98-008 Homework 1: PPM Parsing

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Fall 2022

Overview

The goal of assignment is to get you used to basic Rust constructs and syntax, filling out the core of a program that actually does something useful! We hope this will give you familiarity with Rust's development workflow and make you appreciate the language.

This assignment will have you write a basic parser for a simple image format known as PPM.

PPM Images

PPM is a very simple image format, consisting of just:

- A "magic number" to distinguish it from other files
- Width and height of the image
- The maximum intensity value of
- Pixels as packed RGB pixel values, read sequentially row-by-row from the top left of the image.

`http://ailab.eecs.wsu.edu/wise/P1/PPM.html` outlines the format; for simplicity, we'll summarize it again here. Note that we'll be using the binary format, where each pixel channel takes up exactly one byte.

PPM Format Specification

`PPM`	::=	`MagicHeader`
		`CommentsAndWhitespace` `Width`
		`CommentsAndWhitespace` `Height`
		`CommentsAndWhitespace` `Maxval`
		"$\n$" `Pixels`
`MagicHeader`	::=	"$P6$"
`CommentsAndWhitespace`	::=	("$\t$" | "$\n$" | "$\x0C$" | "$\r$" | " " | ("#" `Comment` "$\n$"))
		`CommentsAndWhitespace`
`Comment`	::=	((Any character except for "$\n$") `Comment`) | ϵ
`Width`	::=	(("0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9") `Width`) | ϵ
`Height`	::=	`Width`
`Maxval`	::=	`Maxval`
`Pixels`	::=	Exactly $w * h * 3$ bytes, where w and h are the parsed width and height

How to read this table: groups being right next to each other means the text they match should be concatenated. The | operator means that either the left or right character can be accepted. Characters in "" means only that exact string is accepted. ϵ matches the empty string.

PPM Image Example

An example would probably help understand the above specification a bit better:

```
P6
# I'm a PPM file! You can tell by the magic header
3 3 # This first number is the width, and the second is the height
# This next number is the maximum intensity of each pixel
# Exporting as "raw" in GIMP always gives 255, which makes sense; this is the
# maximum value of a u8. After this maxval, we are only allowed a single newline
# before the pixels start. These pixels can be arbitrary bytes!
255
<<<<<<<<<aaaaaaaaa~~~~~~~~~
```

Copy-pasting this text into a file ending with `.ppm` and opening it in a compatible image-viewing program should give a 3x3 image with 3 horizontal gray stripes.