Task description: Frost/Fog Detector

A high-level description of the tasks that should be completed for our project.

LoRa WAN communication (Tom/Matthias)

LoRa WAN Communication Tasks
The device should send a message to the backend when a temperature threshold has been reached. When the lower threshold has been reached, the device should send a 'freezing state' message, resembling the windshield being frozen. When the upper threshold has been reached, the device should send a 'thawing state' message, resembling the windshield being thawed again.
The device should send a message to the backend when a certain (relative) humidity threshold level has been reached. When the lower threshold has been reached, the device should send a 'fogged state' message, resembling the windshield being fogged up. When the upper threshold has been reached, the device should send an 'evaporating state' message, resembling the fog on the windshield being evaporated again.
When the battery is below a certain threshold, a warning message should be sent to the backend.
The device should be put back in to sleep mode after delivering a message with LoRa WAN.

BLE Communication (Tijs)

BLE Communication Tasks
When a specific button on our device is being pushed, our device should be woken up, and should broadcast itself over BLE to be able to start a new connection.
When a BLE connection is established with a smartphone running our frontend application, the user should be able to configure the interval at which the MCU reads out the humidity sensors and the temperature sensors. For example, once a day at a certain time, every hour or only between a specific time interval.
When a BLE connection is established, the user should be able to see the battery percentage of the device.
After a connection is closed, the device should be put back in to sleep mode.

Frontend Application (Wouter)

Frontend Application Tasks
The user can set an alarm clock in our application.
The alarm clock is automatically adjusted overnight when the app receives information from the backend that the windshield is fogged up and/or frozen. The number of minutes the alarm clock is adjusted, can be specified in the app.
The user has a statistical overview in the app, showing the number of times the windshield was frozen and/or fogged up. The overview allows the user to see statistics for each day individually or for each week, month, year or a total.
The user has an interface to connect to our device and change the interval at which the sensors are read out.
EXTRA: (The alarm clock is also adjusted even more when it is snowing because the roads will be snowy. The application is subscribed to a weather API that will tell if it was snowing overnight.)

Backend (Wouter)

Backend Tasks
The backend keeps a record of each time the window was fogged up, frozen, evaporated or thawed with a time stamp and date.
When the backend receives a new message from the device, it will notify the associated application as soon as possible.

Hardware

Hardware Tasks
The temperature sensors should be able to be read at a specified time interval.
The humidity sensors should be able to be read at a specified time interval.
A difference between the outside sensors and the inside sensors should be calculated. This relative temperature difference is used in a formula to decide if the windows are fogging up or not.
The device should be put back in sleep mode after it read out it's sensor values.
A solar panel placed on the windshield, should charge the battery of the device.
A battery should power the MCU and its peripherals.
The battery level should be checked whenever the device is awoken.