, and a few sensors. The user controls the system using the App which updates the cloud database, which sends the commands to the Raspberry Pi to interact with the sensors to control and obtain information.

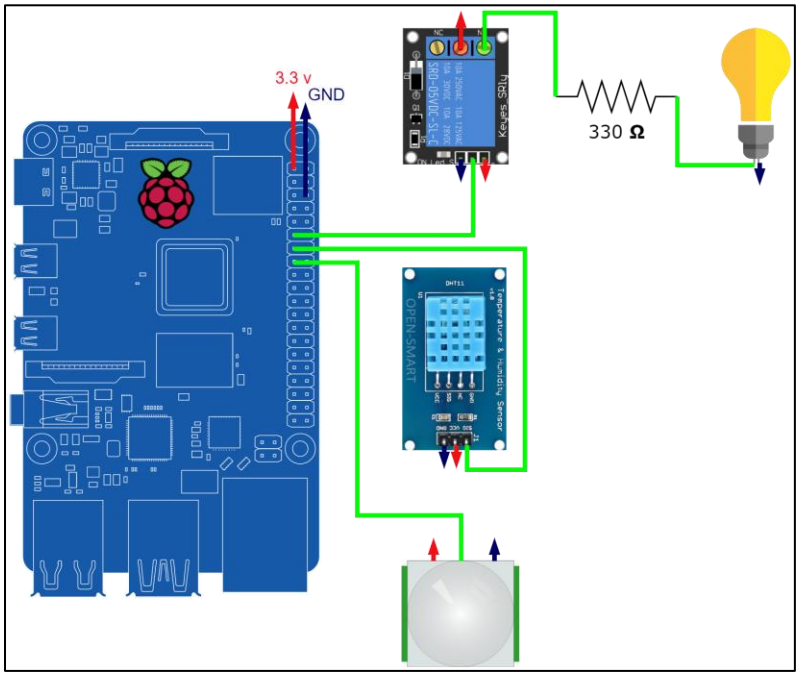

Fig 2. Embedded System Schematic

Table 1. Raspberry Pi Pin Layout

Pin #	Function
Pin 1	3.3 V power to peripherals
Pin 6	GND to peripherals
Pin 17	Signal to Relay
Pin 27	Signal from Temp & Humid Sensor
Pin 22	Signal from Motion Sensor

Parts List

Table 2. Parts List & Cost

Part	Cost
Raspberry Pi 4	$60
Relay	$5
DHT11 Temp & Humid Sensor	$5
HC-SR501 PIR Motion Sensor	$5

Sources

[1] https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/