CS293 Project: Mandelbrot Zoom

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Brief Description

In this project, I have implemented the Mandelbrot Zoom in C++ using the **SFML** graphics library. The project has been done on Ubuntu 20.04. The program renders the Mandelbrot set in a coloured manner, and gives the user complete control over the zooming process. The user can zoom in or zoom out with a particular point as focus, translate horizontally or vertically without zooming, control the rate of zooming, change the colour palette being used, and also save the current screen as an image. The code has been extensively documented with comments and is compatible with Doxygen for generating the documentation in HTML or LaTeX formats.

Setup

1. Installing SFML
   SFML can be installed by running the following command:

   ```
   sudo apt-get install libsfml-dev
   ```

2. Compiling the source code
   I have included a makefile in the submission which takes care of compiling. In the directory of the source code, run the command

   ```
   make mandelbrot
   ```

   This should create an executable file called mandelbrot

3. Running the executable
   In the same directory, run

   ```
   ./mandelbrot
   ```

Instructions to use the application

1. Clicking on any point inside the window with the mouse leads to the application zooming in with that point as the focus. The rate of zoom is called the zoom-factor and has a default value of 1.05. Whenever a point is clicked on, we zoom in by a factor of zoom-factor.
2. The zoom-factor can be increased or decreased by units of 0.03. Pressing the ‘=’ (Equals and Plus Key) key on the keyboard increases the zoom-factor, and pressing the ‘-’ (Minus and Underscore Key) key on the keyboard reduces the zoom-factor.

3. Zoom-factor greater than 1 means we are zooming in, and Zoom-factor lesser than 1 means we are zooming out.
4. Pressing the key ‘I’ key changes the colour palette being used for painting the Mandelbrot set
5. The arrow keys can be used for translating the frame being seen. Up arrow renders a region above the current region and similarly translates in other directions for each arrow key.
6. Clicking on the letter ‘S’ saves the current image. The filename is autogenerated by processing the system date and time.

Code Documentation

The code has been extensively documented and is also compatible with Doxygen. To generate the documentation in LaTeX or HTML formats, the following steps can be followed:

1. Installing doxygen

   ```
   sudo apt-get install doxygen
   ```

2. Generating doxyfile
   In the same directory as the code, run

   ```
   doxygen -g
   ```

3. Generating the documentation

   ```
   doxygen Doxyfile
   ```

4. This will generate the documentation in two subfolders, namely HTML and LaTeX.

   To open the HTML documentation, go into the folder and open the file “index.html” in a browser. All the documentation would be accessible from there.

   To generate PDF from LaTeX, go into the LaTeX folder. Use a LaTeX compiler like pdflatex and run the command “pdflatex refman.tex”. This should generate a pdf file refman.pdf which contains the documentation.