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HCDE 440
A4 - Ambient Display

It's easy to be so consumed in todays society that you leave your house and forget something. That situation sucks even more when you end up outside and bad weather is coming but you didn't have a moment to look at the weather report and prepare by grabbing an umbrella or rain coat.

To help curb this issue, I created a system that can detect when you're heading out and let you know what weather is happening that day.

Using ultrasonic sensors embedded in an umbrella holder, a date and time api paired with a weather api, and a clock with neopixel LED's wired inside, the system is able to translate weather data through color so you can easily glance at the clock on your way out the door to see if you might need a coat or an umbrella.

The system functions by looking for movement from the ultrasonic sensors, making sure both sensors measure a distance below three feet, then grabs the date and time, and sends it over to an MQTT server. From there another ESP will receive a message containing movement was detected and the date and time from the date and time api. The date and time is then inserted into a request to dark sky over HTTPS that returns a detailed weather report.

Once the weather report is received, the ESP parses out only the icon-data object. The reason I chose to grab the icon-data is because it has an expected response for all weather types that can easily be compared then translated to a color. I could not find any documentation that specified a structure on how the weather descriptions were presented.

The biggest hurdle I had to overcome was getting HTTPS working with certificate fingerprint matching and then grabbing only a small portion of the vast amount of data dark sky is able to provide. I actually had to try out four different API's before I was able to find one that could get granular enough to provide hourly weather reporting data, but also allow data requests to be solo'd to specific information so it only returned a compact response.

Having the response shorter also made parsing out the necessary information very easy, but because I have to use HTTPS the system has a 3-6 second delay before information is presented. To counteract this, once the clock ESP receives the message over MQTT the LED's in the clock will turn green to indicate that information is getting collected and will be there momentarily.

The stretch goal of this project was to have weather display on every two hour hand but due to timing I ended up having all the LED's change to one constant color to represent weather.