Semester 1
2023

Portfolio - Project – Report

2023-HS1-ENG20009-Engineering Technology Inquiry Project

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GROUP 4, TUESDAY 10.30

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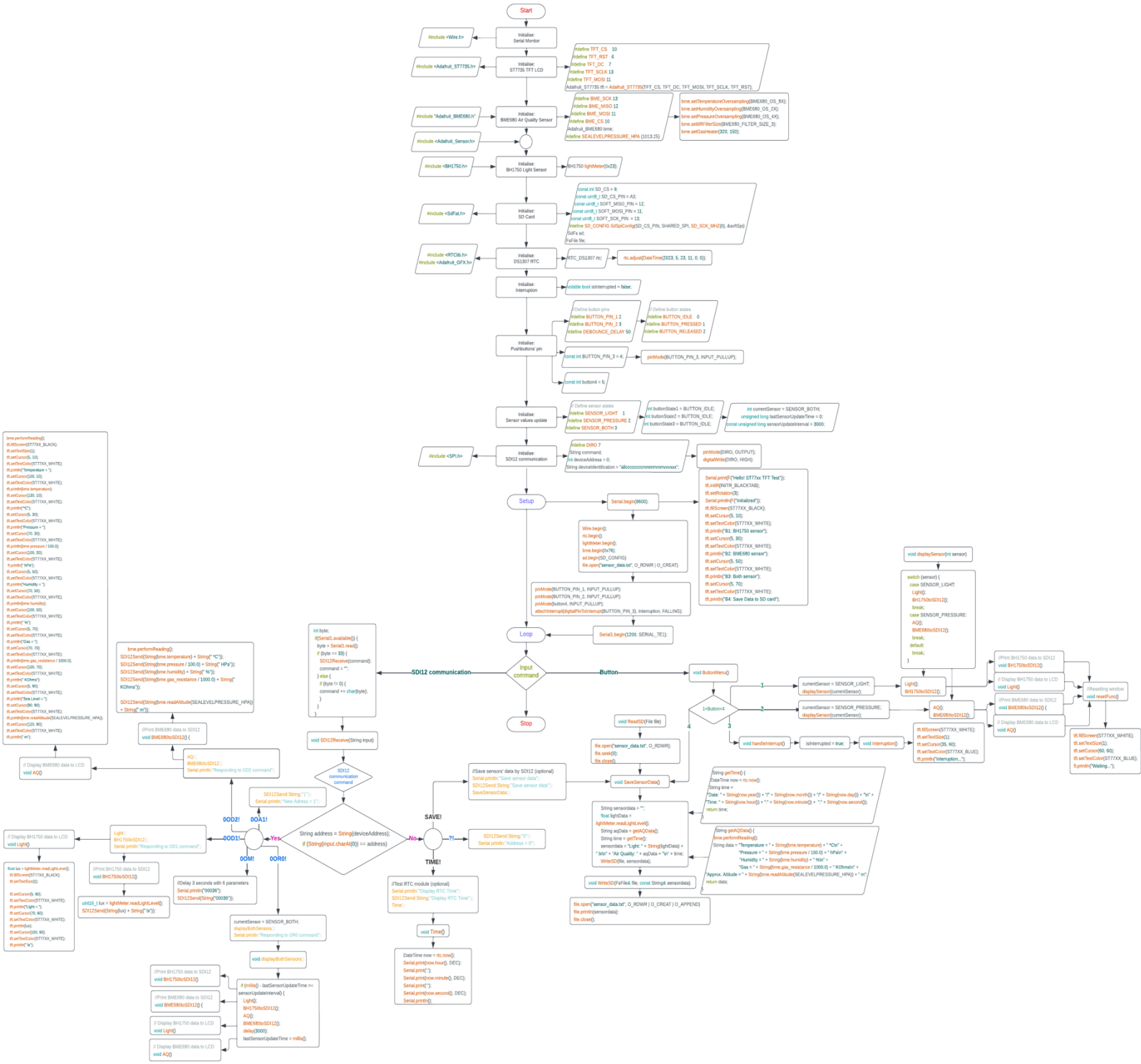
A. Flowchart



B. Abstract

In the final project, we utilized two sensors, the BME680 (Air Quality sensor) and the BH1750 (Lightness sensor), assembling with Arduino DUE board and SDI12 interfacing, demonstrating a Menu to read and display sensors' data into SDI12 communication Serial Monitor and ST7735 TFT LCD, applying interruption and saving data into the SD card.

C. Risk Assessment for Each Application of the Sensor

For each application, I conduct a risk assessment to identify potential risks and implement necessary measures to mitigate them.

1) The Board (Arduino DUE):

- Safety Risks: The board can always be deteriorated by any potential external impact that could downgrade their quality, such as water, dust, food and drink spilling, fall and wear-out. Arduino board has to be inside the hard box after usage to protect it from possible damages.
- Accuracy and Interpretation: Ensuring all hardware elements on the board are well-functioning, no visible evidence of tear-out, all wiring are correct, and jumpers need to be corresponded to the task circuitry.

2) Sensor (BME680 and BH1750):

- Safety Risks: The sensor measures various environmental factors, including potentially harmful ones. I ensure no external detrimental factors such as spilling water, foods and other possible intact between the sensor and external harms to minimize exposure risks. The sensor need to be protected in the plastic bag and inside the hard box after usage to prevent factors that downgrade the hardware.
- Data Accuracy and Interpretation: I assessed the potential for inaccuracies in the sensor readings and implemented calibration techniques to improve data accuracy. All wiring have to be connected correctly and allow regular testing to avoid any hardware errors by the sensor. Data's accuracy could be impacted by external environment factors such as humidity, temperature or dusting on the hardware, avoiding extreme weather condition would allow better result.

3) SDI12 Interface:

- Safety Risks: Ensure no external detrimental factors intact to minimize exposure risks. The module need to be protected in the plastic bag and inside the hard box after usage, in order to prevent all environmental harming elements including exposure to high humidity and temperature that could downgrade the hardware.
- Data Accuracy and Interpretation: All wiring have to be connected correctly and allow regular testing to avoid any hardware errors by the module.

4) SD Card:

- Safety Risks: Ensure no external detrimental factors intact to minimize exposure risks. The module need to be protected in the plastic bag and inside the hard box after usage or remain inside the board, in order to prevent all environmental harming elements including exposure to high humidity and temperature that could downgrade the hardware or possible losing to school's belongings.
- Data Accuracy and Interpretation: Jumper and the card have to be connected correctly and allow regular testing to avoid any hardware errors by the module. Try not to overwrite the file folder regularly by delete or create another folder to store data, avoid errors when saving sensors' data into the SD card.

5) Laboratory Classroom:

- Safety Risks: Ensure wearing proper outfit and shoe to protect potential hazards from electric hardware and wiring in the lab. Avoid bringing foods and drinks into the lab and make sure outfit to be dry and appropriate whenever accessing the school's lab.

By conducting these risk assessments, it aimed to ensure the safety, reliability, and accuracy of our sensor applications and processes throughout the project.

D. Reflection on Relevant Knowledge Learned

Throughout the ENG20009 unit, I acquired valuable knowledge and skills through seminars, facilitation sessions, labs, and workshops. These learning experiences significantly contributed to the success of our project. Here are some reflections on the relevant knowledge I gained:

Seminars: The seminars provided general insights into various topics related to information systems and technology. I learned about the hardware, software, and the skills to enquire and solve challenges oriented around engineering technologies. This knowledge guided myself in making informed decisions during the project, especially in terms of planning, initialisation and developing methodical strategies to solve any technology problems that I may have to confront within my study and future career.

Labs and Workshops Facilitation: The facilitation sessions focused on enhancing our teamwork, communication, and problem-solving abilities. I learned effective collaboration techniques, conflict resolution strategies, and how to manage diverse perspectives within a team. These skills were invaluable in maintaining a positive team dynamic and ensuring smooth project progress. The hands-on lab and workshop sessions equipped me with technical skills and practical knowledge. I was acknowledged about Arduino programming, sensor interfacing, data visualization, and project management. These skills were directly applied to our project, enabling us to design and implement the sensor circuit, generate code, debugging errors, and analyse the collected data effectively.

The knowledge gained from these learning experiences provided a strong foundation for our project work and enabled me to apply theoretical concepts in a real-world context.

E. Reflection on Teamwork

As a member and the leader of Group 4, I strived to function as an effective team member and foster a collaborative environment. Here are reflections on my role and the team's communication approaches:

1) Functioning as an Effective Team Member:

- I took the initiative to engage and motivate all team members, ensuring everyone felt valued and comfortable contributing to the project.
- I actively facilitated team meetings, providing an open space for open discussions, sharing ideas, and making collective decisions, which is usually being held within the Lab Workshop, the Library and other places that share the university facility
- I supported the team by taking on significant responsibilities in software and hardware development, while also seeking support and input from other team members when needed.

2) Communication with Teams and Stakeholders:

We maintained regular communication within the team through various channels, including in-direct meetings, online platforms, and group chat updates.

We established clear roles and responsibilities, ensuring that each team member had a defined scope of work and understood their contribution to the project's success.

We engaged with stakeholders, such as instructors and tutors, to mentor us, delivering progress updates, seeking feedback, and actively addressing any concerns or suggestions.

Our communication approaches encompassed verbal, written, and technological means to facilitate effective collaboration and ensure the project's successful completion.

3) Difficulties with Team-work:

Personally, as the member that support vitally to this project, who contribute the most towards software and hardware task, I am also grateful that I have a lot of support from Salehin and Nethmi, two of my enthusiastic and supportive members. Yet, It is very that two members of us that couldn't participated that much, however, we still recognise them as a helpful member for this project. Eventually, we have made it up to Distinction level, which I would say that the team has done it very well and we can share a great spirit of enthusiasm in the group project. All team members and I are very appreciated to be a part of this group work and dedicating the best to the project at the eventual.

F. Brief Conclusion

In conclusion, our team successfully applied the knowledge gained from seminars, facilitation sessions, labs, and workshops to create an Arduino-based project with SDI12 interfacing and multiple sensors. Through effective teamwork, communication, and risk assessment, we achieved a high-quality project outcome, demonstrating our commitment to the unit's learning outcomes.