# SOEN331: Introduction to Formal Methods 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* _____

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

$\quad$_____
$\quad locations : Description \nrightarrow Point$
$\quad$_____
$\quad \forall\, l1, l2 : \ locations \bullet (l1.description \neq l2.description)$
$\quad$_____

$\quad$__ *INIT* _____
$\quad\quad locations = \{\}$
$\quad$_____

$\quad$__ *AddLocationOK* _____
$\quad\quad \Delta(locations)$
$\quad\quad newDescription? : Description$
$\quad\quad newPoint? : Point$
$\quad\quad$_____
$\quad\quad newDescription? \notin dom\ locations$
$\quad\quad locations' = locations \cup \{newDescription? \to newPoint?\}$
$\quad$_____

$\quad$__ *DeleteLocationOK* _____
$\quad\quad \Delta(locations)$
$\quad\quad location? : locations$
$\quad\quad$_____
$\quad\quad location? \in\ locations$
$\quad\quad locations' = locations \setminus \{location\}$
$\quad$_____

$\quad$__ *ModifyLocationOK* _____
$\quad\quad \Delta(locations)$
$\quad\quad desc? : Description$
$\quad\quad newPoint? : Point$
$\quad\quad$_____
$\quad\quad desc? \in dom\ locations$
$\quad\quad locations' = locations \oplus \{desc? \to newPoint?\}$
$\quad$_____

$\quad$__ *FindLocationOK* _____
$\quad\quad desc? : Description$
$\quad\quad point! : Point$
$\quad\quad$_____
$\quad\quad desc? \in\ dom locations$
$\quad\quad point! = locations(desc?)$
$\quad$_____

$\quad$__ *Success* _____
$\quad\quad result! : Message$
$\quad\quad$_____
$\quad\quad result! = ok$
$\quad$_____

$\quad$__ *LocationAlreadyKnown* _____
$\quad\quad \Xi(locations)$
$\quad\quad description? : Description\ result! : Message$
$\quad\quad$_____
$\quad\quad description? \in dom locations$
$\quad\quad result! = location_a lready_k nown$

$\quad$3
$\quad$_____

$$\begin{array}{l} \underline{\quad noLocationFound \quad\rule{7cm}{0.4pt}} \\[4pt] \Xi(locations) \\ description? : Description\ result! : Message \\[4pt] \rule{3.5cm}{0.4pt} \\[2pt] description? \notin dom\ locations \\ result! = no_location_found \end{array}$$

$AddLocation = (AddLocationOk \wedge Sucess) \vee locationAlreadyKnown$

$deleteLocation = (DeleteLocationOK \wedge Sucess) \vee NoLocationFound$

$modifyLocation = (ModifyLocationOK \wedge Sucess) \vee NoLocationFound$

$findLocation = (FindLocationOK\ Sucess)\ NoLocationFound -|-$