50.051Programming Language Concepts (Cohort 1 Group 8)

PROJECT FINAL REPORT

PokéVenture

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```
CardView:

_____________________________________________________________________________________________
|                                        001 Bulbasaur                                      |
|                                    Grass/Poison- | HP: 45                                  |
|-------------------------------------------------------------------------------------------|
|                                        `;,;.;,;.;.'                                       |
|                                         ..:;:;::;:                                        |
|                                     ..--''' '' ' ' '''--.                                 |
|                                   /' .   .'        '.   .`\                               |
|                                  | /    /            \   '.|                              |
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|                                .'| |   :             :    :|                              |
|                              ,: /\ \..\_\ __..===..__/_../ /`.                            |
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|                             |   |  ''|    :';          | ,  `''\                          |
|                             |.:  \/  | /'-.`'   ':'.-'\ |  \,   |                          |
|                             | '  /  /  | / |...   | \ |  |  |';'|                          |
|                              \ _ |:.|  |_\_|`.'   |_/_|  |.:| _ |                          |
|                             /,.,.|' \__       . .      __/ '|.,.,\                         |
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|                             142   \   `:"""-------'"""' |   |                              |
|                                     ',-,-',             .'-=,=,                           |
|-------------------------------------------------------------------------------------------|
|                          ATK: 49  | DEF: 49  | SPD: 45  | ACC: 100%                      |
|-------------------------------------------------------------------------------------------|
|                       A seed Pokemon that grows stronger with sunlight.                   |
|___________________________________________________________________________________________|

_______________________
|                     |
| 1. Save Pokemon Card |
| 2. Back to Pokedex  |
|_____________________|

Enter Choice:
```

Overview

This project is a text-based Pokémon adventure game, written in C. Players can go on adventures, discover new Pokémon and add them to their Pokédex. In the Pokédex, players can view the Pokémon they have seen to obtain more information about them.

Features

PokeVenture starts from the Menu Page. Every page has a different set of options for the player. Valid inputs are 1-digit number or 3-digit ID (while on Pokedex Page).

```
Menu:

_____________________________________________________
|            Welcome to PokeVenture!                |
|---------------------------------------------------|
|   Gotta catch 'em all! Start your journey to      |
|  discover and learn about different Pokemon!      |
|___________________________________________________|


____________________
|                  |
| 1. View Pokedex  |
| 2. Adventure     |
| 3. Save & Exit   |
|__________________|

Enter Choice:
```

Menu Page: Displays the Home Menu Page, which has the following options:

- 1: Access the **Pokedex page** to see the list of Pokemon the player has encountered
- 2: Access the **Adventure page** to explore and hopefully encounter new Pokemon
- 3: **Save** the game progress and **exit**

```
Pokedex:

| 001 Bulbasaur    | 011 ----------   |
| 002 ----------   | 012 ----------   |
| 003 Venusaur     | 013 ----------   |
| 004 ----------   | 014 ----------   |
| 005 ----------   | 015 Beedrill     |
| 006 ----------   | 016 ----------   |
| 007 ----------   | 017 ----------   |
| 008 ----------   | 018 ----------   |
| 009 Blastoise    | 019 Rattata      |
| 010 ----------   | 020 ----------   |
Page 1/3

| 1. Previous Page          |
| 2. Next Page              |
| 3. Adventure              |
| 4. Back to Menu           |
| 5. Save & Exit            |
| XXX. Access Pokemon #XXX  |

Enter Choice:
```

```
Pokedex:

| 021 ----------   | 031 ----------   |
| 022 ----------   | 032 ----------   |
| 023 ----------   | 033 ----------   |
| 024 Arbok        | 034 ----------   |
| 025 ----------   | 035 ----------   |
| 026 ----------   | 036 ----------   |
| 027 ----------   | 037 ----------   |
| 028 ----------   | 038 ----------   |
| 029 ----------   | 039 ----------   |
| 030 Nidorina     | 040 ----------   |
Page 2/3

| 1. Previous Page          |
| 2. Next Page              |
| 3. Adventure              |
| 4. Back to Menu           |
| 5. Save & Exit            |
| XXX. Access Pokemon #XXX  |

Enter Choice:
```

Pokedex Page: Displays all the Pokemon that the player has encountered

- Players can view the **Pokedex** by its pages (20 entries per page) and have the option to navigate **Previous** and **Next** pages if applicable.
- Players can access a **Pokemon Card** by entering a **3-digit Pokemon ID** (Pick a number from the Pokedex shown).
- Players can go to other pages (**Adventure Page**, **Menu Page**) or **Save and Exit**.

```
CardView:

_____________________________________________________________________________________________
|                                        001 Bulbasaur                                      |
|                                     Grass/Poison- | HP: 45                                 |
|-------------------------------------------------------------------------------------------|
|                                          `;,;.;,;.;.'                                     |
|                                           ..:;:;::;:                                      |
|                                      ..--''' '' ' ' '''--.                                |
|                                    /' .   .'        '.   .`\                              |
|                                   | /    /            \   '.|                              |
|                                   | |   :             :    :|                              |
|                                 .'| |   :             :    :|                              |
|                               ,: /\ \.._\ __..===..__/_../ /`.                            |
|                              |'' |  :.|  `'           `'  |.'  ::.                        |
|                              |   |  ''|    :';           | ,  `''\                        |
|                              |.:  \/  | /'-.`'   ':'.-'\ |  \,   |                        |
|                              | '  /  /  | / |...   | \ |  |  |';'|                        |
|                               \ _ |:.|  |_\_|`.'   |_/_|  |.:| _ |                        |
|                              /,.,.|' \__       . .      __/ '|.,.,\                        |
|                                   | ':`.`----._____.---'.'   |                              |
|                              l42   \   `:"""-------'""' |   |                              |
|                                     ',-,-',            .'-=,=,                            |
|-------------------------------------------------------------------------------------------|
|                          ATK: 49  | DEF: 49  | SPD: 45  | ACC: 100%                      |
|-------------------------------------------------------------------------------------------|
|                       A seed Pokemon that grows stronger with sunlight.                   |
|___________________________________________________________________________________________|

_____________________
|                   |
| 1. Save Pokemon Card |
| 2. Back to Pokedex |
|___________________|

Enter Choice:
```

CardView Page: Displays the Selected Pokemon's information including ID, name, status, and description. It also displays an ASCII text art of the Pokemon if available.

- Players can choose to **Save the Card** which will download a **.txt file** of the card shown into the user/output/ folder.
- Players can navigate back to the **Pokedex Page** to view other Pokemon as well.

```
CardView:
_____________________________________________________________________________________
|                                  002 Pokemon Name                                  |
|                                   Type | HP: --                                    |
|-----------------------------------------------------------------------------------|
|                                 Pokemon Not Found                                  |
|-----------------------------------------------------------------------------------|
|                        ATK: --- | DEF: --- | SPD: --- | ACC: ---%                  |
|-----------------------------------------------------------------------------------|
|                                    Description                                     |
|___________________________________________________________________________________|

Nothing to save here!
_____________________
|                   |
| 1. Save Pokemon Card |
| 2. Back to Pokedex |
|___________________|

Enter Choice:
```

CardView Page (If Pokemon has not been seen): This Page displays **empty information** if Players try to access unencountered Pokemon.

```
Adventure:
_____________________________________________
|   Hello Trainer, are you ready to adventure?   |
|                                               |
|                  Let's go!                    |
|_______________________________________________|

_____________________
|                   |
| 1. Start Adventure |
| 2. Back to Menu   |
| 3. Save & Exit    |
|___________________|

Enter Choice:
```

Adventure Page: Displays a Welcome Screen for players to Start an Adventure

- Players can choose to **Start Adventuring**, Go back to the Menu **Page**, or **Save and Exit.**

```
Adventure:

_____________________________________________
| You feel the air shift. Something approaches.  |
|_____________________________________________|
```

```
_____________________________________________
|                `;,;.;,;.;.'                 |
|                 ..:;:;::;:                  |
|            ..--''' '' ' ' '''--.            |
|          /' .   .'        '.   .`\          |
|         | /    /            \   '.|         |
|         | |   :             :    :|         |
|       .'| |   :             :    :|         |
|     ,: /\ \..\_\ __..===..__/_../ /`.        |
|    |'' |  :.|  `'           `'  |.'  ::.    |
|    |   |  ''|    :';           | ,  `''\    |
|    |.:  \/  | /'-.`'   ':'.-'\ |  \,   |    |
|    | '  /  /  | / |...   | \ |  |  |';'|    |
|     \ _ |:.|  |_\_|`.'   |_/_|  |.:| _ |    |
|    /,.,.|' \__       . .      __/ '|.,.,\    |
|         | ':`.`----.____.---'.'    |         |
|    142   \   `:"""-------'"""' |   |         |
|           ',-,-',             .'-=,=,        |
|---------------------------------------------|
|           A Wild Bulbasaur appeared         |
|_____________________________________________|
```

```
_____________________
|                   |
| 1. Adventure Again |
| 2. View Pokemon    |
| 3. Back to Menu    |
|___________________|

Enter Choice:
```

Other **Success** Messages Available:

```
Adventure:

_____________________________________________
|  Footprints! Something's been here recently.  |
|_____________________________________________|
```

```
Adventure:

_____________________________________________
|  The wind carries a strange scent... could it  |
|                      be?                      |
|_____________________________________________|
```

```
Adventure:

_____________________________________________
|    You hear rustling nearby... something's    |
|            definitely out there.              |
|_____________________________________________|
```

Adventure Page (Success): Displays a successful encounter with a Pokemon. Encountered Pokemons are added into the Pokedex.

- Players can choose to continue their **Adventure** or **View the Pokemon** they just encountered.
- Players can also go back to **Menu Page**

```
Adventure:
_____________________________________________
|  You feel like something is watching you. But  |
|              it never shows itself.             |
|_____________________________________________|

_______________________
|                     |
| 1. Adventure Again  |
| 2. Back to Menu     |
|_____________________|

Enter Choice:
```

```
Adventure:
_____________________________________________
|   No Pokemon appeared... but you found some    |
|              mysterious footprints.             |
|_____________________________________________|

_______________________
|                     |
| 1. Adventure Again  |
| 2. Back to Menu     |
|_____________________|

Enter Choice:
```

Other **Fail** Messages Available:

```
Adventure:
_____________________________________________
| You didn't find one today, but something tells |
|                you you're close.                |
|_____________________________________________|
```

```
Adventure:
_____________________________________________
|  You reach into the bushes and pull out... a   |
|                moldy sandwich.                  |
|_____________________________________________|
```

Adventure Page (Fail): Displays a failed encounter with Pokemon. It randomly selects a fail message from a fixed list to inform the player that no Pokemon was encountered.

- Players may choose to try **Adventuring** again or go back to the **Menu Page**.

Constraints

✅ Processing files as an input - File reading

- Extracted Pokemon data from **.csv** file and saved into a Pokedex Struct
- ASCII art for each Pokemon is read from individual **.txt** files in *data/ascii/* folder
- Game progress is read from binary save file (**pokedex.dat**)

✅ Processing files as an output - File writing

- When exiting the game, progressed is saved into a binary file (**pokedex.dat**)
- In the CardView page, players can Save a Pokemon Card, which will output a **.txt** file of the card into their *user/output/* folder. The card displays the selected Pokemon's information including ID, name, status, and description. It also displays ASCII text art of the Pokemon.

✅ Parser

- A csv parser was used to process Pokemon data (as mentioned before)
- A binary file (**pokedex.dat**) is parsed when the game is loaded to resume progress from the previous saved game
- Handling of user inputs to ensure correct transitions between states
    - Using **regex** to ensure valid inputs
    - Using **switch/case** and **if/else** to handle transitions

✅ Clean C Programming

- Our code compiles with all the required flags: **-Wall -Werror -ansi -pedantic**
- Our code has been tested to work on both **Windows** and **Mac**

✅ State machines

- Our game uses an **FSM** to manage page states and transitions.
- States are defined inside an enum **PageState**

```
typedef enum {
    MENU,                /** Main Menu Page */
```

```
    POKEDEX,            /** Pokedex List Page */
    CARDVIEW,           /** Individual Pokemon Card View */
    ADVENTURE,          /** Adventure Mode Page */
    ADVENTURE_SUCCESS,  /** Adventure Success Screen */
    ADVENTURE_FAIL,     /** Adventure Fail Screen */
    SAVE                /** Save Game Page */
} PageState;
```

- Transitions are managed using a centralised function: **updatePageState()**

```
void updatePageState(Page *page, Pokedex *pokedex, char *input)
```

✅ No external libraries

- Our game only uses standard C libraries

Development Process

🧠 Challenges

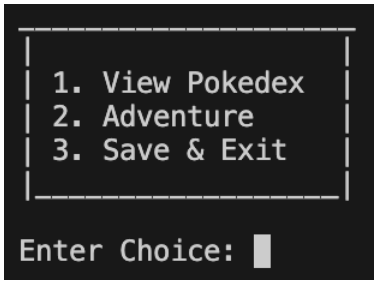
- For the FSM, we weren't sure how we should set it up. Should we create one state for every single possible transition and risk the total number of states getting out of hand, or would it be better to have lesser states, but each with increased complexity (through the implementation of substates) for each state?
- Weird malloc bug on one PC - one of our groupmates on Windows had a malloc issue that we couldn't solve. Code that used malloc multiple times would not work—we initially had an implementation where you malloc a Page, and then malloc for each element in the page, before passing the Page instance to another function to be printed. We changed our implementation to just print the page directly.
- On CardView Page, the Pokemon descriptions were not warping well, this was due to the hidden extra character \r from extracting the .csv file which was later found and fixed.
- Since we are working with both Mac and Windows, some functions are not compatible with both systems such as snprintf so we decided to find a common function that works on both like sprintf.

⚖️ Workload Split

- David - Handled the FSM and transitions
- Jia Le - Handled the Adventure portion of the game
- Robin - Handled the Pokedex and Pokemon-related functions

💻 Code Compatibility

- We have 2 Mac users and 1 Window user
- Every time we push new code, we would ask one another to check if it was working on their side, to make sure that we don't push code that would eventually be unusable on another system
- Some issues were easily debugged, and for those that were not, features had to be scrapped to maintain code compatibility
    - For example, we wanted to use box-drawing unicode characters to draw the boxes in our game, but the terminal on Windows does not seem to handle them well, so we stuck to using ASCII characters only '|' '_' '-'



    - We had some cool implementations in the Adventure portion like implementation of a cutscene, but had to scrap them because it didn't work consistently across systems. If interested, it is in our GitHub Repo (branch: MVC version) linked at the end of this document.

🤯 Lessons Learnt

- We have learnt to be mindful of how different operating systems handle functions. Some functions may work on one OS but fail on another.
- Check compatibility frequently if that is a requirement for the project, because it becomes harder and harder to debug and maintain compatibility the more you build. Frequent communication is essential for members using different platforms.
- Planning FSM requires careful balance between too many states (hard to manage) and too few (complex logic)
- We should plan out our software project using UML use cases and sequence diagrams, or at least some shared visual plan, so everyone is aligned from the start. We used https://excalidraw.com/ for our project. It's a tool similar to Miro and made communication easier.

File Structure

```
project-root/
|── data/
|       |── ascii/                    #Folder for all Pokemon ascii arts
|               |──  Arbok.txt
|               |──  Beedrill.txt
|               |──  ...
|       |── pokedex.dat               #Pokedex Struct saved as binary file
|       |── pokemon.csv               #csv file that contains all Pokemons' information
|── src/
|       |──  initialize/              #Files for initialising Pokedex data
|               |──  file_io.c
|               |── file_io.h
|               |── initialize.c
|               |── Makefile          #This makefile is used for initialising
|       |── util/
|               |── db.c              #Handles Pokedex loading and saving
|               |── db.h
|               |── page.c            #Handles Page displays
|               |──  page.h
|               |──  pokedex.c        #Handles creation and deletion of Pokedex Struct
|               |──  pokedex.h
|               |── pokemon.h
|               |──  text.c           #Handles Text to be displayed (used by page.c)
|               |── text.h
|       |── main.c
|── user/
|       |── output/                   #Folder for all Pokemon Cards saved
|               |──  Arbok.txt
|               |──  Beedrill.txt
|               |──  ...
|── Makefile
|── README.md
```

GitHub Repository

GitHub Link: https://github.com/halanaman/PLC_Project.git