Introduction

In this assignment, you'll write a program that will introduce you to programming in C on UNIX based systems.

Learning Outcomes

* How to write a C program to solve a problem? (Module 1 MLO 4)
* How do you interact with the user in C programs? (Module 1 MLO 6)
* How are C programs transformed into an executable form? (Module 1 MLO 7)
* Define programming language constructs in C (Module 2 MLO 1)
* Describe structure data types of C programming language (Module 2 MLO 3)
* What are pointers and how is this mechanism supported in C? ((Module 2 MLO 4)
* Describe memory allocation in Unix (Module 2 MLO 5)
* Explain how to create and manipulate strings in C (Module 2 MLO 6)

Instructions

Write a program that

* Reads a CSV file with movie data that is provided to the program as an argument
* Processes the data in the file to create structs to hold data for each movie
* Creates a linked list of all these structs
* Gives user choices to ask questions about the movies in the data
* Prints out the data about the movies per user choice

Format of the CSV File

Here is a [sample file](https://canvas.oregonstate.edu/courses/1884946/files/91228449/download) whose format corresponds to the format of the CSV file your program will be tested with.

* The first line in the input file will always be the header line containing the column headers (i.e., it will not have data for a movie).
* All the other lines will have the data for a movie in valid format and no columns will be missing.
* The file will not have any empty lines.
* The file will contain data for at least one movie.
* Don't assume a maximum number of movies in the file.
* Commas appear as delimiters between columns, but will not appear in the values of any columns.
* The name of the input file will be less than 50 characters and will not contain any spaces.
* Don't assume that the input file name will have a particular extension.

This file has the following columns:

1. Title
   * This is a string with the movie title.
   * E.g., Iron Man 2
   * You cannot assume a maximum length of the movie title.
2. Year
   * This is a 4 digit integer value for the year the movie was released
   * It's value will be between 1900 and 2021 (inclusive of these years).
   * E.g., 2010
3. Languages
   * The language or languages in which the movie was released.
   * One or more string values that are always enclosed within []
   * Multiple values are separated by semi-colons.
   * E.g,
     + [English;Portuguese;Spanish]
     + [English;French]
     + [English]
   * You can assume that the maximum number of languages any movie can be released in is 5.
   * You can assume that the maximum length of a language string is 20 characters.
   * You cannot assume any particular case for the letters in the language.
     + E.g., don't assume that the first letter is upper case, or that all letters are lowercase.
4. Rating Value
   * A number between 1 and 10 (inclusive of both 1 and 10)
   * It can be an integer or a double with one digit after the decimal point
   * E.g.,
     + 5
     + 8.7

Program Functionality

Process the input file

When your program starts it must read all data from the file and process it. After processing the file, the program must print the following message to stdout

"Processed file XYZ and parsed data for M movies"

where XYZ is the name of the file that has been process and M is the number of movies whose data has been processed (this will be 1 less than than the number of lines in the file because the first line has the column headers).

E.g., Processed file movies\_sample\_1.csv and parsed data for 24 movies

Interactive Functionality

Next your program should display a menus of interactive choices to the user and process the selected choice as described below. For the text of messages to print, see the section "Sample Program Execution."

1. Show movies release in the specified year

* If the user chooses this option, then ask them to enter a year and
  + Display the names of all the movies released in that year, one on each line
* If the data doesn't have any movies released in that year, print a message about this.
* Your program can assume that the user will enter a 4 digit integer for the year between 1900 and 2021 (inclusive of these years)

2. Show highest rated movie for each year

* If the user chooses this option, then for each year for which at least one movie was released, display a movie that had the highest rating along with the year and the rating with one line per year.
  + In case of ties, display any one movie that had the highest rating that year.
* Display the data in the form: YYYY RatingValue MovieTitle
* The data doesn't have been sorted by year or by rating value.
* E.g.,
  + 2010 8.5 Avengers: Infinity War
  + 2012 8.1 The Avengers

3. Show movies and their year of release for a specific language

* If the user chooses this option, ask them to enter a language and
  + For all movies released in the specified language
  + Display the year of release and the movie title, one line per movie
* If the data doesn't include any movie released in this language, print a message about it.
* You should only do an exact match on the language entered by the user
  + E.g., "English" shouldn’t match "english"
* You can assume that the length of the language string entered by the user will be less than 20 character.

4. Exit

* If the user choose this option, the program should exit.

Notes:

* For the interaction choice if  the user enters an incorrect integer (i.e., something other than 1 to 4), print an error message and again present the 4 choices to the user.
* You can assume that when the program asks user to enter an integer, the user will indeed enter an integer (i.e., you don't need to verify the data type of the user input).
* Don't assume that the languages in the test file will be the same as the ones that appear in the sample file.
* Don’t make an assumption about the number of distinct languages that can appear in the test file.

Technical Requirements

Your program is required to

1. Read data from the file line by line
2. Break-up the line into tokens
3. Create a struct called movie with the data for that line
4. Create a linked list containing all the movie structures

In the Resources Section we have provided sample code that you can adapt to meet these technical requirements.

Sample Program Execution

Here is a complete example of executing the assignment with the provided sample CSV file.

$ ./movies movies\_sample\_1.csv   
Processed file movies\_sample\_1.csv and parsed data for 24 movies  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 1  
Enter the year for which you want to see movies: 1999  
No data about movies released in the year 1999  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 1  
Enter the year for which you want to see movies: 2012  
The Avengers  
Rise of the Guardians  
Anna Karenina  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 2  
2008 7.9 Iron Man  
2009 7.6 Sherlock Holmes  
2010 7.0 Iron Man 2  
2013 7.2 Iron Man 3  
2017 7.9 Thor: Ragnarok  
2012 8.1 The Avengers  
2016 7.8 Captain America: Civil War  
2018 8.5 Avengers: Infinity War  
2015 7.4 Avengers: Age of Ultron  
2011 7.0 Thor  
2014 7.8 Captain America: The Winter Soldier  
2003 6.6 Right on Track  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 3  
Enter the language for which you want to see movies: English  
2008 The Incredible Hulk  
2009 Sherlock Holmes  
2008 Iron Man  
2010 Iron Man 2  
2013 Iron Man 3  
2017 Thor: Ragnarok  
2012 The Avengers  
2016 Doctor Strange  
2018 Avengers: Infinity War  
2015 Avengers: Age of Ultron  
2011 Thor  
2013 Thor: The Dark World  
2017 Spider-Man: Homecoming  
2011 Captain America: The First Avenger  
2016 Captain America: Civil War  
2015 Ant-Man  
2014 Captain America: The Winter Soldier  
2018 Mary Queen of Scots  
2016 Revolting Rhymes Part One  
2017 The Glass Castle  
2016 Free Fire  
2003 Right on Track  
2012 Rise of the Guardians  
2012 Anna Karenina  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 3  
Enter the language for which you want to see movies: Punjabi  
No data about movies released in Punjabi  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 5  
You entered an incorrect choice. Try again.  
  
1. Show movies released in the specified year  
2. Show highest rated movie for each year  
3. Show the title and year of release of all movies in a specific language  
4. Exit from the program  
  
Enter a choice from 1 to 4: 4  
$

Hints

* Code the functionality incrementally, constantly testing it and using version control (e.g., Git) to track changes.
  + You can use the Grading Rubric as a guide to incrementally develop the functionality.
* To convert a string to int, you can use the function [atoi (Links to an external site.)](https://man7.org/linux/man-pages/man3/atoi.3.html" \t "_blank).
* To convert a string to a double, you can use the function [strtod (Links to an external site.)](https://man7.org/linux/man-pages/man3/strtod.3.html" \t "_blank).
* To extract tokens from a string, use [strtok\_r (Links to an external site.)](https://man7.org/linux/man-pages/man3/strtok_r.3.html" \t "_blank) instead of strtok.
* To print a variable of data type double to one decimal space, use "%.1f" for this variable in the format string passed to [printf (Links to an external site.)](https://man7.org/linux/man-pages/man1/printf.1.html" \t "_blank).

Resources

* We have provided an example program [main.c (Links to an external site.)](https://repl.it/@cs344/studentsc" \l "main.c" \t "_blank) that reads a space delimited text file with student data, processes it line by line, creates a linked list of student structs with that data and then prints that data.
  + In your assignment, you can use and adapt any code from this program and also any code presented in the explorations.
  + A sample file with student info that you can use with this program is available [here (Links to an external site.)](https://repl.it/@cs344/studentsc#student_info1.txt).
  + You can compile and run the program by using the following commands:

gcc --std=gnu99 -o students main.c