CS 2110 Timed Lab 4: DMA

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Contents

1 Before You Begin

Please take the time to read the entire document before starting the assignment. We have made some important updates, and it is your responsibility to follow the instructions and rules.

2 Timed Lab Rules - Please Read

2.1 General Rules

1. You must take the timed lab in your assigned recitation classroom. Not doing so will be considered an honor code violation.
2. You are allowed to submit this timed lab starting at the moment the assignment is released, until you are checked off by your TA as you leave the recitation classroom. Gradescope submissions will remain open until 6 pm - but you are not allowed to submit after you leave the recitation classroom under any circumstances. **Submitting or resubmitting the assignment after you leave the classroom is a violation of the honor code - doing so will automatically incur a zero on the assignment and might be referred to the Office of Student Integrity.**
3. Make sure to give your TA your Buzzcard before beginning the Timed Lab, and to pick it up and get checked off before you leave. **Students who leave the recitation classroom without getting checked off will receive a zero.**
4. Although you may ask TAs for clarification, you are ultimately responsible for what you submit. **The information provided in this Timed Lab document takes precedence.** If in doubt, please make sure to indicate any conflicting information to your TAs.
5. Resources you are allowed to use during the timed lab:
    - Assignment files
    - Previous homework and lab submissions
    - Your mind
    - Blank paper for scratch work (please ask for permission from your TAs if you want to take paper from your bag during the Timed Lab)
6. Resources you are **NOT** allowed to use:
    - The Internet (except for submissions)
    - Any resources that are not given in the assignment
    - Textbook or notes on paper or saved on your computer
    - Email/messaging
    - Contact in any form with any other person besides TAs
7. **Before you start, make sure to close every application on your computer.** Banned resources, if found to be open during the Timed Lab period, will be considered a violation of the Timed Lab rules.
8. We reserve the right to monitor the classroom during the Timed Lab period using cameras, packet capture software, and other means.

2.2 Submission Rules

1. Follow the guidelines under the Deliverables section.
2. You are also responsible for ensuring that what you turned in is what you meant to turn in. After submitting you should be sure to download your submission into a brand new folder and test if it works. No excuses if you submit the wrong files, what you turn in is what we grade. In addition, your assignment must be turned in via Canvas/Gradescope. Under no circumstances whatsoever we will accept any email submission of an assignment. Note: if you were granted an extension you will still turn in the assignment over Canvas/Gradescope.
3. Do not submit links to files. We will not grade assignments submitted this way as it is easy to change the files after the submission period ends.

2.3 Is collaboration allowed?

Absolutely NOT. No collaboration is allowed for timed labs.

3 Overview

For this assignment, you will be drawing a collage onto the GBA screen. To create the collage, you will be implementing two functions in `TL04.c`:

1. `fillScreen`
2. `cropAndDisplay`

We have also provided `myLib.h`, which contains relevant macros for the GBA, `Makefile`, which will be used to compile your code, and all of the image files needed. The **only** file you need to edit is `TL04.c`

PLEASE DOUBLE CHECK YOUR SUBMISSION BEFORE YOU LEAVE THE TIMED LAB.

4 Instructions

4.1 fillScreen

Parameters:

- `volatile u16* color`: A pointer to an unsigned short representing a color.

Return type: `void`

Description: This function will fill the GBA screen with 2 colors. The top half of the screen will be colored using `color`, and the bottom half will be colored using the complementary color of `color`. The complementary color can be found from the original `color` by subtracting each BGR value from the maximum possible value for each channel (`0x1F`). This function must use DMA, and cannot use looping constructs (for loops, while loops, do-while loops, etc.).

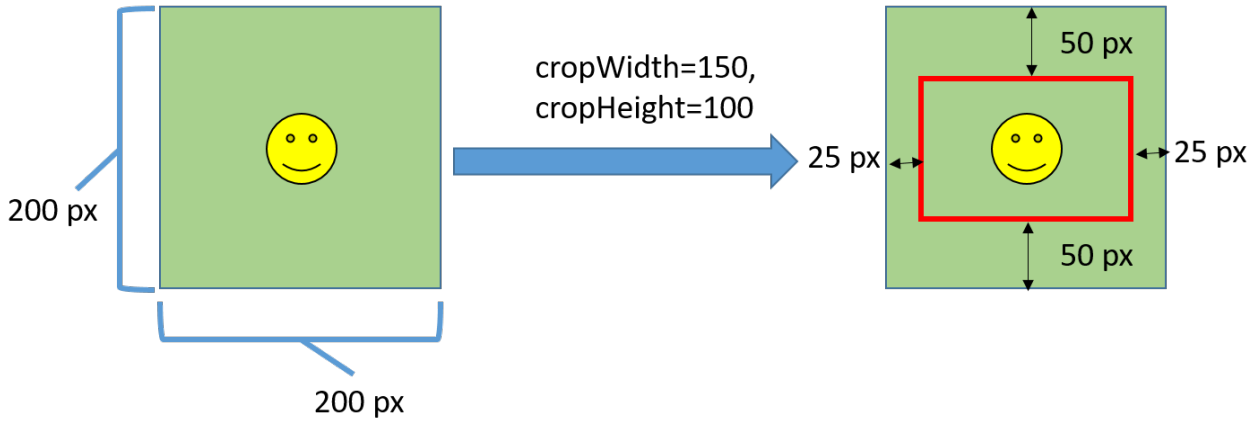
4.2 cropAndDisplay

Parameters:

1. `const unsigned short* image`
2. `unsigned int imWidth`: width of image
3. `unsigned int imHeight`: height of image
4. `unsigned int cropWidth`: width of your cropped image
5. `unsigned int cropHeight`: height of your cropped image
6. `unsigned int row`: row on the GBA screen
7. `unsigned int col`: column on the GBA screen

Return type: `int`

Description: This function should crop the image according to the parameters `cropWidth` and `cropHeight`, and display the result on the GBA screen. You should crop the image so that the cropped margins will be equal on all sides. For example, if imWidth=200, imHeight=200, cropWidth=150, cropHeight=100, your crop window should look like this:



The cropped image's top left corner should be at the location specified by the `row`, `col` parameters.

You should also use DMA in this function, and use exactly 1 for loop (no nested for loops).

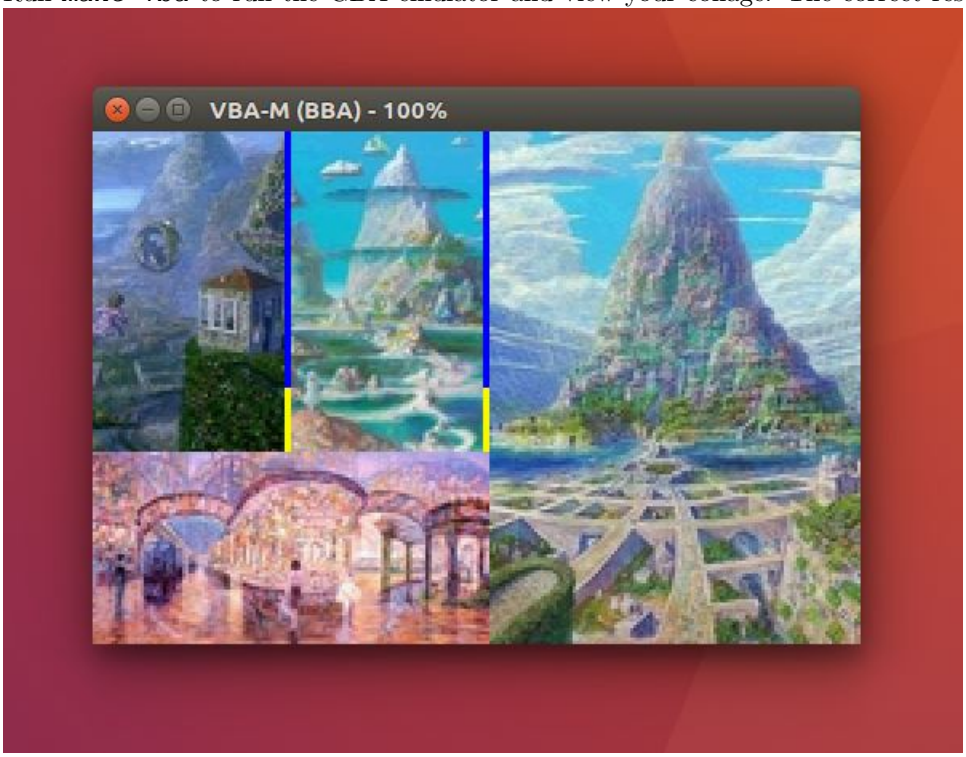
If the crop size is larger than the original image in either direction, the function should not draw anything to the screen, and return the value 1. Otherwise, return 0.

4.3 Restrictions

You should not edit any other files in the directory except for `TL04.c`.

5 Testing Your Work

Run `make vba` to run the GBA emulator and view your collage. The correct result should look like this:



Please note that we will be testing your submission on Ubuntu 16.04. Your submission **MUST** work on Ubuntu 16.04.

6 Rubric

The output is an approximation of your score on this timed lab. It is a tool provided to students so that you can evaluate how much of the assignment expectations your submission fulfills. However, **we reserve the right to run additional tests, fewer tests, different tests, or change individual tests** - your final score will be determined by your instructors and no guarantee of tester output correlation is given.

7 Deliverables

Please upload the following files to Canvas:

1. `TL04.c`

Do NOT upload an archive, upload the files individually.

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