Josi Whitlock

Mrs. McClendon

CTE LAB, Cohort F

12 December 2021

Place Value Visualization Project

App title: “Place Value Visualization.”

App video link: https://youtu.be/AGfwBrbirN8.

The app was programmed in C# using the Unity Engine framework. The app was designed to help visualize different place values in numbers. In the video linked above, a portion of the code is shown briefly before the app is demonstrated. In the demonstration, the user flips through the help pages (the manual) before entering the main program screen. Then, the user shows the process of manipulating units, followed by the demonstration of several of the menu options such as themes, visible boundaries, and animation speed.

During the development of the app, a problem was encountered: the process of combining over one thousand units at the same time would cause lag spikes of up to twelve seconds. Lag spikes of that magnitude are unacceptable for the final project. The lag was due to a large amount of processing being done during a single frame. This meant that the processing had to finish before the app would be allowed to draw a new frame, causing a massive delay between the button press and the units completing their merge.

The solution was coroutines. Coroutines are processes that will yield the thread of execution to another process as dictated by their code. For example, Units have a coroutine that runs every tenth of a second, checking if the time a merge should take has elapsed. All Unit instances run this coroutine, so if it was a method running every frame update, the overhead

would be significant. However, since the coroutine only runs every tenth of a second (yielding for a tenth of a second every iteration), the overhead is significantly reduced; from running 60 to 110 times per second to only ten. This freed up time for the merge processing to take place, and significantly reduced the lag spike.

In version 2.0, various features/additions could be made:

- More themes
- Fancier screen transition
- Nicer mini-menu buttons
- Animation speed floor and ceiling labels
- Ability to switch from tens places to decimal places

These would not only make the app more elegant to use but increase usability in classrooms extending beyond the tens places.