Project Report

Industry project semester 2

Comfort home

Course T-CB-ITS2-CMK

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Group tutor: Xander Hover

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06/23/2020

The aim of this report is to present group number seven's solution for the industry project in semester 2 about an indoor climate control system. First the project description and requirements are given, then the approach and project organisation is described. Then the results are presented, together with the process. Finally, there is a project evaluation and reflection, as well as a couple of recommendations.

Introduction

This industry project's aim is to create a smart air conditioning system, using a shield provided by Airios, an embedded systems board and a simulation of the ventilation box in C#. In the course of the project, a change was decided on and 3 node MCU modules as well as an LCD display were added to the hardware, in purpose of enabling the system to work properly.

Project Background

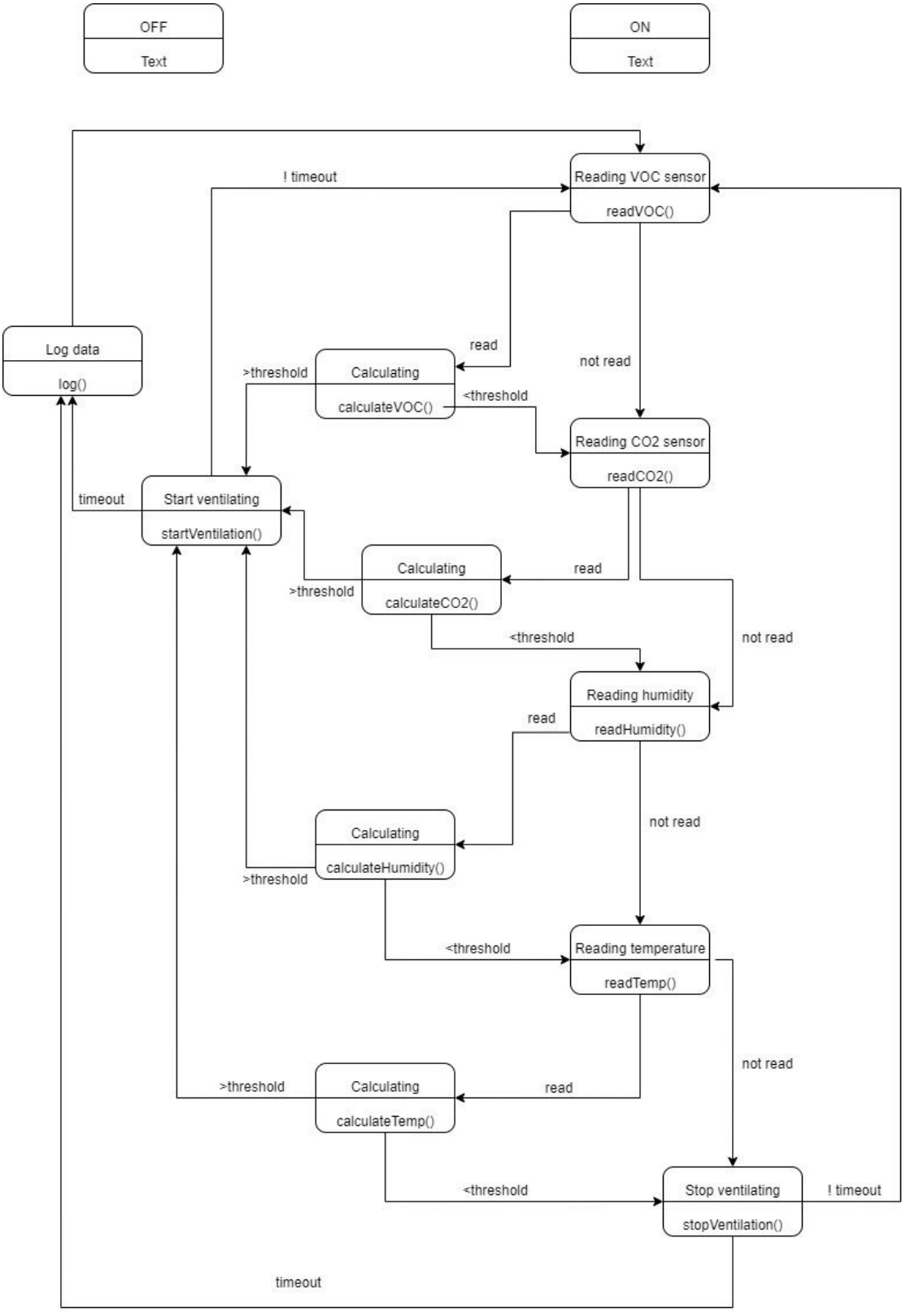
The project was provided by Airios for the second semester in the T-CB-ITS2-CMK course. The goal is to create an indoor climate control system that uses 3 sensors, all attached on a shield provided by the company. They are: a CO2 sensor, an air quality sensor (VOC) and a temperature and humidity sensor. The shield is attached to an embedded board (Nucleo STM32) and communicates wirelessly through a ZigBee module to a C# application, that simulates the ventilation system. Later on the ZigBee module was replaced with an ESP module mounted on a node MCU. Additionally, an LCD display was included in the end for better visual representation of the ventilation data. The application must calculate the air conditioning's duty cycle based on the values and store the readings into a database on a fixed interval of time. This database allows other systems to connect to it, which links them between each other and enables them to send data to each other. The UI of the application allows the users to see the status of the ventilation, as well as the readings of the sensors and presents them in a way, such that it shows how high their levels are compared to the thresholds. It also shows the latest reading from the other systems connected to the database. Communication loss is also accounted for, as the application shows a warning on the screen and the shield itself uses LEDs to indicate loss of traffic.

Project statement

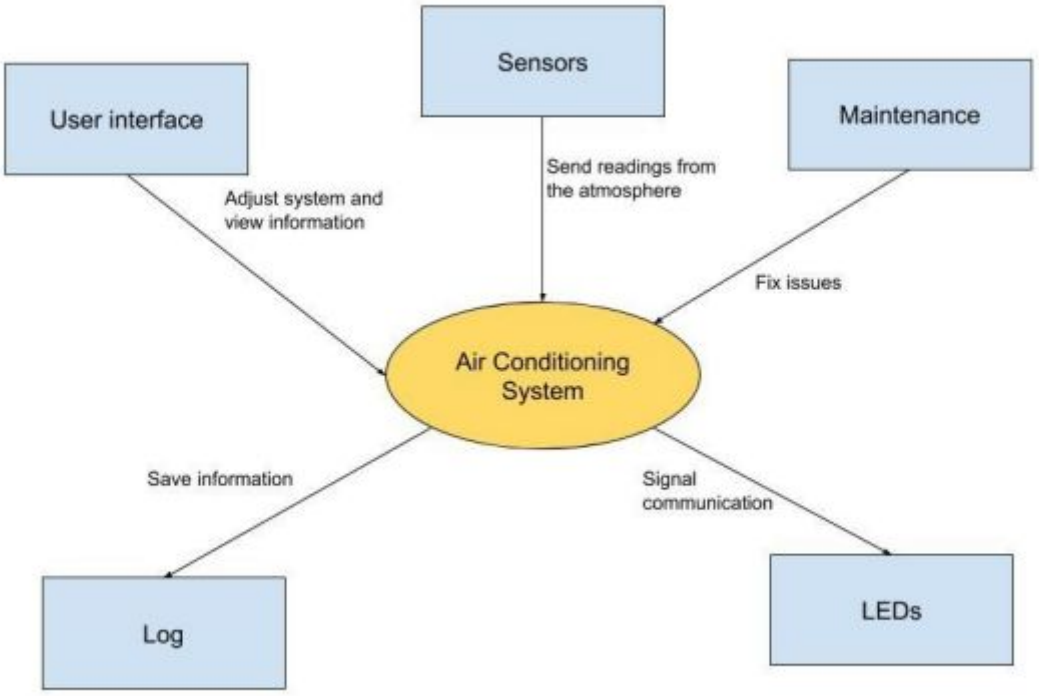
The project is supervised by a project mentor (Xuemei Pu), a group tutor (Xander Hover) and a representative of the company. Each of them provides vital assistance and guidelines towards completing the project in the best way possible.
The way of working is agile, with sprint demos planned every couple of weeks and a progress meeting every Monday. This helps for getting feedback regularly, as well as to keep the supervisors up to date with the group's progress.
The process organisation in the group was as follows; meetings are scheduled every week or whenever someone requests it, communication is always possible online or in person, and later online only. The team members are assigned a general role in the beginning, although each of them takes part in every major task in the workflow. A version control system was used (GitLab), where also the scrum board is made. Tests are carried out regularly and the results are examined to help improve the solution.

Process & Results

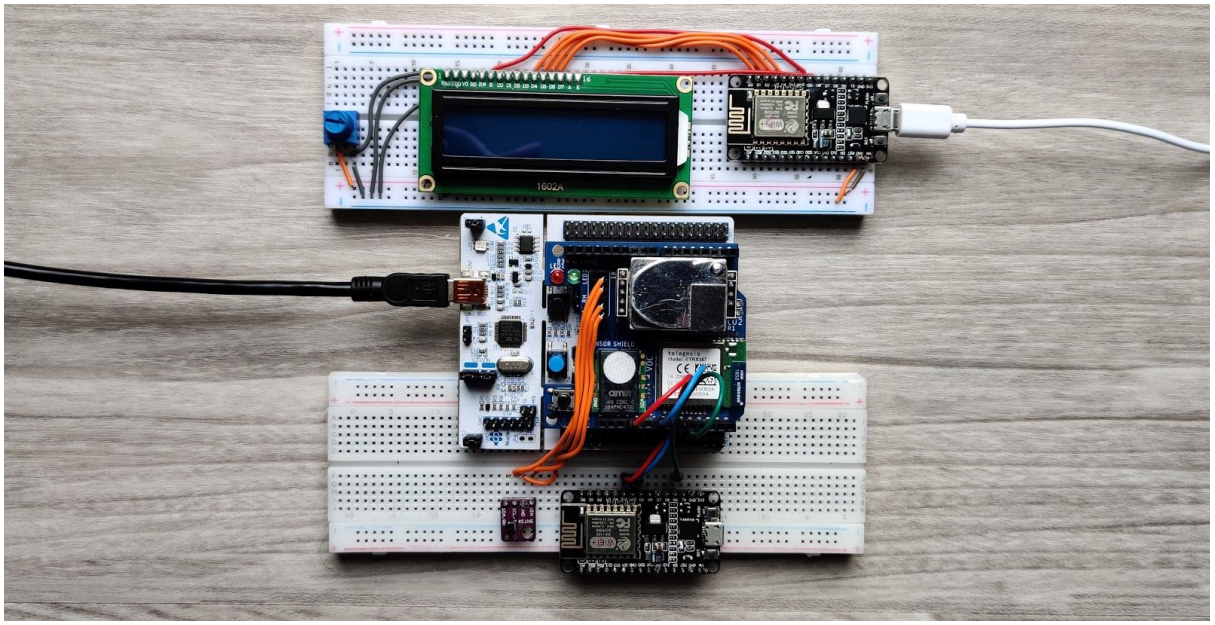
State diagram



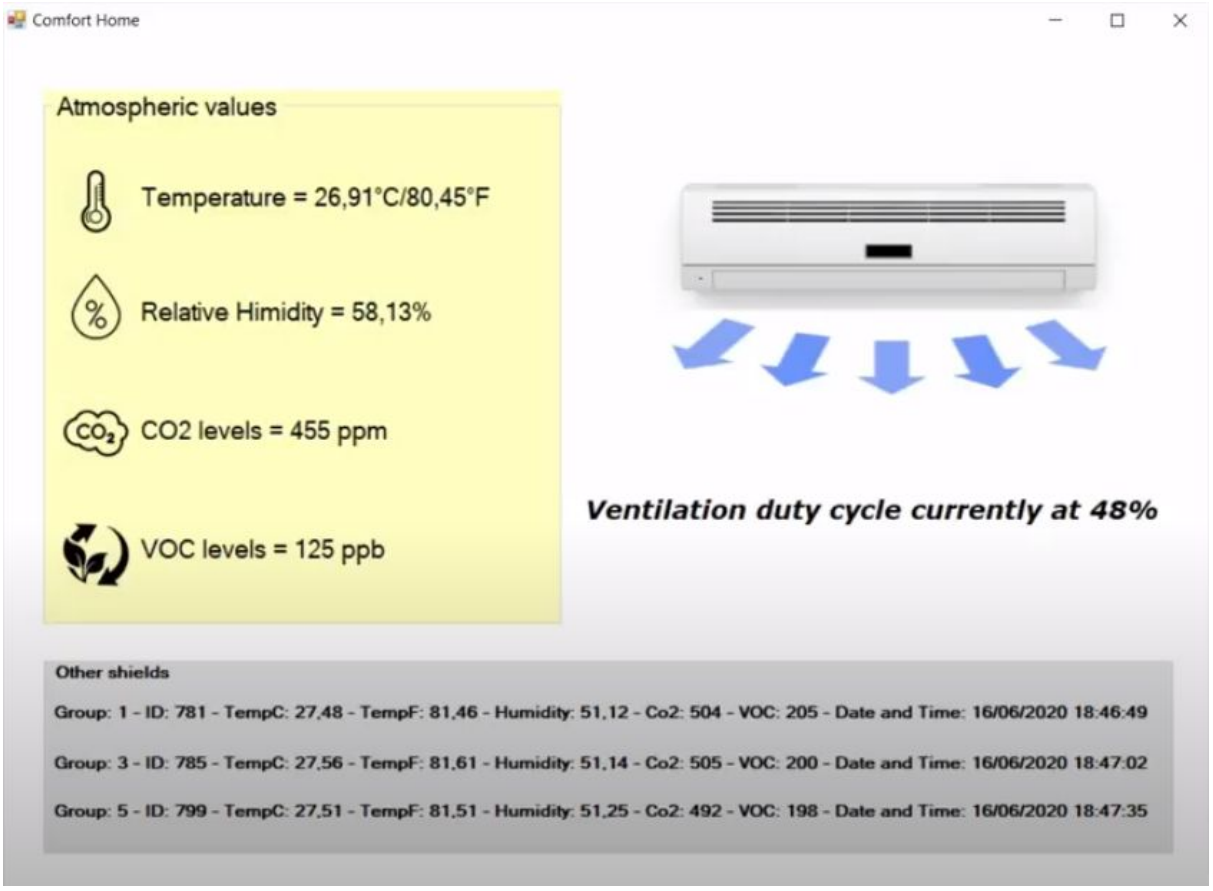
System context diagram



System architecture



C# Application UI



Conclusion & recommendations

This implementation of the project fulfills all of the requirements. Thanks to great organisation, risk management, problem solving and taking feedback into consideration, the task is completed without making compromises. Despite the unexpected difficulties caused by non-functional sensors, missing team members and social distancing rules, the project was still completed, though with a lot of extra effort. One thing that was not completed properly was regular counselling with the group tutor, as that could provide a lot of valuable feedback. This will be taken into consideration when working on future projects.What could be improved are a couple of things. Firstly, better hardware would facilitate the completion of such a project in the future, as that could be a bottleneck in the workflow. Secondly, a more flexible team composition could be introduced, in order to reduce the damage dealt by someone leaving the team. Lastly, the requirements for communication between the separate systems could be defined better, in order to make the task easier to understand and solve. Nevertheless, this project solution is ready to be installed in a realistic environment, as it is fully functional, user friendly, suited for upgrades and long-time usage.

References

Airios: https://www.airios.eu/
GitLab: https://git.fhict.nl/