DATA STRUCTURES AND ALGORITHMS

SEMINAR 3

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SortedMultimap

- Domain of ADT SortedMultimap:

$$\mathcal{SMM} = \{smm | smm \text{ is a SortedMultimap with TKey, TValue, pairs}\}$$

ADT SortedMultimap - Interface I

- init (smm, rel)
  - **descr:** creates a new empty SortedMultimap
  - **pre:** *rel* $\in$ *Relation*
  - **post:** *smm* $\in \mathcal{SMM}$, *smm* is an empty SortedMultimap

ADT SortedMultimap - Interface II

- destroy(smm)
  - **descr:** destroys a SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** the SortedMultimap was destroyed

ADT SortedMultimap - Interface III

- add(smm, k, v)
  - **descr:** add a new pair to the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$, $k - TKey$, $v - TValue$
  - **post:** $smm' \in \mathcal{SMM}$, $smm' = smm \cup < k, v >$

ADT SortedMultimap - Interface IV

- remove(smm, k, v)
  - **descr:** removes a key value pair from the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$, $k - TKey$, $v - TValue$
  - **post:** $remove \leftarrow$
    $$\begin{cases} true, & \text{if } < k, v > \in smm, smm' \in \mathcal{SMM}, smm' = smm - < k, v > \\ false, & \text{otherwise} \end{cases}$$

ADT SortedMultimap - Interface V

- search(smm, k, l)
  - **descr:** returns a list with all the values associated to a key
  - **pre:** $smm \in \mathcal{SMM}$, $k - TKey$
  - **post:** $l \in \mathcal{L}$, l is the list of values associated to the key k. If k is not in the SortedMultimap, l is the empty list.

ADT SortedMultimap - Interface VI

- iterator(smm, it)
  - **descr:** returns an iterator over the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** $it \in \mathcal{I}$, *it* is an iterator over *smm*, the current element from *it* is the first pair from *smm*, or, *it* is invalid if *smm* is empty
  - **Obs:** the iterator for a SortedMultimap is similar to the iterator for other containers, but the *getCurrent* operation returns a <key, value> pair.

ADT SortedMultimap - Interface VII

- size(smm)
  - **descr:** returns the number of pairs from the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** $size \leftarrow$ the number of pairs from smm

ADT SortedMultimap - Interface VIII

- Other possible operations:
- keys(smm, s)
  - **descr:** returns the SortedSet of all keys from the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** $s \in \mathcal{S}$, s is the sorted set of all keys from smm

ADT SortedMultimap - Interface IX

- values(smm, b)
  - **descr:** returns the bag of all values from the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** $b \in \mathcal{B}$m b is a bag with all the values from smm

ADT SortedMultimap - Interface X

- pairs(smm, b)
  - **descr:** returns the bag of all pairs from the SortedMultimap
  - **pre:** $smm \in \mathcal{SMM}$
  - **post:** $b \in \mathcal{B}$, b is a bag with all the pairs from smm

ADT List

init(l)
first(l)
last(l)
valid(l, position)
next(l, position)
previous(l, position)
getElement(l, position)
position(l, elem)
setElement(l, position, elem)
destroy(l)

addToBeginning(l, elem)
addToEnd(l, elem)
addBeforePosition(l, elem, position)
addAfterPosition(l, elem, position)
remove(l, position)
search(l, elem)
isEmpty(l)
size(l)
iterator(l, it)