2020 Fall Object-Oriented Programming Team Project Final Report

1. **Title of your project**

   Digitalization of Entry Log List for Tracking COVID-19

2. **List team members: names (in Korean), email addresses, and student IDs**

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3. **Motivation for your project**

   Entry log became a mandatory procedure in this COVID-19 era. It is important to manage the enter and exit records of people entering a space, such as DGIST face-to-face lectures or ceremonial events. A handwritten entry log is not only an uncomfortable and slow way for people to react but also a dangerous method to prevent the virus. However, DGIST didn't have a digitalized log system for students and faculties. Therefore, we thought that developing a digital entry log system is mandatory for DGIST members. Through our digital logs system using student ID cards, the students would be easier to be identified and be recorded their entry logs, and eventually, it would be easier to determine whether he/she's in contact with a COVID-confirmed person.

4. **Summarize what you planned to do and what have done and haven't done.**

   - Development of RFID reader using Arduino **-DONE**
   - Getting Student ID and name through RFID **-DONE**
   - Saving Student ID, name, enter/exit time data by tagging student card **-DONE**
   - Inquiring an entering/exiting time data for a certain person in preparation for epidemiological investigations **-DONE**
   - Saving the entry list as a csv file, which can be opened with EXCEL and easily be managed by any non-programmer users **-DONE**
   - Make UI that visualize student information corresponding to the tagged ID card and can perform the functions above with clicking and typing **- INCOMPLETE**

5. **Describe the implementation design of your project.**

   a. **Provide a class diagram which includes classes with their major member functions and other functions**

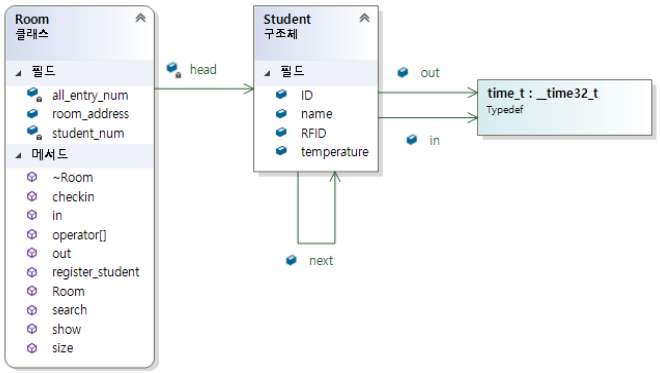

Figure 1. Class diagram

b. Provide details about what you are each in charge of.

Submitted through Google Forms.

6. Explain how to compile your code and how to test

- RFID Reader

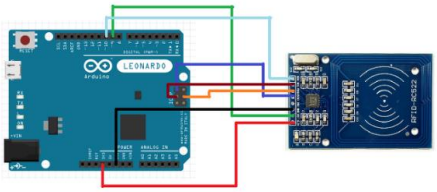

Figure 2. Circuit diagram of Arduino RFID reader

RFID Reader was developed using Arduino Leonardo board and RC522 (RFID module). The Arduino Leonardo board is suitable for connection with our program because the computer recognizes it as an input device such as a keyboard and mouse.

When the RFID card is tagged to the RFID module, the code reads the unique ID of the RFID card and transmits it through keyboard input. By default, it is built into the Arduino board, so users do not have to do any extra work, such as compile or run programs, when used. (Simply plug and play)

If you want to compile, open the *RFID_students.ino* file(This can be found on the github link in 9.) in the Arduino program and upload it to the Arduino board. The written code needs the MFRC522 library written by GithubCommunity.

- Main Project

Verified operating system: Windows / Visual Studio 2019

Create a project in Visual Studio and import *main.cpp*, *teamproject.cpp*, and *teamproject.h*(This can be found on the github link in 9.). Then, compile and run *main.cpp*.

- <u>Confirmed test case</u>
  - Check Corner cases such as duplicated In/out cases for a person: successfully enter/exit log saved for duplicated enter case.
  - Register a student with a student card, with RFID: Checked the data was successfully stored in the students.csv file and maintained well.

- Once registered, by just tagging the student card can record one's entry/exit log: Checked the personal information and enter/exit time was saved in room###.csv file and maintained well.

7. Results section

a. Describe your experiment setup and metrics of success

There are 6 menus that we can choose.

0. Register the RFID Card / 1. Enter the room / 2. Exit the room / 3. Check current room status / 4. Check your enter time / 5. Exit the program.

1. Input the Room number
   If you run the project file successfully, then you can input the room number.
   Then you can check the 'Entry_logs' folder in C:\ and 'room_number.csv', 'students.csv' file.
   If there is already the students.csv file then we don't make it again.

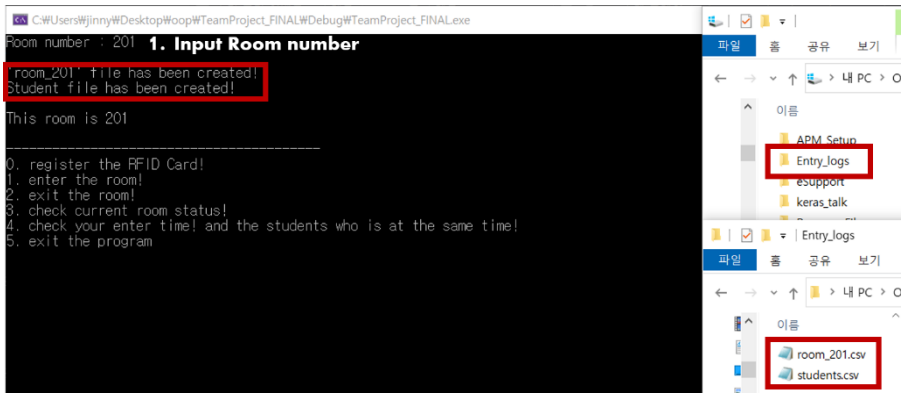

Figure 3. Main project execution 1

2. Enroll the RFID Card
   After choosing the menu 0, you have to input your student ID, Student name, and then just tag your Student Card to the RFID Reader module. The information that you enter is written in the students.csv file. Then, enrollment is finished.

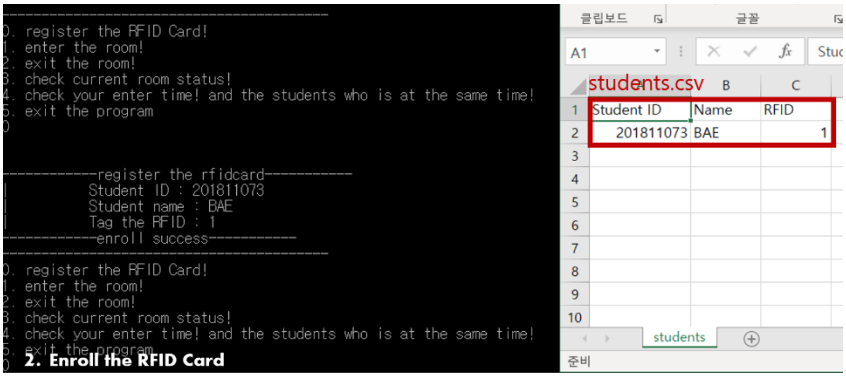

Figure 4. Main project execution 2

3. Enter the Room
   When you want to enter the room, you just choose menu 1, and tag the card to the RFID reader. Then you have to input your temperature and you can check these information and entry time in 'room_number.csv' file.

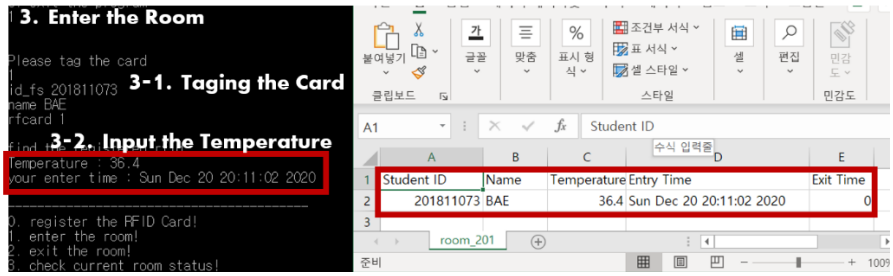

Figure 5. Main project execution 3

4. Check the Current Status of the Room
If you choose menu 3, it shows the students who are in the room now.

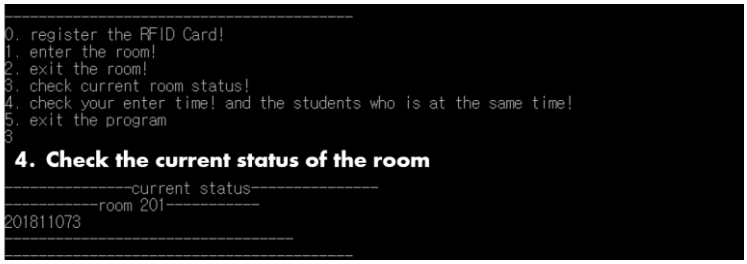

Figure 6. Main project execution 4

5. Exit the Room
When you want to exit the room, you have to choose menu 2. Same with enter, if you tag the card to the reader machine then the process is finished. After that, you can check that the exit time is written in the 'room_number.csv' file.

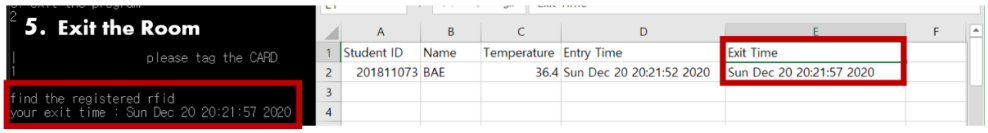

Figure 7. Main project execution 5

6. Check the Current Status of the Room
You can check that the room is empty.

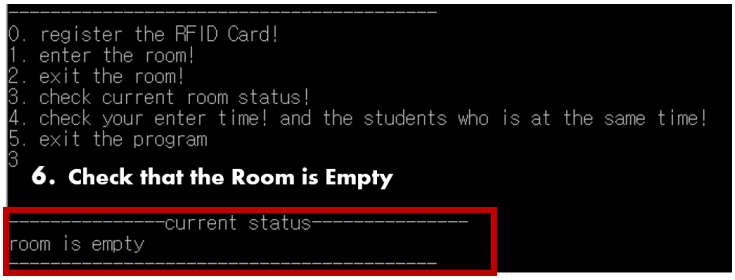

Figure 8. Main project execution 6

7. Check your Entering Time
Also, you can check your entry time with entering your Student ID.

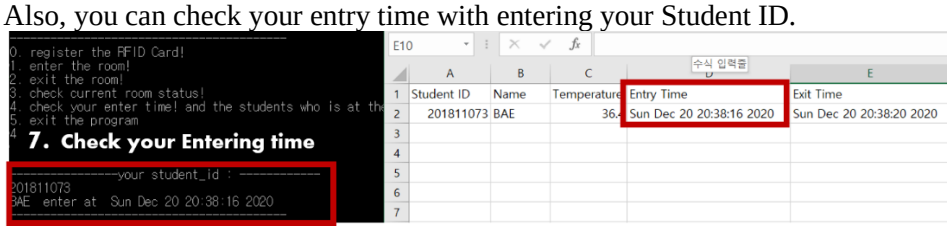

Figure 9. Main project execution 7

b. Present results with discussion

We implemented all the functions we planned, and the details with related functions were described in part 7. Result section a). In the process of executing those functions, the part about exception handling is still insufficient, and there may be various bugs due to it. Some of the bugs that I found while doing some tests but have not yet fixed are that when registering a student ID, if you put a space in the name input field, the saving is not done properly. Also, We originally wanted to show all the students who entered the same time zone through the search function, but we encountered difficulties in the process of implementing them, leaving a regret. Nevertheless, it was confirmed that the functions are implemented well enough to actually use the current version of code.

In the case of UI, we tried to develop using pyqt5. We tried to match functions with each clicking button and typing inputs. In advance, we planned to use a subscriber and publisher for making this system. However, when introducing subscribers and publishers, it seemed difficult to organize classes systematically, so I tried to use C++ based UI design program, Qt Creator.

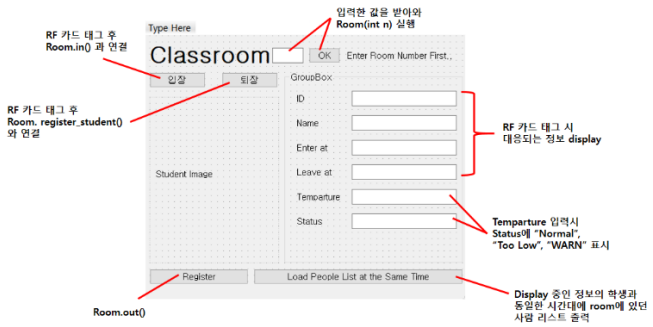

Figure 10. Designed UI

The designed UI is as above. However, while building the code written by qt creator, “qmaind.lib cannot be opened” error was popped up as below. For solving this problem, we tried re-installing the qt creator, downloading the qt main library file separately and pasting it in the designated path, and modifying the PATH. But it still did not resolve, so we resumed UI development with Visual Studio MFC. However, in the program, an error that the “windows” plugin could not be loaded as shown below occurred. UI development could not be completed because we could not resolve these errors.

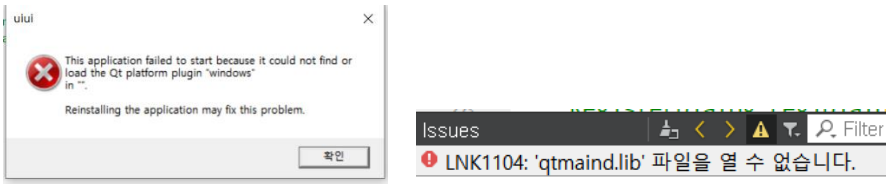

Figure 11. Errors related UI

8. Conclusion of your work and what you learned

Through this project, we developed a digitalized entry log system with student ID cards. The system is user-friendly as it manages the log by tagging student cards and saving data as a csv file, which can be opened with Excel.

We learned how to develop a simple embedded system, including developing UI, managing csv files, dealing with Arduino, and most importantly, how to apply OOP in such a project.

9. Link of the source code repository (if applicable. Otherwise zip and upload it to LMS.)

https://github.com/bae3559/OOP_TeamProject_2020