Programming Assignment 2

Due: W Feb 18 @ 11:59PM CST

This project extends your DVD library program to add search functionality. You will also modify your existing code to manipulate DVD data in multiple formats. Your program must satisfy many requirements (indicated below by the word must). I have divided the requirements into three parts, to better explain how your program should behave. There is no need to split your program into three parts; rather, you should write and submit one program that satisfies all the requirements described in all parts of this document.

Part I: Data Formats

Your program will manipulate data in three different formats:

Disk format. Your program will load data from and store data to a text file. Download the initial data file **`movies.txt`**, and examine it. The first line of this file contains movie attributes, separated by a tab character (`'\t'`). Each of the file's remaining lines contains data for one movie. Each movie's attribute values are separated by a tab and are in the same order as the attributes on the first line. Note that attributes which have multiple values are encoded as a possibly empty, `'/'`-delimited string.

In-memory format. The DVD library data structure is the same as in the previous assignment, but your program must build the data structure from the data file. The data structure must be a dictionary. The dictionary's keys must be strings of one or more numerical characters, which correspond to a UPC. The dictionary's values must themselves be dictionaries, where each value encodes the movie data that corresponds to its UPC key. A movie's dictionary must be encoded as described in the table to the right.

Key	Value Type
`'title'`	`str`
`'year'`	`int`
`'rating'`	`str`
`'directors'`	`list of str`
`'stars'`	`list of str`
`'genres'`	`list of str`

Display format. When your program displays a movie, the output must conform to the following template:

```
   Record: 17
      UPC: 9780792852193
    title: The Usual Suspects (Special Edition)
     year: 1995
directors: Bryan Singer
    stars: Stephen Baldwin | Gabriel Byrne | Benicio Del Toro | Kevin Pollak | Kevin Spacey
   rating: R
   genres: Crime | Mystery | Neo-Noir | DTS | DVD | Full Screen | Widescreen
```

In particular, the output must:

- Include a record number. This number indicates the order in which the movie was printed out in a list of other movies. If the user sorts the movies, then the record number displayed for a particular movie could change.
- Line up the colons after all the attribute names.
- Display any attribute with multiple values (i.e., directors, stars, and genres) as a `' | '`-delimited string.

Part II: Loading, Saving, and Adding Movie Data

Implement the following operations, which convert data from disk format to in-memory format, and vice-versa:

Load movies. The program opens `movies.txt` and converts the file's text data from disk format to in-memory format. The load operation must execute before the user sees the menu. The load operation must print out how many movies were loaded (see example output). Your program must offer the load operation to the user as a menu option. When the user chooses this option, the program re-loads the movie data from disk, replacing the current in-memory data. If the user has changed the movie data without saving it, the load operation erases those changes.

Save movies. The program saves the in-memory data to `movies.txt` in the disk format. Your program must offer the save operation to the user as a menu option. It is the user's responsibility to save data. If the user does not preserve changes before re-loading data or exiting the program, those changes are lost.

Add a movie. Modify the add operation from your previous program so that it obeys these requirements: When the user chooses to add a movie, your program should prompt the user to enter a value for each attribute. Match each user-entered attribute against a regular expression, to ensure the user's entry is in the proper format. Your regular expressions must enforce the following attribute formats:

`UPC`: One or more digits.
`title`: One or more characters.
`year`: Four digits.
`rating`: Either G or PG or PG-13 or R or NC-17 or NR.
`directors`, `stars`, `genres`: A possibly empty, `'/'`-delimited string where each element is one or more characters .

If the user's entry matches the regular expression, convert the entry to the in-memory format described in the table above. After the user has entered information for all attributes, add the new movie to the database. If the user makes a mistake, continue to prompt the user to enter a value. If the user hits `Ctrl-C`, then abort the add operation and return the user to the menu.

You can assume that there is a file in the current directory called `movies.txt`, and that all loads and saves go to this file.

Part III: Search

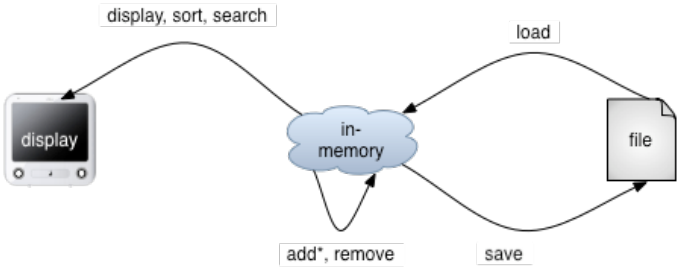
Provide two search operations for your user:

Simple search. Prompt the user to enter a query in the form `attribute=searchvalue`. Iterate through the database and locate any movies where the value for the user-specified `attribute` contains the value in the user specified `searchvalue`. Your program must continue to prompt the user to enter a query until the query format is correct, and the user-entered `attribute` is valid. If the user hits `Ctrl-C`, the program must abort the search and return the user to the menu. If your program implements sort-by-attribute, then it must display the results sorted by the user-entered `attribute`. (See sample output for an example of a query.)

Advanced search. Prompt the user to enter a query in the form `attribute=regex`, where `regex` is a regular expression. Compile the regular expression, and iterate through the database to locate any movies where the value for the user-specified `attribute` contains the value described by the the user specified `regex`. [Hint: Use the compiled expression's `search` method, instead of its `match` method.] Your program must continue to prompt the user to enter a query until the query format is correct, and the user-entered `regex` is valid. If the user hits `Ctrl-C`, the program must abort the search and return the user to the menu. If your program implements sort-by-attribute, then it must display the results sorted by the user-entered `attribute`.

Summary

The diagram on the right illustrates how the various operations in your program manipulate the various data formats.



*The add operation also converts from a user format to the in-memory format.

What To Turn In

Turn in your program in a single file called `pa2.py`; you need not submit `movies.txt`. You must also turn in a project report in the file `report.txt`.
Each submitted file should have both team members' names and EIDs in a comment at the top of the file. Be sure to read the **Programming Assignment Overview** for instructions on how to prepare your report and submit your work. The *`homework-name`* for this assignment is: `pa2`.

Extras

- Allow the user to choose which file to load from and save to. The load operation must continue to prompt the user to enter a filename that exists and is properly formatted. The save operation must get user confirmation to over-write an existing file (use `os.path.isfile` to check whether a file exists).
- Track user changes. Save the file only if the user has made changes. If the user wants to perform an operation that may erase changes (e.g., quit, load), ask the user if they would like to save their changes first. Do so only if there are unsaved changes.
- Allow the user to combine attribute queries, as in: `stars=Clooney AND directors=Coen`.

Example Program Execution

Below is an example of the program running. Some records have been omitted for brevity. Notice the search results and error handling. This particular program has also implemented sort-by-attribute, so the output may differ from yours.

```
Loaded 20 movies
********************************************************************************
MENU:
   0: Display all the movies in your collection
   1: Sort movies by a given key
   2: Search movies by key
   3: Search movies using a regular expression
   4: Add a new movie to the collection
   5: Remove a movie from the collection
   6: Load movies from disk
   7: Save changes to disk
   8: Quit the program
********************************************************************************
Enter a choice: 0
    Record: 1
       UPC: 0012236131472
     title: Reservoir Dogs
      year: 1992
 directors: Quentin Tarantino
     stars: Kirk Baltz | Lawrence Bender | Randy Brooks | Edward Bunker | Steve Buscemi
    rating: R
    genres: Crime | Gangsters | DTS | DVD | Full Screen

    Record: 2
       UPC: 0043396189713
     title: Seinfeld - Season 8
      year:
 directors: Andy Ackerman
     stars:
    rating: NR
    genres: Domestic Comedies | Seinfeld | DTS | Comedy | Television | DVD | Boxed Set | Full Screen
                                          etc.

********************************************************************************
MENU:
   0: Display all the movies in your collection
                                          etc.
   8: Quit the program
********************************************************************************
Enter a choice: 2
Enter your search in the form key=search_string: Clooney
Invalid entry.
       Improper query: Clooney
Enter your search in the form key=search_string: stars=Clooney
    Record: 1
       UPC: 9780790747422
     title: Three Kings
      year: 1999
 directors: David O. Russell
     stars: George Clooney | Nora Dunn | Ice Cube | Holt McCallany | Mykelti Williamson
    rating: R
    genres: Comic Action | George Clooney | Comedy | Drama | Persian Gulf War | Military Life | Anti-War Films |
Iraq War | DTS | Action & Adventure | DVD | Widescreen

    Record: 2
       UPC: 9780788826887
     title: O Brother, Where Art Thou?
      year: 2000
 directors: Joel Coen
```

```
     stars: Michael Badalucco | George Clooney | Frank Collison | Charles Durning | Wayne Duvall
    rating: PG-13
    genres: Crime | Comic Action | George Clooney | Comedy | Drama | Buddy Films | Obsessive Quests | Comic
Criminals | DTS | Action & Adventure | DVD | Widescreen

********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 3
Enter your search in the form key=regex: year=19\d4
    Record: 1
       UPC: 9780800141707
     title: Dr. Strangelove or: How I Learned To Stop Worrying and Love the Bomb
      year: 1964
 directors: Stanley Kubrick
     stars: Glenn Beck | Frank Berry | Jack Creley | Hal Galili | Sterling Hayden
    rating: PG
    genres: Divers | Military & War | Satire | Comedy

    Record: 2
       UPC: 9786305168850
     title: Young Frankenstein (Special Edition)
      year: 1974
 directors: Mel Brooks
     stars: Anne Beesley | Oscar Beregi Jr. | Rusty Blitz | Peter Boyle | Johnny Dennis
    rating: PG
    genres: Mel Brooks | Gene Wilder | DTS | Special Editions | Parody & Spoof | Comedy | DVD | Widescreen
```

etc.

```
********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 4
Enter value for UPC: 043396141223
Enter value for title: Ghostbusters
Enter value for year: 1984
Enter value for rating: pg
Invalid entry.
       Your input pg does not match pattern for rating: (G)|(PG)|(PG-13)|(R)|(NC-17)|(NC17)|(NR)
Enter value for rating: PG
Enter values for directors (Use | to separate values): Ivan Reitman
Enter values for stars (Use / to separate values): Bill Murray / Dan Aykroyd / Harold Ramis
Enter values for genres (Use / to separate values): Comedy / Ghosts
********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 3
Enter your search in the form key=regex: year=19\d4
    Record: 1
       UPC: 9780800141707
     title: Dr. Strangelove or: How I Learned To Stop Worrying and Love the Bomb
      year: 1964
 directors: Stanley Kubrick
     stars: Glenn Beck | Frank Berry | Jack Creley | Hal Galili | Sterling Hayden
```

```
    rating: PG
    genres: Divers | Military & War | Satire | Comedy

    Record: 2
       UPC: 9786305168850
     title: Young Frankenstein (Special Edition)
      year: 1974
 directors: Mel Brooks
     stars: Anne Beesley | Oscar Beregi Jr. | Rusty Blitz | Peter Boyle | Johnny Dennis
    rating: PG
    genres: Mel Brooks | Gene Wilder | DTS | Special Editions | Parody & Spoof | Comedy | DVD | Widescreen

    Record: 3
       UPC: 043396141223
     title: Ghostbusters
      year: 1984
 directors: Ivan Reitman
     stars: Bill Murray | Dan Aykroyd | Harold Ramis
    rating: PG
    genres: Comedy / Ghosts
```

etc.

```
********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 7
Changes saved
********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 6
Loaded 21 movies
********************************************************************************
MENU:
   0: Display all the movies in your collection
```

etc.

```
   8: Quit the program
********************************************************************************
Enter a choice: 8
```