

ECE 175: Computer Programming for Engineering Applications

Homework Assignment 9

Due Date: 11.59 pm Tuesday November 9, 2021, via D2L dropbox

Conventions: Name your C programs as *hwxy.c* where x corresponds to the homework number and y corresponds to the problem number. For example, the C program for homework 9, problem 1 should be named as *hw9p1.c*.

Write comments to your programs. Programs with no comments will receive PARTIAL credit.

Submission Instructions: Use the designated Dropbox on D2L to submit your .c files.

Lab 9: **No Lab 9** assignment during the week of November 8 – 12, 2021.

Use the lab sessions on Wednesday on Friday to

- 1) get help with your final project, e.g. talk to TA/ULA about the overview or the program flow of your final project, get started on writing the C code, etc.
- 2) Prepare for midterm 2 exam. The written exam of midterm 2 is on Tuesday November 16, 2021. The lab exam of midterm 2 is during your lab session of November 15-19, 2021.

Problem 1(100 points) Songs database

The song database used in this assignment is a modified version from <https://chart2000.com/about.htm>

Use the following user-defined type:

```
#define SSIZE 100
typedef struct song_s {
    char name[SSIZE];      //song name
    char artist[SSIZE];    //artist(s)
    int year;              //year released
    int us_rank;           //highest rank in US in that year
} song;
```

Write an interactive C program that

- 1) first ask a user a number of songs to read in (from the text file, **song_top100.txt on D2L**) – let's keep it in **int num**
- 2) **dynamically allocate memory** for an array of **songs** of the appropriate size (**num** that the user just enters in step 1))
Note: 12 points will be deducted if malloc or calloc is not used with this homework.
free() should be used when the memory that you request is no longer in used.
- 3) read the data from the text file (song_top100.txt) to initialize the dynamically allocated array above.
- 4) display an option menu (as shown in the sample code execution). The program lets a user search by
 - **keyword**: The list of songs that their name contains the keyword entered by a user. The list is displayed and sorted by its released year.
 - **artist**: The list of songs by the artist name entered by a user. The list is displayed and sorted by its released year.
 - **year**: The list of songs with top 5 US rankings in the year entered by a user.

- *ranking*: The list of songs with the US ranking entered by a user. The list is displayed and sorted by its released year.
- 5) ask a user to enter an option and display the number of songs meeting the search criterion.
 - 6) interactive (q/Q to quit)

Note: 10 points will be deducted if the songs are not listed by the released year.

The given function `selection_sort` (zyBooks section 13.6) is to sort an array of type `int` from maximum to minimum value. *Modify these functions* to use variables of type `songs` and to make it sort by the "year" member of `songs`

```
void swap(int *x, int *y){
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
}

void selection_sort(int x[], int size){
    int i, j, max;
    for (i = 0; i < size; i++) {
        max = i; // start searching from currently unsorted
        for (j = i; j < size; j++) {
            if (x[j] > x[max]) //change it to use "year" member of songs
                max = j; //if found a larger element, move it to the front
        }
        swap(&x[i], &x[max]);
    }
}
```

Below is the list of the first 25 songs from the text file. It is used in Sample code execution 1. Observe that the songs read in from the text file are not sorted by year.

Better(2019) by Khalid, US(8)
 Shape Of You(2017) by Ed Sheeran, US(1)
 Without You(2021) by The Kid LAROI, US(8)
 Harlem Shake(2013) by Baauer, US(1)
 Girl Crush(2015) by Little Big Town, US(18)
 Leave The Door Open(2021) by Silk Sonic (Bruno Mars & Anderson .Paak), US(1)
 Thinking Out Loud(2015) by Ed Sheeran, US(2)
 Wildest Dreams(2015) by Taylor Swift, US(5)
 Sing(2014) by Ed Sheeran, US(13)
 Moves Like Jagger(2012) by Maroon 5 & Christina Aguilera, US(9)
 Teenage Dream(2010) by Katy Perry, US(1)
 The Fight Song(2015) by Rachel Platten, US(6)
 Beautiful(2013) by Mariah Carey & Miguel, US(15)
 Trampoline(2019) by SHAED, US(13)
 Starboy(2016) by The Weeknd & Daft Punk, US(2)
 Ain't It Fun(2014) by Paramore, US(10)
 Highest In The Room(2020) by Travis Scott, US(8)

Say Something(2014) by A Great Big World & Christina Aguilera, US(4)
Levitating(2021) by Dua Lipa & DaBaby, US(2)
Wake Me Up(2013) by Avicii, US(4)
Beneath Your Beautiful(2013) by Labrinth & Emeli Sande, US(34)
I'll Wait(2013) by Mumford & Sons, US(12)
Just The Way You Are (Amazing)(2011) by Bruno Mars, US(6)
Cooler Than Me(2010) by Mike Posner, US(6)
Rake It Up(2017) by Yo Gotti & Nicki Minaj, US(8)

Observe that a user can enter lowercase or UPPERCASE letters when searching.

Sample code execution 1 (**Bold** information entered by a user)

Enter number of songs you want to use from the database: **25**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

Ket

no choice found

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

KEY

Enter the keyword: **Happy**

No songs with Happy in this database

Continue (q/Q to quit)? **a**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

key

Enter the keyword: **you**

3 songs with you

Without You(2021) by The Kid LAROI, US(8)

Shape Of You(2017) by Ed Sheeran, US(1)

Just The Way You Are (Amazing)(2011) by Bruno Mars, US(6)

Continue (q/Q to quit)? **h**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

artist

Enter the artist name: **Flo rida**

No songs by Flo rida in this database.

Continue (q/Q to quit)? **s**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

artist

Enter the artist name: **ED sheeRan**

3 songs by ED sheeRan

Shape Of You(2017) by Ed Sheeran, US(1)

Thinking Out Loud(2015) by Ed Sheeran, US(2)

Sing(2014) by Ed Sheeran, US(13)

Continue (q/Q to quit)? **j**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

ARTIST

Enter the artist name: **Christina Aguilera**

2 songs by Christina Aguilera

Say Something(2014) by A Great Big World & Christina Aguilera, US(4)

Moves Like Jagger(2012) by Maroon 5 & Christina Aguilera, US(9)

Continue (q/Q to quit)? **l**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

year

Enter year: **2000**

No songs in 2000 in this database.

Continue (q/Q to quit)? **t**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

year

Enter year: **2013**

2 songs with top 5 ranking in 2013

Harlem Shake(2013) by Baauer, US(1)

Wake Me Up(2013) by Avicii, US(4)

Continue (q/Q to quit)? **n**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

rank

no choice found

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

rank

Enter highest US ranking: **90**

No songs with US rankings of 90

Continue (q/Q to quit)? **d**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

rank

Enter highest US ranking: **1**

4 songs with US rankings of 1

Leave The Door Open(2021) by Silk Sonic (Bruno Mars & Anderson .Paak), US(1)

Shape Of You(2017) by Ed Sheeran, US(1)

Harlem Shake(2013) by Baauer, US(1)

Teenage Dream(2010) by Katy Perry, US(1)

Continue (q/Q to quit)? **q**

Sample code execution 2 (**Bold** information entered by a user)

Enter number of songs you want to use from the database: **1098**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

kEy

Enter the keyword: **HaPpy**

2 songs with HaPpy

I Hope You're Happy Now(2020) by Carly Pearce & Lee Brice, US(27)

Happy(2014) by Pharrell Williams, US(1)

Continue (q/Q to quit)? **v**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

Artist

Enter the artist name: **Flo rida**

11 songs by Flo rida

My House(2016) by Flo Rida, US(4)

G.D.F.R(2015) by Flo Rida & Sage The Gemini, US(8)

I Don't Like It, I Love It(2015) by Flo Rida, Robin Thicke & Verdine White, US(43)

Troublemaker(2013) by Olly Murs & Flo Rida, US(25)

Good Feeling(2012) by Flo Rida, US(3)

I Cry(2012) by Flo Rida, US(6)

The Wild Ones(2012) by Flo Rida & Sia, US(5)

Whistle(2012) by Flo Rida, US(1)

Good Feeling(2011) by Flo Rida, US(4)

Where Them Girls At(2011) by David Guetta, Flo Rida & Nicki Minaj, US(14)

Club Can't Handle Me(2010) by Flo Rida & David Guetta, US(9)
Continue (q/Q to quit)? **b**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

YEAR

Enter year: **2020**

38 songs with top 5 ranking in 2020

Roxanne(2020) by Arizona Zervas, US(4)

Dynamite(2020) by BTS, US(1)

Toosie Slide(2020) by Drake, US(1)

Someone You Loved(2020) by Lewis Capaldi, US(4)

Dance Monkey(2020) by Tones & I, US(4)

Intentions(2020) by Justin Bieber & Quavo, US(5)

Heartless(2020) by The Weeknd, US(4)

10,000 Hours(2020) by Dan & Shay & Justin Bieber, US(5)

Positions(2020) by Ariana Grande, US(1)

Memories(2020) by Maroon 5, US(2)

Savage(2020) by Megan Thee Stallion & Beyonce, US(1)

The Box(2020) by Roddy Ricch, US(1)

WAP(2020) by Cardi B & Megan Thee Stallion, US(1)

Come & Go(2020) by Juice WRLD & Marshmello, US(2)

Stupid Love(2020) by Lady GaGa, US(5)

Roses(2020) by SAINT JHN, US(4)

Don't Start Now(2020) by Dua Lipa, US(2)

Blinding Lights(2020) by The Weeknd, US(1)

Watermelon Sugar(2020) by Harry Styles, US(1)

Laugh Now Cry Later(2020) by Drake & Lil Durk, US(2)

Mood(2020) by 24kGoldn & iann dior, US(1)

Popstar(2020) by DJ Khaled & Drake, US(3)

Lose You To Love Me(2020) by Selena Gomez, US(5)

Godzilla(2020) by Eminem & Juice WRLD, US(3)

Stuck With U(2020) by Ariana Grande & Justin Bieber, US(1)

Wishing Well(2020) by Juice WRLD, US(5)

Savage Love (Laxed 0 Siren Beat)(2020) by Jawsh 685 & Jason Derulo, US(1)

The Scotts(2020) by The Scotts, US(1)

Say So(2020) by Doja Cat & Nicki Minaj, US(1)

Rockstar(2020) by DaBaby & Roddy Ricch, US(1)

All I Want For Christmas Is You(2020) by Mariah Carey, US(1)

Circles(2020) by Post Malone, US(1)

I Hope(2020) by Gabby Barrett & Charlie Puth, US(3)

Holy(2020) by Justin Bieber & Chance The Rapper, US(3)

WHATS POPPIN(2020) by Jack Harlow & DaBaby, Tory Lanez & Lil Wayne, US(2)

Rain On Me(2020) by Lady Gaga & Ariana Grande, US(1)

Life Is Good(2020) by Future & Drake, US(2)
Yummy(2020) by Justin Bieber, US(2)

Continue (q/Q to quit)? **d**

Enter:

'key' to search song name with a keyword

'artist' to search song(s) by artist

'year' to search song(s) with top 5 in US rankings

'rank' to search song(s) with US rankings

RaNK

Enter highest US ranking: **10**

34 songs with US rankings of 10

Whoopty(2021) by CJ, US(10)

We Paid(2020) by Lil Baby & 42 Dugg, US(10)

Better Now(2019) by Post Malone, US(10)

Lover(2019) by Taylor Swift, US(10)

Going Bad(2019) by Meek Mill & Drake, US(10)

Sweet But Psycho(2019) by Ava Max, US(10)

Bandit(2019) by Juice WRLD & Youngboy Never Broke Again, US(10)

Walk It Talk It(2018) by Migos & Drake, US(10)

Malibu(2017) by Miley Cyrus, US(10)

It Ain't Me(2017) by Kygo & Selena Gomez, US(10)

Strip That Down(2017) by Liam Payne & Quavo, US(10)

I Hate U I Love U(2016) by Gnash & Olivia O'Brien, US(10)

Just Like Fire(2016) by Pink, US(10)

Ex's & Oh's(2015) by Elle King, US(10)

Somebody(2015) by Natalie La Rose & Jeremih, US(10)

Photograph(2015) by Ed Sheeran, US(10)

Centuries(2015) by Fall Out Boy, US(10)

Rather Be(2014) by Clean Bandit & Jess Glynne, US(10)

A Sky Full Of Stars(2014) by Coldplay, US(10)

Ain't It Fun(2014) by Paramore, US(10)

Love Somebody(2013) by Maroon 5, US(10)

Heart Attack(2013) by Demi Lovato, US(10)

Sweet Nothing(2013) by Calvin Harris & Florence Welch, US(10)

Don't Wake Me Up(2012) by Chris Brown, US(10)

Turn Up The Music(2012) by Chris Brown, US(10)

Drive By(2012) by Train, US(10)

Mr Know It All(2011) by Kelly Clarkson, US(10)

I'm On One(2011) by DJ Khaled, Drake & Rick Ross, US(10)

Judas(2011) by Lady GaGa, US(10)

Just A Dream(2011) by Nelly, US(10)

Young Forever(2010) by Jay0Z & Mr Hudson, US(10)

Magic(2010) by BoB & Rivers Cuomo, US(10)

What Do You Want From Me?(2010) by Adam Lambert, US(10)

Do You Remember?(2010) by Jay Sean, Sean Paul & Lil' Jon, US(10)

Continue (q/Q to quit)? **Q**