Python Program to check if given array is Monotonic

In this tutorial, we will learn how to check if an array is monotone or not. An array is a container data structure that stores elements, where each element can be accessed by an index. An array is said to be monotonic in nature if the array elements are continuously increasing or continuously decreasing.

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Monotonic increasing

An array A[] is monotonic increasing if all the elements in it satisfy the condition

for all i <= j, **A[i] <= A[j]**

[1, 2, 3, 4, 7, 10] is monotonic increasing.

Monotonic decreasing

An array A[] is monotone decreasing if all the elements in it satisfy the condition:

for all i <= j, **A[i] >= A[j]**

[11, 10, 9, 6, 4, 1] is monotonic decreasing.

The program should take the array as input and return **True** if the array is monotonic else it should return **False.** For example,

Look at the sample input and output for the program.

Input: 7 3 2 1 0

Output: True

Input: 10 11 13 9 14

Output: False

We will follow the approach of checking if the array is monotonic increasing or decreasing by checking the adjacent elen Index array. To check for monotonic increasing, we will check if a[i] **<=** a[i+1] for all indexes i from 0 to n-1 where n is the size of the array. To check for monotonic decreasing, we will check if a[i] **>=** a[i+1] for all indexes i from 0 to n-1 where n is the size of the array.

An array with only a single element will be treated as a monotone and the function should return the value True in our program.

Algorithm

Look at the algorithm to understand the working of the program.

Step 1- Define a function that will check the monotone nature of the array

Step 2- Find and store size of array using len()

Step 3- If the array has only one element return True

Step 4- Else, check if all values in the array are continuously decreasing or continuously increasing

Step 5- If the condition is true, return True

Step 6- If the condition is not true, return False

Step 7- Declare an array with values

Step 8- Pass the array in the function

Step 9- Print the result

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Python Program

This is the program to check if an array is monotone or not. We have defined a function which will return True if the array is monotone else it will return False.

```
#check if monotone
#function definition
```

```
def ismonotone(a):
    n=len(a) #size of array
    if n==1:
        return True
    else:
        #check for monotone behaviour
        if all(a[i]>=a[i+1] for i in range(0,n-1) or a[i]<=a[i+1] for i in range(0,n-1)):
            return True
        else:
            return False

A = [6, 5, 4, 2]
print(ismonotone(A))
b = [6, 2, 4, 2]
print(ismonotone(b))
c=[4,3,2]
print(ismonotone(c))
d=[1]
print(ismonotone(d))
```

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OUTPUT:

```
True

False

True

True
```

Conclusion

In this tutorial, we have learned about what are monotone arrays and how can we check if an array is a monotone or not using a function. There are two types of monotonic arrays- monotone increasing and monotone decreasing. If an array has only 1 element then it is monotone.

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