Compile

```
javac MusicPlayler.java
```

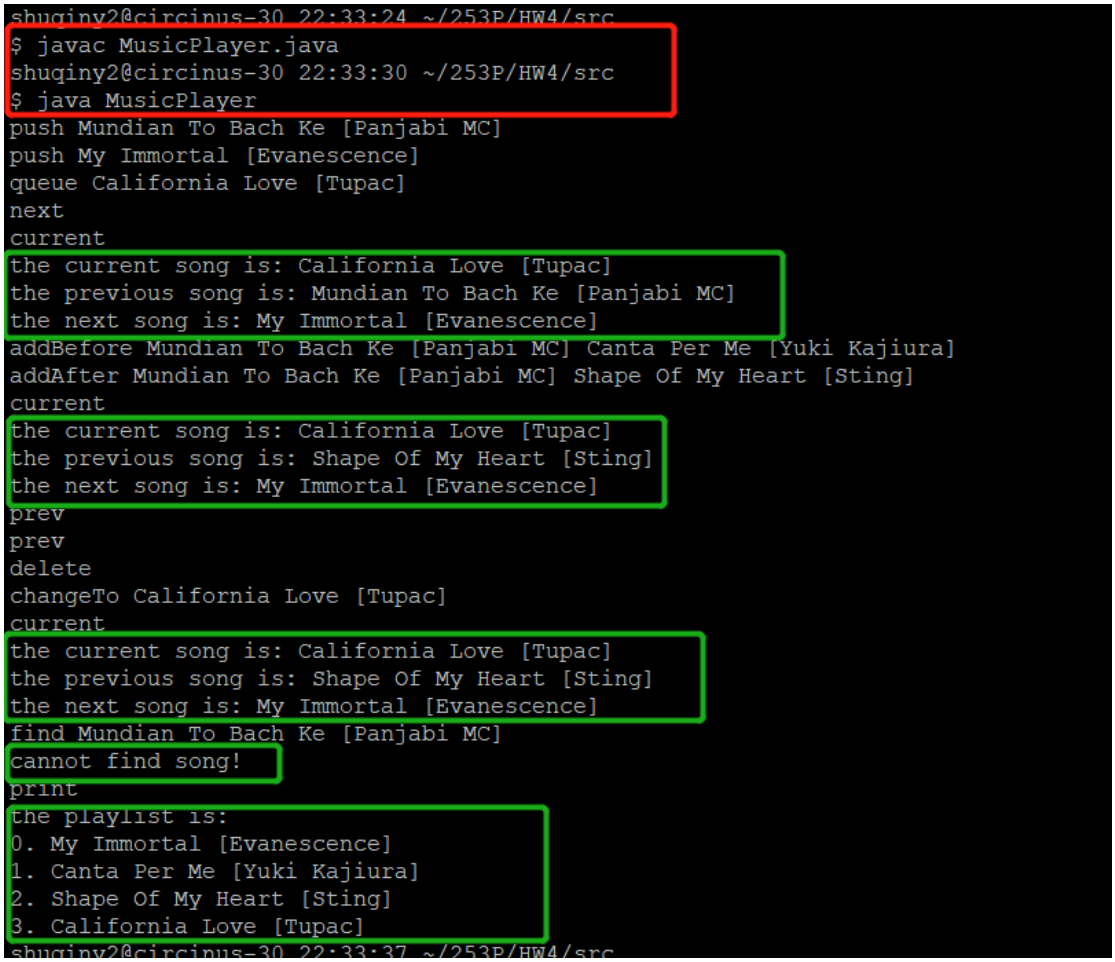
```
java MusicPlayer
```

```
shuqiny2@circinus-30 22:33:11 ~/253P/HW4
$ cd src
shuqiny2@circinus-30 22:33:24 ~/253P/HW4/src
$ javac MusicPlayer.java
shuqiny2@circinus-30 22:33:30 ~/253P/HW4/src
$ java MusicPlayer
```

Run

// red part: compile and run

// green part: output



Q & A

1. What data structure did you implement ***SimplePlayList*** as?

   I implement SimplyPlayList as a linked list, each song can be seen as a node.

2. List all the attributes (aka fields) you needed in order to implement ***SimplePlayList*** (also include the attributes for any other auxiliary data structures it uses)? (Do not list functions (aka methods)).

```
Class SimplePlayList {
    protected  Node head;  // The first song of playlist
    protected  Node cur;  // The current song of playlist
    protected  int size;  // The size of playlist
}
class Node {
    protected  Song song;
    protected  Node next;
}
class Song {
    protected String title;
    protected String artist;
}
```

3. How does ***SimplePlayList*** retrieve a random song in *O(n)* time? Explain in detail using a few sentences.

   Get a random n (n is between 0 and the length of playlist), move the pointer from current position to its next n times.

4. If ***prev*** is processed in *O(n)* time, then how is ***find*** able to print the previous song of the found song in *O(1)* time?

   The cur pointer can only move to the next node, so if you want to visit the previous node, you have to start from the beginning. That's how ***prev*** works in O(n). But in ***find***, since we have to traverse the whole list***,*** we can keep the location of the previous song with an extra pointer. By using this pointer we can achieve O(1) in ***find.***

Two Leetcode problems are substitutions, but I'd like to briefly talk about some ideas about 4.2 and 4.3

5. Very briefly explain how ***GeneralPlayList*** differs from ***SimplePlayList*** as? (Just one or two short sentences that gets the main point(s) across).

   SimplePlayList is a linked list while ***GeneralPlayList*** is a doubleLinkedList. Also, ***GeneralPlayList*** keeps a pointer pointing to its tail.

6. List all the attributes (aka fields) you needed in order to implement ***GeneralPlayList*** (also include the attributes for any other auxiliary data structures it uses)? (Do not list functions (aka methods)).

```
class DoubleLinkedNode {
    protected  Song song;
    protected  DoubleLinkedNode next;
    protected  DoubleLinkedNode pre;
     protect boolean visited;    // if this node has been visited
}
class GeneralPlayList implements MusicPlayerImpl {

     protected DoubleLinkedNode head;  // The first song of playlist
     protected DoubleLinkedNode tail;  // The first song of playlist
     protected DoubleLinkedNode cur;  // The current song of playlist
     protected  int size;  // The size of playlist
     static int randomCnt;

}
```

7. What allows queue to be able to add to the end of the playlist in O(1) time now?

   We keep a tail pointer. Every time queue an element, just append to the tail and move the pointer.

8. How does ***GeneralPlayList*** retrieve a random song without iterating over a song twice? Explain in detail using a few sentences.

   Every node has a param `visited`, which will be initialized to false.

   Add a param `randomCnt` to GeneralPlaylist, counting the number of songs that was

randomly retrieved.

When random() is called, we firstly do the same traversal in SimplePlaylist, then check if this node has been visited. If hasn't been visited, update `visited`, increment `randomCnt` and retrieve this song; else go next until an unvisited node is found.

When `randomCnt` equals to the size of the playlist, reset `randomCnt` to 0 and every node to unvisited.

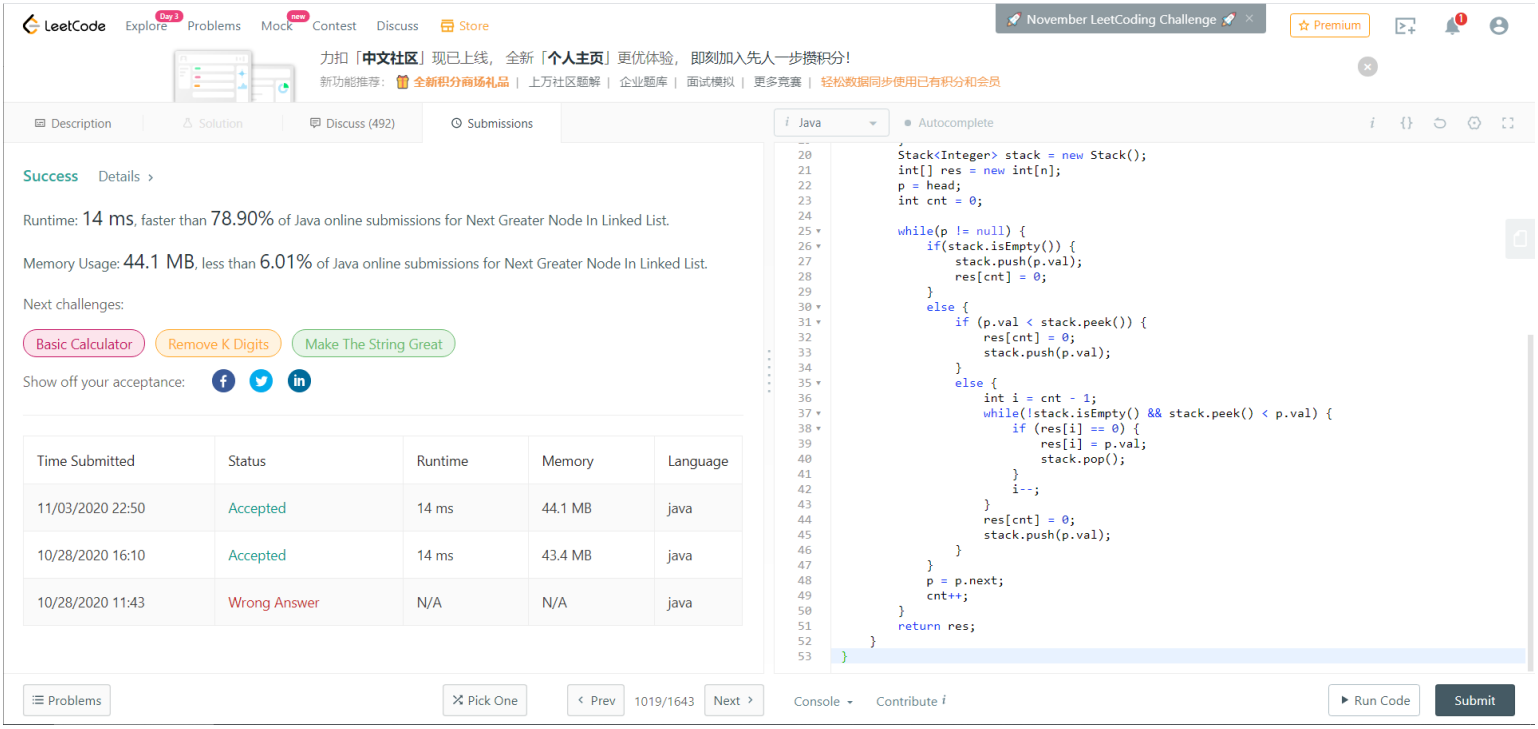
9. Very briefly explain how ***AdvancedPlayList*** differs from ***GeneralPlayList*** as? (Just one or two short sentences that gets the main point(s) across).

   AdvancedPlayList has one more HashMap<String, DoubleLinkedNode>, whose key is the title and artist of a song and the value is the node in playlist.

10. What additional data structure did you use to help you achieve the desired improvements?

    A hashMap.

Leetcode 1019



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