

Problem Definition

Supposing that you are a Software Engineer in a music record label, where you would like to estimate the number of views/hits on music streaming services as YouTube or SoundCloud, for determining the label artist's prospective careers in your label. If the number of views/hits meet the expectations, the AR can sign new contracts with the artist for his/her brand new productions. This estimation can be done by using the outcomes of the search engines which can also provide the number of views for each suggestion given a keyword string. However, in a search engine, it is desired to retrieve the most relevant suggestions, although the number of suggestions can be more than one. In this regard, it is somehow needed to fuse the information that is provided within the suggestions.

In this recitation, we will be dealing with this problem in a minimal scenario. Suppose that you are given an input file which contains entries including the artist name, track ID, search keyword string, URL, and the number of views. First, you are asked to fill a circular-doubly linked list without initializing a static array to store the content in memory. The ordering will be based on **the number of views** where the linked list will be sorted in **descending order**, containing the duplicate entries.

Then, you are asked to remove the duplicate entries within the linked list by using the search keyword string. The remainder entry's number of views should be incremented by the total of duplicate entries' number of views. Only the entry with the highest number of views should be preserved.

Finally, if you have implemented the 'add_node' correctly, you should be obtaining the linked list in **ascending order** based on the number of views. This operation does not require explicitly reversing the circular-doubly linked list in contrast to the singly linked list.

Implementation

You are expected to implement the following functions of the class 'TrackLinkedList': constructor, destructor, 'add_node', 'search', 'reduce_duplicates'. In order to successfully implement 'reduce_duplicates', you may also need to implement the constructors, destructors, 'add_node', 'contains' and 'search' functions of 'KwdLinkedList' class, which is a linked list that is designed for storing the keywords. Finally, you need to implement the constructor and destructor members of the 'TrackNode' class (and optionally, for 'KwdNode'). The regions that you should provide your implementation are marked with 'FILL'.

- `TrackNode::TrackNode(int views, string name, string artist_name, string kwd, string url)`
 - Create the node constructor by filling in the entry attributes.
- `TrackNode::~~TrackNode()`
 - Destroy the pointer that points the next node.
- `KwdNode::KwdNode(string kwd)`
 - Create the constructor for the linked list that will store the keywords.
 - The 'count' variable will also be initialized with 0, which should only be incremented for the second or further occurrence of a particular keyword.
- `KwdNode::~~KwdNode()`
 - Similar to the destructor of TrackNode.

- `KwdLinkedList::KwdLinkedList()`
 - You need to start with an empty linked list.
- `KwdLinkedList::~~KwdLinkedList()`
 - Destroy the pointer that points to the head, if that is unempty.
- `void KwdLinkedList::add_node(string kwd)`
 - Add a keyword to the linked list. Does not necessarily have to be in an ascending or descending order.
 - Consider the cases for adding the node to the head, to the tail and to anywhere else.
- `bool KwdLinkedList::contains(string kwd)`
 - A utility function which checks whether a keyword is already present within the linked list.
- `KwdNode* KwdLinkedList::search(string kwd)`
 - Attempts to catch an exact match to the keyword by using the entities in the linked list. Returns the pointer to the node.
- `TrackLinkedList::TrackLinkedList()`
 - You need to start with an empty linked list.
- `TrackLinkedList::~~TrackLinkedList()`
 - Destroy the pointer that points to the head, if that is unempty.
 - You may want to break the circularity as a trick since this method is only called at the end of the program.
- `void TrackLinkedList::add_node(TrackNode* node)`
 - The added nodes should have a descending order which is based on the number of views.
- `TrackNode* TrackLinkedList::search(int view)`
 - Given the number of views for a track, find the appropriate spot for placement.
 - Mind that this search operation will be used in `add_node` function and the linked list will be in descending order.
- `void TrackLinkedList::reduce_duplicates()`
 - By using the keywords corresponding the entries, remove the entries having the same keyword.
 - Make sure to handle zero-length linked list scenario, and assume that the linked list is sorted in descending order based on the number of views. This function should be designed to be run after adding all entries to the linked list.

You are not allowed to modify the content of 'main.cpp' and all member functions of the classes which have been pre-implemented for you. You are free to use those implementations in your code (the specified functions in 'trackNode.cpp' and 'trackLinkedList.cpp'), however.

Note: The number of entries may reach upto a million, hence make sure that there are no memory leaks present in your code.

Sample Outputs

```
-----0-----
Stardust - Music Sounds Better With You (Official Music Video)
Views: 60954568, Keyword: music sounds better with you
URL: https://www.youtube.com/watch?v=FQlAEiCb8m0
-----1-----
DJ Tiesto - Destination Sunshine
Views: 1556907, Keyword: destination sunshine tiesto remix
URL: https://www.youtube.com/watch?v=Zsq0W7P6sqo
-----2-----
System F vs Armin van Buuren - Exhale (Official Video)
Views: 764806, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=uG0x0dobSQc
-----3-----
John O'Callaghan & Bryan Kearney - Exactly
Views: 281890, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=lllRp2-4caw
-----4-----
John O'Callaghan & Bryan Kearney - Exactly (Original Mix)
Views: 224162, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=DJ0NrVZq3nQ
-----5-----
Mike Foyle vs Signalrunners - Love Theme Dusk (Mike's Broken Record Mix)
Views: 205211, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=_YXrVCjzk0s
-----6-----
System F feat. Armin van Buuren - Exhale (Original Mix)
Views: 182959, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=QaoEajxFsJU
-----7-----
Balearic Bill - destination sunshine (Tiesto Power Mix) [1999]
Views: 167713, Keyword: destination sunshine tiesto remix
URL: https://www.youtube.com/watch?v=hWqGGKSK0wE
-----8-----
Fred Baker Vs. Nyram - Confirmation (Original Mix)
Views: 136733, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=klV7NG64eTA
-----9-----
Signalrunners & Mike Foyle - Love Theme Dusk (Mike's Broken Record Mix) HQ
Views: 74219, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=4zMFoClhw10
-----10-----
System F Featuring Armin Van Buuren - Exhale (Original) (2001)
Views: 47914, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=TDHXvaTaID0
```

Figure 1: Terminal screen when outputting all of the entries within the linked list.

```

-----11-----
Balearic Bill - Destination Sunshine (DJ Tiesto Power Mix) (1999)
Views: 43116, Keyword: destination sunshine tiesto remix
URL: https://www.youtube.com/watch?v=g10QT5Ud96k
-----12-----
Mike Foyle vs Signalrunners - Love Theme Dusk
Views: 25706, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=9iHcXbilz1I
-----13-----
John O'Callaghan & Bryan Kearney - Exactly (O'Callaghan & Kearney) (Original Mix)
Views: 17085, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=k9gbmF8rMzM
-----14-----
O'Callaghan & Kearney - Exactly (Original Mix) (2006)
Views: 12028, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=HxKdgNy5QXc
-----15-----
Fred Baker Vs Nyram - Confirmation (2005)
Views: 11949, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=wYJSK9uAwX0
-----16-----
Confirmation -
Views: 9738, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=thfI19peL94
-----17-----
FRED BAKER vs NYRAM - Confirmation
Views: 8652, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=725ZP0mACeo
-----18-----
Joy Kitikonti - JoyDontStop (Joyenergizer Mix)
Views: 5329, Keyword: joydontstop joyenergizer mix
URL: https://www.youtube.com/watch?v=DO_J5CjYESA&t=35s
-----19-----
Mike Foyle Vs Signalrunners - Love Theme Dusk (Mike's Broken Record Mix) (2005) *Leaked Version*
Views: 3329, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=3CoKOLae6NA
-----20-----
Spacedust - Music Feels Good With You
Views: 3066, Keyword: music sounds better with you
URL: https://www.youtube.com/watch?v=LQ-xHxbdVw8
-----21-----
System F feat. Armin van Buuren - Exhale (Original)
Views: 1470, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=K8ZS0nktvSc

```

Figure 2: Terminal screen when outputting all of the entries within the linked list.

Submission Rules

- Make sure you write your name and number in all of the files of your project, in the following format:

```
/* @Author
Student Name: <student_name>
Student ID : <student_id>
Date: <date> */
```
- Use comments wherever necessary in your code to explain what you did.
- Usage of **STL Containers (vector, list, etc.)** are not permitted for this task.
- Your program will be checked by using **Calico**(<https://bitbucket.org/uyar/calico>) automatic checker.
- Do not share any code or text that can be submitted as a part of an assignment (discussing ideas is okay).
- Only electronic submissions through Ninova will be accepted no later than deadline.

```

-----0-----
Stardust - Music Sounds Better With You (Official Music Video)
Views: 60957634, Keyword: music sounds better with you
URL: https://www.youtube.com/watch?v=FQlAEiCb8m0
-----1-----
DJ Tiesto - Destination Sunshine
Views: 1767736, Keyword: destination sunshine tiesto remix
URL: https://www.youtube.com/watch?v=Zsq0W7P6sqo
-----2-----
System F vs Armin van Buuren - Exhale (Official Video)
Views: 997149, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=uG0x0dobSQc
-----3-----
John O'Callaghan & Bryan Kearney - Exactly
Views: 535165, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=lllRp2-4caw
-----4-----
Mike Foyle vs Signalrunners - Love Theme Dusk (Mike's Broken Record Mix)
Views: 308465, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=_YXrVCjzk0s
-----5-----
Fred Baker Vs. Nyram - Confirmation (Original Mix)
Views: 167072, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=klV7NG64eTA
-----6-----
Joy Kitikonti - JoyDontStop (Joyenergizer Mix)
Views: 5329, Keyword: joydontstop joyenergizer mix
URL: https://www.youtube.com/watch?v=DO_J5CjYESA&t=35s

```

Figure 3: Terminal screen after omitting the entries sharing the same keyword (Mind the difference in the number of views compared to the original).

- You may discuss the problems at an abstract level with your classmates, but you should not **share or copy code** from your classmates or from the Internet. You should submit your **own, individual** homework.
- Academic dishonesty, including cheating, plagiarism, and direct copying, is unacceptable.
- If you have any question about the recitation, you can send e-mail to Caner Özer (ozerc@itu.edu.tr).
- Note that **YOUR CODES WILL BE CHECKED WITH THE PLAGIARISM TOOLS!**


```
-----0-----
Joy Kitikonti - JoyDontStop (Joyenergizer Mix)
Views: 5329, Keyword: joydontstop joyenergizer mix
URL: https://www.youtube.com/watch?v=DO_J5CjYESA&t=35s
-----1-----
Fred Baker Vs. Nyram - Confirmation (Original Mix)
Views: 167072, Keyword: confirmation fred baker
URL: https://www.youtube.com/watch?v=klV7NG64eTA
-----2-----
Mike Foyle vs Signalrunners - Love Theme Dusk (Mike's Broken Record Mix)
Views: 308465, Keyword: love theme dusk mike foyle vs signalrunners
URL: https://www.youtube.com/watch?v=_YXrVCjzk0s
-----3-----
John O'Callaghan & Bryan Kearney - Exactly
Views: 535165, Keyword: bryan kearney exactly
URL: https://www.youtube.com/watch?v=lllRp2-4caw
-----4-----
System F vs Armin van Buuren - Exhale (Official Video)
Views: 997149, Keyword: system f exhale
URL: https://www.youtube.com/watch?v=uG0x0dobSQc
-----5-----
DJ Tiesto - Destination Sunshine
Views: 1767736, Keyword: destination sunshine tiesto remix
URL: https://www.youtube.com/watch?v=Zsq0W7P6sqo
-----6-----
Stardust - Music Sounds Better With You (Official Music Video)
Views: 60957634, Keyword: music sounds better with you
URL: https://www.youtube.com/watch?v=FQlAEiCb8m0
```

Figure 4: Terminal screen after traversing the reduced linked list in the reverse order.

