Air-Conditioner Controller with Machine Learning

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Abstract

Keywords
embedded systems, c++, machine learning

1 Introduction

2 Proposed design

The system was implemented with a focus on Object Oriented Programming and C++ language, using the Windows Subsystem for Linux (WSL)[1] platform and a GitHub repository[2] for version control, project management and code sharing.

The complete project requirements provided professor Eduardo Augusto Bezerra can be found in his webpage[3], and in the project's GitHub repository's[2] Documentation Folder.

The system is designed to control an air-conditioner and use machine learning algorithms to reduce energy consumption. The system evaluates environmental data and learns user's characteristics to determine the optimal air-conditioner setting at different operating conditions and adjust it automatically.

The software is designed to facilitate portability to different air-conditioner manufacturers and different operating systems through use of polymorphism and abstract classes, although this project being developed for Linux operating system and Samsung ACs.

2.1 Host computer software

The host computer software was compiled using g++, debbuged using gdb, and uses the GNU Make[4] build system.

2.2 Embedded system software

The chosen embedded system hardware was an ESP32 based development board featuring the ESP32-WROOM-32[5] microcontroller module and an DHT11[6] temperature and relative humidity sensor. The software for the embedded system was implemented using the Espressif's ESP-IDF[7] framework and it's available tools. The machine learning algorithm was developed using TensorFlow Lite[8] framework.

2.3 Smart phone software

2.4 Integration and test

3 Results

4 Discussion

Conclusions

References

[1] *Windows Subsystem for Linux Documentation*. URL: https://docs.microsoft.com/en-us/windows/wsl/.

[2] Ramon de Araujo Borba. *Project's GitHub Repository*. URL: https://github.com/ramonborba/EEL7323.

[3] Eduardo Augusto Bezerra. *Project Specifications*. URL: https://gse.ufsc.br/bezerra/wp-content/uploads/2022/02/Especificacao_2021_2-v2.pdf.

[4] *GNU Make Documentation*. URL: https://www.gnu.org/software/make/manual/html_node/index.html#SEC_Contents.

[5] *ESP32-WROOM-32 Datasheet*. URL: https://github.com/ramonborba/EEL7323/blob/finalproj/FinalProject/Documentation/datasheets/esp32-wroom-32_datasheet_en.pdf.

[6] *DHT11 Datasheet*. URL: https://github.com/ramonborba/EEL7323/blob/finalproj/FinalProject/Documentation/datasheets/Datasheet_DHT11.pdf.

[7] *ESP-IDF Programming Guide*. URL: https://docs.espressif.com/projects/esp-idf/en/latest/esp32/index.html.

[8] *TensorFlow Lite website*. URL: https://www.tensorflow.org/lite/.