Flash Mental

Adam Wu

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1 Purpose

The primary objective of this project is to help students honing their mental math skills in preparation for the flash mental competition [1]. This small application will have similar format to how the competition will be, except the fact that the students or teachers have the control to the setting of the speed of how fast the numbers will show on the screen as well as how large they would like the numbers to be. To me, I think this is really useful as this application can help both beginner level students and advanced level students to train for *Chinese American Abacus Association* (CAAA) Flash Mental Math competition [1]. Another main purpose of this project is to help me and other teachers to utilize this in classrooms so that it would be easier to use instead of preparing slides that will show the flashing numbers (which requires a great amount of time).

2 How to Use the Program

To use this program, you will need to first go through with installation. This is perhaps the hardest part of the process to get my application unfortunately, because I have no clue how to distribute this app on multi-platform since this is my first project with pygame. There are two ways to install this application, the first is to clone this repository onto your local devide, the second is to download the zip file of this repository, or you can download a binary/executable file through the release section of the repository (only applicable for MacOS apple silicon and Windows machine). I will go through step by step for each of the following.

2.1 Cloning the repository

To clone the repository, you must first have git installed through terminal. This process is very simple and can be searched how to do on the web. Once you have git installed, you may type in your terminal:

```
$ git clone https://github.com/ATOMiNATiON/flashMental.git
$
```

Once git has finished, you will find out that you will have all the files that are in my repository. The second step is to now install Python onto your machine, and pip install pygame (Can easily be done and searchable on google). Now the last thing is to go into the *src* folder. The next and final steps are to run the following command in the terminal based on your machine:

if you are running macos:

```
$ python3 flash.py
$
```

if you are running on windows:

```
$ python flash.py
$
```

The game should then start immediately on the screen

[1] The flash mental math competition is hosted by Chinese American Abacus Association (CAAA) [1]

2.2 Downloading the zip file

The second option of getting this application is to download the zip file (also install Python onto your machine as well as installing the library pygame). This one is a bit easier to do because you just have to click the green icon on the repository that says *Code*, and select *Download zip*. Once you have that, you can extract the files and open up the src folder in terminal and run the following commands based on your machine:

if you are running macos:

```
$ python3 flash.py
$
```

if you are running on windows:

```
$ python flash.py
$
```

The game should then start immediately on the screen

2.3 Downloading a binary/executable file

This final step is special because you can only use this method if you have a *1. MacOS apple silicon* or *2. Windows machine*. You do not need to install Python or any python libraries (pygame) when using this method and is much faster than all the other methods described above. If you pass the requirements stated in the first sentence, then let's begin. You go to the repository and try to locate a place called *releases*. From there, just find the executable file good for you machine and that's it!

3 Program Design

For this project, I will be using the Pygame library to create this flash mental math game. Additionally, there will be extra files (modules) that will help the main.py file. The extra files are: button.py, generate.py, and input_box.py. The button module[2] helps to create a button in pygame and also returns a boolean value when it is being clicked. The generate module helps to generate the problem specified in the game, it then returns the type of problem. The input_box module helps create input boxes in the game so that users can type the specified type of questions.

For each of the options like addition/subtraction, multiplication, and division. I created the program so that when one option is being clicked, it creates a new game loop. I chose to create a new game loop so that it would load it to a new page (from what I have researched, it is the only way to create a new page). This decision making also allowed me to create a very clean game that is very simple to use even for young kids.

4 Data Structures

This program used a stack data structure to keep all the numbers for addition and subtraction. The stack also had to check if the numbers being randomly generated were both positive when added with previous numbers **and** that it is the size of the specified digit size. Other than the stack data structure, there are no other data structure that was implemented in this project. For the future, I might utilize other data structure when creating a new feature into the game like different themes for the game (I would need to find an artist or learn how to use photoshop)

[2]The button module was from the youtuber, *Coding with Russ* [2]

5 Results

Currently, my program functionally works and overall is good. The only thing I might need to fix is the button module. Sometimes the button are not working the way I want it to work, so I will need to update the code for the button. But for now, the button works fine for normal users.

This project was really fun to create and I have learned a lot along the way when building this project. One thing I learned is that building a game is not an easy task. It takes a lot of time and effort to create. I spent at least 8+ hours for 5 days to create this game (there was still bugs too), but eventually got to work the way I want it to work.

Upon building this game, I hope that people/students would play this game that I have created so that they can practice or just have fun with it. After all, being the creator of this game, I would want nothing more than people to play this game I have built for them!

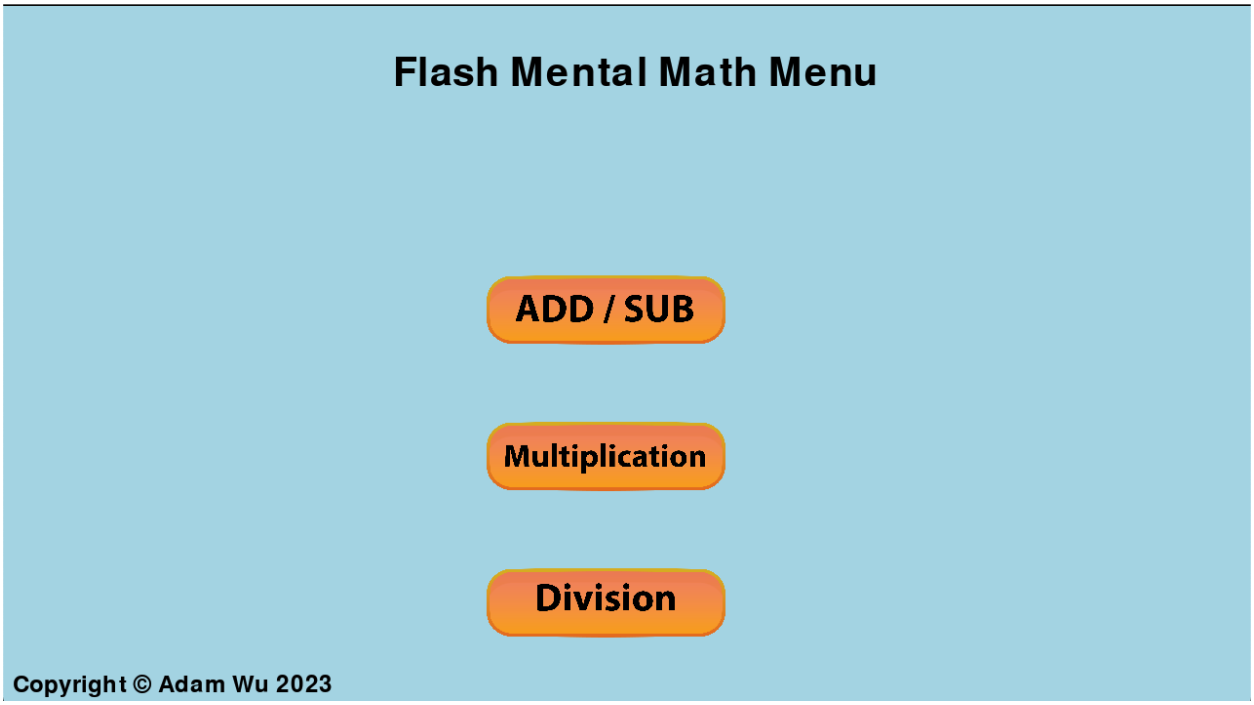

Figure 1: A screenshot of Flash Mental Math

References

[1] CAAA. Chinese american abacus association. https://caaa-abacus.weebly.com/, 2023. Accessed: 2023-09-22.

[2] Coding with Russ. Pygame beginner tutorial in python - adding buttons. https://youtu.be/G8MYGDf_-9ho?si=0l3cyihyTw0DkcsJ, 2023. Accessed: 2023-09-22.