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dequeue_implementation.py

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```

1
2 # HSLU / ICS/AI ML : Modul ADS : Algorithmen & Datenstrukturen
3 # Path : uebung02/ml/aufgabe02
4 # Version: Mon Sep 25 19:09:35 CEST 2023
5
6 from uebung02.ml.aufgabe02.node import Node
7 from uebung02.ml.aufgabe02.dequeue_empty_exception import DequeEmptyException
8
9
10 class DequeImplementation:
11     """
12     Double linked list and DE-Queue (double ended queue: Deque)
13     """
14     def __init__(self):
15         self._header = Node()
16         self._trailer = Node()
17         self._header.set_next(self._trailer)
18         self._trailer.set_prev(self._header)
19         self._size = 0
20
21     def insert_first(self, element):
22         second = self._header.get_next()
23         first = Node(element, self._header, second)
24         second.set_prev(first)
25         self._header.set_next(first)
26         self._size += 1
27
28     def remove_last(self):
29         if self.is_empty():
30             raise DequeEmptyException("Deque is empty!")
31         last = self._trailer.get_prev()
32         e = last.get_element()
33         secondtolast = last.get_prev()
34         self._trailer.set_prev(secondtolast)
35         secondtolast.set_next(self._trailer)
36         self._size -= 1
37         return e
38
39     def remove_first(self):
40         if self.is_empty():
41             raise DequeEmptyException("Deque is empty!")
42         first = self._header.get_next()
43         e = first.get_element()
44         second = first.get_next()
45         self._header.set_next(second)
46         second.set_prev(self._header)
47         self._size -= 1
48         return e
49
50     def insert_last(self, element):
51         node = Node(element, self._trailer.get_prev(), self._trailer)
52         self._trailer.get_prev().set_next(node)
53         self._trailer.set_prev(node)
54         self._size += 1
55
56     def first(self):
57         if self.is_empty():
58             raise DequeEmptyException("Deque is empty!")
59         return self._header.get_next().get_element()
60
61     def last(self):
62         if self.is_empty():
63             raise DequeEmptyException("Deque is empty!")
64         return self._trailer.get_prev().get_element()
65
66     def size(self):
67         return self._size

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68
69     def is_empty(self):
70         return self._size == 0
71
72     def __str__(self):
73         node = self._header.get_next()
74         elements = []
75         while node != self._trailer:
76             elements.append(str(node.get_element()))
77             node = node.get_next()
78         separator=","
79         return "[" + separator.join(elements) + "]"
80
81
82 if __name__ == '__main__':
83     deque = DequeImplementation()
84     deque.insert_first(3)
85     deque.insert_first(2)
86     deque.insert_first(1)
87     print(deque)
88     deque.insert_last(4)
89     deque.insert_last(5)
90     deque.insert_last(6)
91     print(deque)
92     print("size : " + str(deque.size()))
93     print("empty : " + str(deque.is_empty()))
94     print("first : " + str(deque.first()))
95     print("last : " + str(deque.last()))
96     for i in range(3):
97         print(str(deque.remove_first()), end = " ")
98     print()
99     for i in range(3):
100         print(str(deque.remove_last()), end = " ")
101     print()
102     deque.remove_first()
103
104
105 """ Session-Log:
106
107 [1, 2, 3]
108 [1, 2, 3, 4, 5, 6]
109 size : 6
110 empty : False
111 first : 1
112 last : 6
113 1 2 3
114 6 5 4
115 Traceback (most recent call last):
116   File "/home/tletsch/HSLU/HS23/ADS_Uebungen_Python/Uebungen/uebung02/ml/aufgabe02/deq
ueue_implementation.py", line 102, in <module>
117     deque.remove_first()
118   File "/home/tletsch/HSLU/HS23/ADS_Uebungen_Python/Uebungen/uebung02/ml/aufgabe02/deq
ueue_implementation.py", line 41, in remove_first
119     raise DequeEmptyException("Deque is empty!")
120 uebung02.ml.aufgabe02.dequeue_empty_exception.DequeEmptyException: Deque is empty!
121
122 """

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node.py

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3 # Path   : uebung02/ml/aufgabe02
4 # Version: Mon Sep 25 19:09:35 CEST 2023
5
6
7 class Node:
8
9     def __init__(self, e = None, p = None, n = None):
10         self._element = e
11         self._next = n
12         self._prev = p
13
14     def set_element(self, new_elem):
15         _element = new_elem
16
17     def set_next(self, new_next):
18         self._next = new_next
19
20     def set_prev(self, new_prev):
21         self._prev = new_prev
22
23     def get_element(self):
24         return self._element
25
26     def get_next(self):
27         return self._next
28
29     def get_prev(self):
30         return self._prev
31
32
```

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dequeue_empty_exception.py

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```
1
2 # HSLU / ICS/AIML : Modul ADS : Algorithmen & Datenstrukturen
3 # Path   : uebung02/ml/aufgabe02
4 # Version: Mon Sep 25 19:09:35 CEST 2023
5
6 class DequeEmptyException(Exception):
7
8     def __init__(self, err):
9         super().__init__(err)
10
```