# SOEN331: Introduction to Formal Methods for Software Engineering

# for Software Engineering

# Assignment 2 on Object-Z specification

Tarek Ait Hamouda (40044119), Abhijit Gupta (40066502),

Ethel Narra Pangan (40061530)

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# 1 Map

**Map**

$[Description, Coordinate]$
$Point == Coordinate \times Coordinate$
$Message ::== ok \mid location\_already\_known \mid no\_location\_found$

$locations : Description \nrightarrow Point$

**INIT**

$locations = \{\}$

**AddLocationOK**

$\Delta(locations)$
$newDescription? : Description$
$newPoint? : Point$

$newDescription? \notin dom\ locations$
$locations' = locations \cup \{newDescription? \rightarrow newPoint?\}$

**DeleteLocationOK**

$\Delta(locations)$
$location? : locations$

$location? \in\ locations$
$locations' = locations \setminus \{location?\}$

**ModifyLocationOK**

$\Delta(locations)$
$desc? : Description$
$newPoint? : Point$

$desc? \in dom\ locations$
$locations' = locations \oplus \{desc? \rightarrow newPoint?\}$

**FindLocationOK**

$\Xi(locations)$
$desc? : Description$
$point! : Point$

$desc? \in\ dom\ locations$
$point! = locations(desc?)$

**Success**

$\Xi(locations)$
$result! : Message$

$result! = ok$

```
┌─ LocationAlreadyKnown ─────────────────────────────────────┐
│ Ξ(locations)                                               │
│ description? : Description                                  │
│ result! : Message                                          │
├────────────────────────────────────────────────────────────┤
│ description? ∈ dom locations                               │
│ result! = location_already_known                           │
└────────────────────────────────────────────────────────────┘
```

```
┌─ noLocationFound ──────────────────────────────────────────┐
│ Ξ(locations)                                               │
│ description? : Description                                  │
│ result! : Message                                          │
├────────────────────────────────────────────────────────────┤
│ description? ∉ domlocations                                │
│ result! = no_location_found                                │
└────────────────────────────────────────────────────────────┘
```

$AddLocation \stackrel{\wedge}{=} (\text{AddLocationOk} \wedge Sucess) \vee locationAlreadyKnown$

$deleteLocation \stackrel{\wedge}{=} (\text{DeleteLocationOK} \wedge Sucess) \vee NoLocationFound$

$modifyLocation \stackrel{\wedge}{=} (\text{ModifyLocationOK} \wedge Sucess) \vee NoLocationFound$

$findLocation \stackrel{\wedge}{=} (\text{FindLocationOK} \wedge Sucess) \vee NoLocationFound$

**Map2**

**Map**

$count : \mathbb{N}$

$count >= 0$

**INIT**

$count = 0$

**AddLocationOK**

$\Delta(count)$

$count' = count + 1$

**DeleteLocationOK**

$\Delta(count)$

$count' = count - 1$

**ModifyLocationOK**

$count' = count$

**FindLocationOK**

$count' = count$