

For the MIS:

**Used External Functions:** NONE

**Used External Data Types:** comp, String

**Exported Constants:** NONE

**Exported Functions**

Name	Input Type	Output Type	Exceptions
init	int		invalid
put	comp		notinit, duplicate, full
get_value	String	int	notinit, notfound
get_reversed_nodes	String	String*String	notint, notfound

**State Variables**

s:comp seq  
max:int  
is\_init:Boolean := false

**State Transformations**

init(n:int)

**Exceptions:**

$n \leq 0 \rightarrow \text{invalid}$

**Transition:**

max := n  
s := <>  
is\_init := true

put(c:comp)

**Exceptions:**

$\neg \text{is\_init} \rightarrow \text{notinit}$

$|s| = \text{max} \rightarrow \text{full}$

$\exists a, p, n : \text{String} \exists v : \text{int}. (c = (a, p, n, v) \wedge$

$(\exists pos, neg : \text{String} \exists d : \text{int}. (a, pos, neg, d) \in s) \rightarrow \text{duplicate}$

**Transition:**

s := s  $\text{---}$  c

int get\_value(nam:String)

**Exceptions:**

$\neg \text{is\_init} \rightarrow \text{notinit}$

$\neg \exists pos, neg : \text{String} \exists d : \text{int}. (nam, pos, neg, d) \in s \rightarrow \text{notfound}$

**Output:**

$d \mid \exists pos, neg : \text{String} \exists d : \text{int}. (nam, pos, neg, d) \in s$

String\*String get\_reversed\_nodes(nam:String)

**Exceptions:**

$\neg \text{is\_init} \rightarrow \text{notinit}$

$\neg \exists pos, neg : \text{String} \exists d : \text{int}. (nam, pos, neg, d) \in s \rightarrow \text{notfound}$

**Output:**

$(neg, pos) \mid \exists pos, neg : \text{String} \exists d : \text{int}. (nam, pos, neg, d) \in s$