Project Stage
Data structures and algorithms

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1)Task

ADT Set – implementation on a hash table, collision resolution by open addressing

2)ADT Specification:

- Set = {s|s is a set with elements of the type TElem}
- TElement -> the general element in containers
  The interface of TElem contains the following operations:
  - assignment (e1 ← e2)
    - pre: e1, e2 ∈ TElem
    - post: e′ 1 = e2
  - equality test (e1 = e2)
    - pre: e1, e2 ∈ TElem
    - post:

      equal = ->True, if e1 =e2

      ->False, otherwise
- Iterator = { it | it – iterator over Set}

3)ADT Interface:

a. Set:

- ***init (s) :***
  - ***descr: creates a new empty set***
  - ***pre: true***
  - ***post: s ∈S, s is an empty set***
- ***destroy (s) :***
  - ***descr: destroys a set***
  - ***pre: s ∈S***
  - ***post:the set s was destroyed***
- ***add(s, e):***
  - ***descr: adds a new element into the set***
  - ***pre: s ∈S, e ∈TElem***

- ***post:s 0 ∈ S, s 0 = s ∪ {e} (e is added only if it is not in s yet. If s contains the element e already, no change is made)***

- ***remove(s, e) :***
  - ***descr: removes an element from the set***
  - ***pre: s ∈ S, e ∈ TElem***
  - ***post: s ∈ S, s 0 = s \ {e} (if e is not in s, s is not changed)***
- ***size(s) :***
  - ***descr: returns the number of elements from a set***
  - ***pre: s ∈ S***
  - ***post: size ← the number of elements from s***
- ***find(s, e) :***
  - ***descr: verifies if an element is in the set***
  - ***pre: s ∈ S, e ∈ TElem***
  - ***post: find ← True, if e ∈ s***
    False, otherwise
- ***iterator(s, it):***
  - ***descr: returns an iterator for a set***
  - ***pre: s ∈ S***
  - ***post: it ∈ I, it is an iterator over the set s***

b. Iterator:

- ***init(it, s):***
  - ***pre: s ∈ Set***
  - ***post: it ∈ Iterator , it – iterator over b pointing to ”first element”***
- ***next(it):***
  - ***pre: it ∈ Iterator, it is a valid iterator***
  - ***post: it' - pointing to the next element***
- ***valid(it):***
  - ***pre: it ∈ Iterator***
  - ***post: valid(it) = True, if it valid. False, otherwise***
- ***getCurrent(it, e):***
  - ***pre: it ∈ Iterator***
  - ***post: e ∈ TElement, e – the current element pointed by it***

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4) ADT Representation:

a. ***SET (implementation on a hash table, collision resolution by open addressing):***
   - m: Integer
   - h: TFunction
   - T: TElem[]

b. ***ITERATOR:***
   - s: ↑Set
   - currentPos : Integer

5) Problem statement:

We have a parking lot at a apartment block where every tenant gets a parking space based on the apartment number. The tenants may own more than one car.

6)Problem solution:

If the tenants own more than one car(while they have only one parking space), the tenants will park the cars at the first free parking space they find regardless it’s someone else's spot.