Assignment 5 – Color Blindness Simulator

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Purpose

The purpose of this program is to simulate images that a person with dueteranopia would see and provide the user the experience of what colorblindness would feel like.

How to Use the Program

To use this program, the user must run the program with an input and output file selected. The user can also select the help option for more directions on how to use the program.

```
Options:
-i: sets the file to read from FILE
-o: sets the file to write to as FILE
-h: help message
```

Running the help function will exit the program. Otherwise, the user should specify which input and output file they will select.

These descriptions were given by the Lab Document[1].

Program Design

There are 3 major parts of this program: the section that handles creating the IO files, the section that reads or writes to those IO files, and the section that handles the actual dueteranopia bit map conversion.

Data Structures

There are some data structures used in this program. One of the main data structures that is used in this program is the buffer for reading the IO Files. This structure is what is used to allocate space for the files. There are other data structures used for the bitmap section, like the color structure and the actual bitmap.

Algorithms

This program does not use any algorithms as of yet.

Function Descriptions

There are many functions used in this program. I will sort them out based on which section they are part of.

Buffer functions

[1] Assignment 5 Surfin' USA by Kerry Veenstra edited by Ben Grant[1]

```
Buffer *read_open (const char *filename)
Inputs: name of the file
Outputs: the buffer
Purpose: This function returns the buffer and starts the read functionality.

void read_close (Buffer **pbuf)
Inputs: pointer to the pointer of the Buffer
Outputs: None
Purpose: This function closes the reading functionality of the Buffer.

Buffer *write_open (const char *filename)
Inputs: name of the file
Outputs: the buffer
Purpose: This function returns the buffer and starts the write functionality.

void write_close (Buffer **pbuf)
Inputs: pointer to the point of the buffer
Outputs: None
Purpose: This function closes the writing functionality of the Buffer.
```

Serialization Functions

```
bool read_uint8 (Buffer *buf, uint8_t *x)
Inputs: a pointer to a buffer, a pointer to a 8 bit integer
Outputs: check to see if ran
Purpose: This function reads one byte and then points to the next byte.

bool read_uint16 (Buffer *buf, uint16_t *x)
Inputs: a pointer to a buffer, a pointer to a 16 bit integer
Outputs: check to see if ran
Purpose: This function reads 2 bytes and then points to the next 2 bytes.

bool read_uint32 (Buffer *buf, uint32_t *x)
Inputs: a pointer to a buffer, a pointer to a 32 bit integer
Outputs: check to see if ran
Purpose: This function reads 4 bytes and then points to the next 4 bytes.

void write_uint8 (Buffer *buf, uint8_t x)
Inputs: a pointer to a buffer, a 8 bit integer
Outputs: None
Purpose: This function writes 1 byte x to the buffer.

void write_uint16 (Buffer *buf, uint16_t x)
Inputs: a pointer to a buffer, a 8 bit integer
Outputs: None
Purpose: This function writes 2 byte x to the buffer.

void write_uint32 (Buffer *buf, uint32_t x)
Inputs: a pointer to a buffer, a 8 bit integer
Outputs: None
Purpose: This function writes 4 byte x to the buffer.
```

Graph Functions

```
void bmp_write (const BMP *bmp, Buffer *buf)
Inputs: bitmap, buffer
Outputs: None
Purpose: This function writes a bitmap file.

BMP *bmp_create (Buffer *buf)
Inputs: buffer
Outputs: Bitmap
Purpose: This function creates a bitmap.

void bmp_free (BMP **bmp)
Inputs: pointer to the pointer of the bitmap
Outputs: None
Purpose: This function frees the bitmap.

void bmp_reduce_palette (BMP *bmp)
Inputs: pointer to the bitmap
Outputs: None
Purpose: The function adjusts the palette to simulate deuteranopia.
```

main Functions

```
int main (int argc, char **argv)
Inputs: number of arguments, arguments
Outputs: Exit value
Purpose: This function runs all of the other functions and handles input and errors too.

void print_help (void)
Inputs: None
Outputs: None
Purpose: This function prints the help.
```

Results

The code works perfectly. There were no errors while running the code. The code achieves everything that it is supposed to do. It perfectly simulates dueteranopia for each file. There are some things lacking with the code though. I feel like I could have made some things faster, like the write close function. There are some other things that could be improved, like the error handling part of the program. The outputs of the program are shown in the image below.

Error Handling

There was not much error handling to do for this program. The only error handling that was done was to handle if the strings were invalid or not given at all. To check if the read and write functions don't give proper values, I used the perror function to print if something went wrong.

References

[1] Kerry Veenstra, Jess Srinivas. Assignment 5 color blindness simulator. https://git.ucsc.edu/cse13s/spring2023/resources/-/blob/master/asgn5/asgn5.pdf, 2023. [Online; accessed 25-May-2023].

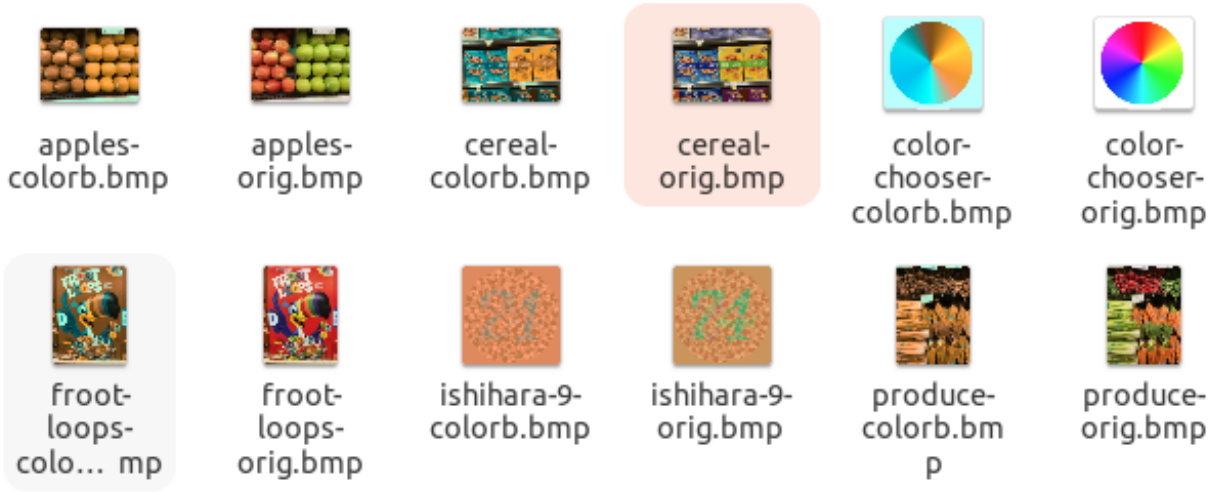

Figure 1: Screenshot of all the output files