Model Report

CAT_Lib

Version 1.0 • Proposed

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automaton diagram

Class diagram in package 'automaton'

automaton
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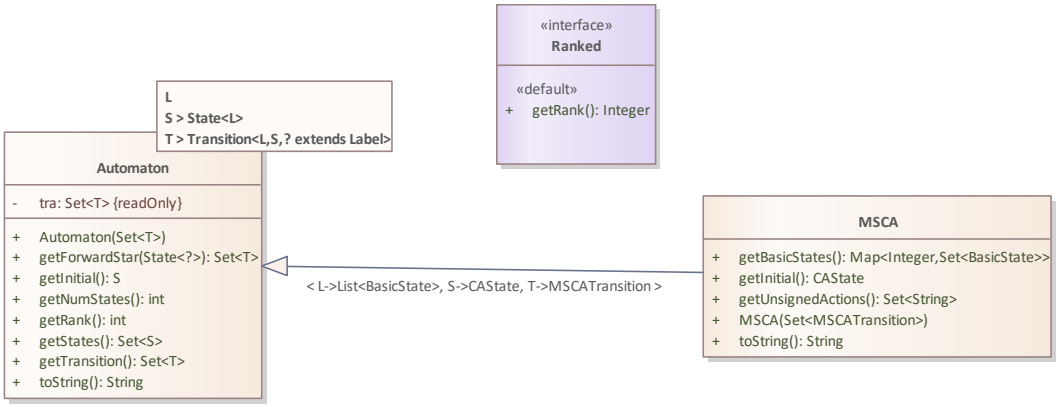

Figure 1: automaton

label

Package in package 'automaton'

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label diagram

Class diagram in package 'label'

label
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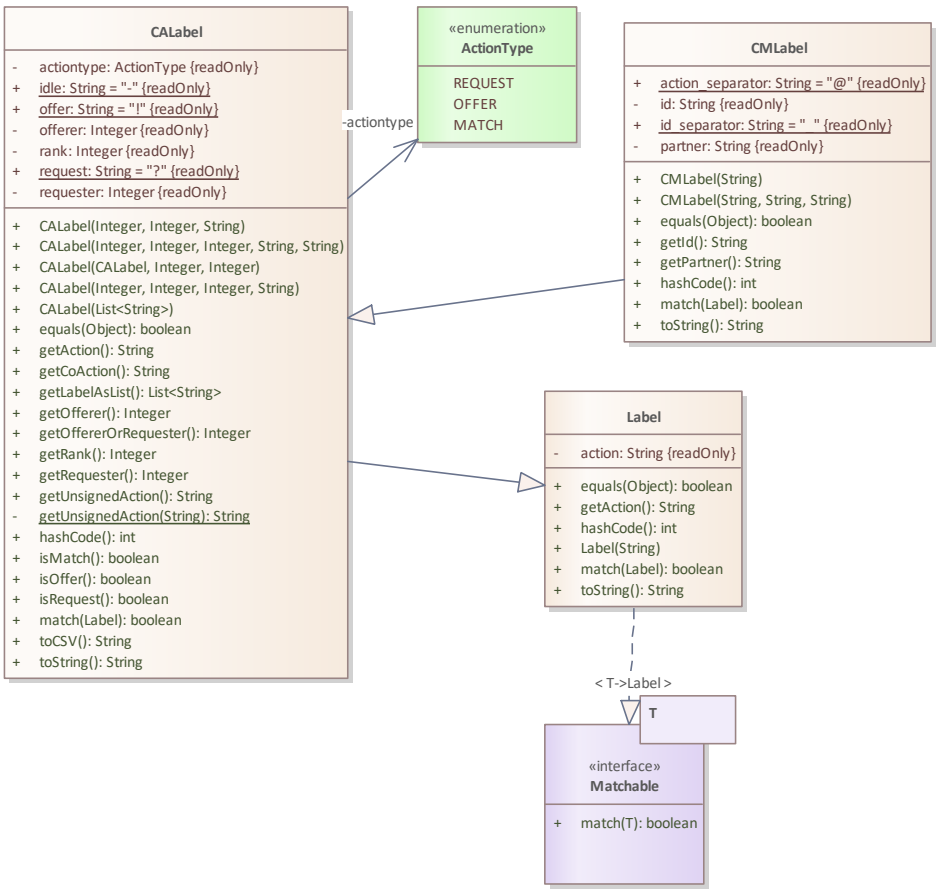

Figure 2: label

CALabel

Class in package 'label'

Class implementing a label of a contract automaton transition. Note: in this class Java Modelling Language contracts have been experimented, only using Extended Static Checker analysis of OpenJML. However, the specs are outdated w.r.t. the current implementation.

CALabel
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ELEMENTS OWNED BY CALabel

ActionType : Enumeration

OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from CALabel to Label

[Direction is 'Source -> Destination'.]

INCOMING STRUCTURAL RELATIONSHIPS

INCOMING STRUCTURAL RELATIONSHIPS

Generalization from CMLabel to CALabel

[Direction is 'Source -> Destination'.]

ATTRIBUTES

actiontype : ActionType Private Const

[Is static True. Containment is Not Specified.]

idle : String Public Const = "-"

private final /*@ spec_public @*/ String action; //in case of match, the action is always the offer

[Is static True. Containment is Not Specified.]

offer : String Public Const = "!"

[Is static True. Containment is Not Specified.]

offerer : Integer Private Const

the index of the offerer in the label or -1

[Is static True. Containment is Not Specified.]

rank : Integer Private Const

the rank of the label (i.e. number of principals)

[Is static True. Containment is Not Specified.]

request : String Public Const = "?"

[Is static True. Containment is Not Specified.]

requester : Integer Private Const

the index of the requester in the label or -1

[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) CALabel

Target: Private actiontype (Enumeration) ActionType

OPERATIONS

CALabel (rank : Integer , principal : Integer , action : String) : Public

Constructor only used for requests or offer actions, i.e., only one principal is moving

OPERATIONS

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CALabel (rank : Integer , principal1 : Integer , principal2 : Integer , action1 : String , action2 : String) : Public

Constructor for a match transition

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CALabel (lab : CALabel , rank : Integer , shift : Integer) : Public

Construct a CALabel by shifting of some positions the index of principals moving in the label

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CALabel (rank : Integer , offerer : Integer , requester : Integer , offeraction : String) : Public

Constructor used for match transitions

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CALabel (label : List<String>) : Public

Constructor using a list of strings. Each position in the list is an index in the CALabel and each string is the action of the principal at that position.

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

equals (obj : Object) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getAction () : String Public

@return in case the calabel is a request it return the requests action, in case of offer or match returns the offer action

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getCoAction () : String Public

@return in case the calabel is a request it return the offer action, in case of offer or match returns the request action

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getLabelAsList () : List<String> Public

@return the calabel encoded in a list of strings, at each position there is the action performed by that principal in that position

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getOfferer () : Integer Public

OPERATIONS

@ public normal behavior
@ requires this.offerer!=null;
@ ensures !this.isRequest() ==> \result == this.offerer

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getOffererOrRequester () : Integer Public

@return the index of the offerer or requester, does not support match transitions

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRank () : Integer Public

@ public normal_behavior
@ requires this.rank != null;
@ ensures \result == this.rank;
@

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRequester () : Integer Public

@ public normal behavior
@ requires this.requester!=null;
@ ensures !this.isOffer() ==> \result == this.offerer

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getUnsignedAction () : String Public

@return a string containing the action with request/offer sign

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getUnsignedAction (action : String) : String Private

[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isMatch () : boolean Public

@ public normal behavior
@ requires this.action != null;
@ ensures \result == this.offerer!=-1 && this.requester!=-1 && this.action.startsWith(offer);

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isOffer () : boolean Public

OPERATIONS

```
@ public normal behavior
@    requires this.action != null;
@    ensures \result == this.offerer!=-1 && this.requester==-1 && this.action.startsWith(offer);
```
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isRequest () : boolean Public

```
@ public normal behavior
@    requires this.action != null;
@    ensures \result == this.offerer==-1 && this.requester!=-1 && this.action.startsWith(request);
```
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

match (label : Label) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toCSV () : String Public

```
@return a string description of the calabel in comma separated values
```
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

```
@ public normal_behaviour
@    requires this.rank >=0;
@    requires this.action != null;
@      requires this.action.length()>=2;
@      requires this.action.startsWith(offer) || this.action.startsWith(request);
```

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ActionType

Enumeration owned by 'CALabel', in package 'label'

the actiontype is used for redundant checks

ActionType
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ATTRIBUTES

REQUEST : Public

[Stereotype is «enum». Is static True. Containment is Not Specified.]

ATTRIBUTES

OFFER : Public
[Stereotype is «enum». Is static True. Containment is Not Specified.]

MATCH : Public
[Stereotype is «enum». Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) CALabel

Target: Private actiontype (Enumeration) ActionType

CMLabel

Class in package 'label'

Class representing the label of a Communicating Machine

CMLabel
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OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from CMLabel to CALabel
[Direction is 'Source -> Destination'.]

ATTRIBUTES

action_separator : String Public Const = "@"
[Is static True. Containment is Not Specified.]

id : String Private Const
[Is static True. Containment is Not Specified.]

id_separator : String Public Const = "_"
[Is static True. Containment is Not Specified.]

partner : String Private Const
[Is static True. Containment is Not Specified.]

OPERATIONS

CMLabel (lab : String) : Public

OPERATIONS

Construct a CMLabel enconded in a string lab
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CMLabel (sender : String , receiver : String , action : String) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

equals (obj : Object) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getId () : String Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getPartner () : String Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

match (l2 : Label) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Label

Class in package 'label'

Class representing a Label of a transition

Label
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OUTGOING STRUCTURAL RELATIONSHIPS

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from Label to Ranked

[Direction is 'Source -> Destination'.]

Realization from Label to Matchable

[Direction is 'Source -> Destination'.]

INCOMING STRUCTURAL RELATIONSHIPS

Generalization from CALabel to Label

[Direction is 'Source -> Destination'.]

ATTRIBUTES

action : String Private Const

the action performed by the label

[Is static True. Containment is Not Specified.]

OPERATIONS

equals (obj : Object) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getAction () : String Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Label (action : String) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

match (arg : Label) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

OPERATIONS

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Matchable

Interface in package 'label'

Interface of a matchable object
@param <T> the type of the object to match with

Matchable
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Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Realization from Label to Matchable
[Direction is 'Source -> Destination'.]

OPERATIONS

match (arg : T) : boolean Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

state

Package in package 'automaton'

state
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state diagram

Class diagram in package 'state'

state
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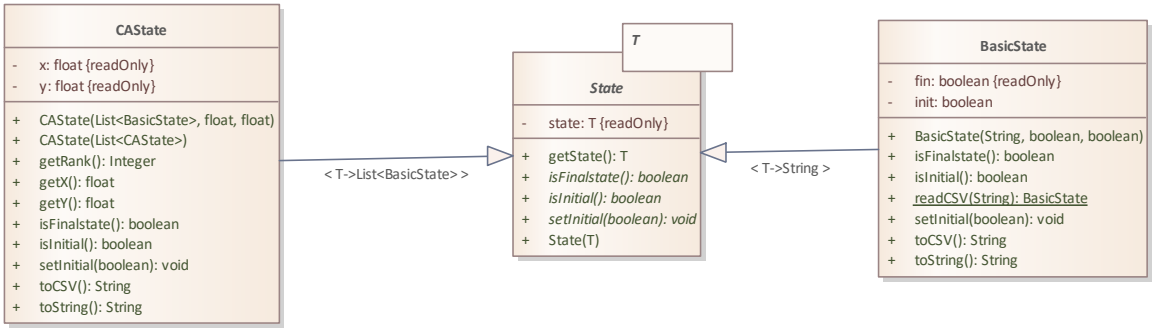

Figure 3: state

BasicState

Class in package 'state'

Class representing a BasicState

BasicState
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OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from BasicState to State

[Direction is 'Source -> Destination'.]

ATTRIBUTES

fin : boolean Private Const

[Is static True. Containment is Not Specified.]

init : boolean Private

[Is static True. Containment is Not Specified.]

OPERATIONS

OPERATIONS

BasicState (label : String , init : boolean , fin : boolean) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isFinalstate () : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isInitial () : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

readCSV (s : String) : BasicState Public

@return a new basicstate object constructed from the parameter s
[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

setInitial (init : boolean) : void Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toCSV () : String Public

@return a string encoding the object as comma separated values
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CAState

Class in package 'state'

Class representing a state of a Contract Automaton

CAState
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from CAState to State

[Direction is 'Source -> Destination'.]

ATTRIBUTES

x : float Private Const

[Is static True. Containment is Not Specified.]

y : float Private Const

[Is static True. Containment is Not Specified.]

OPERATIONS

CAState (lstate : List<BasicState> , x : float , y : float) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CAState (states : List<CAState>) : Public

Construct a new CAState from a list of CAStates by flattening them into a list of basic states

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRank () : Integer Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getX () : float Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getY () : float Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isFinalstate () : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isInitial () : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

setInitial (initial : boolean) : void Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toCSV () : String Public

@return an encoding of the object as comma separated values
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

State

Class in package 'state'

Abstract class encoding a state
@param <T> generic type of the instance variable of the state

State
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OUTGOING STRUCTURAL RELATIONSHIPS

Realization from State to Ranked
[Direction is 'Source -> Destination'.]

INCOMING STRUCTURAL RELATIONSHIPS

Generalization from CAState to State
[Direction is 'Source -> Destination'.]

Generalization from BasicState to State
[Direction is 'Source -> Destination'.]

ATTRIBUTES

state : T Private Const
[Is static True. Containment is Not Specified.]

OPERATIONS

OPERATIONS

getState () : T Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isFinalstate () : boolean Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isInitial () : boolean Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

setInitial (init : boolean) : void Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

State (label : T) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

transition

Package in package 'automaton'

transition
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transition diagram

Class diagram in package 'transition'

transition
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

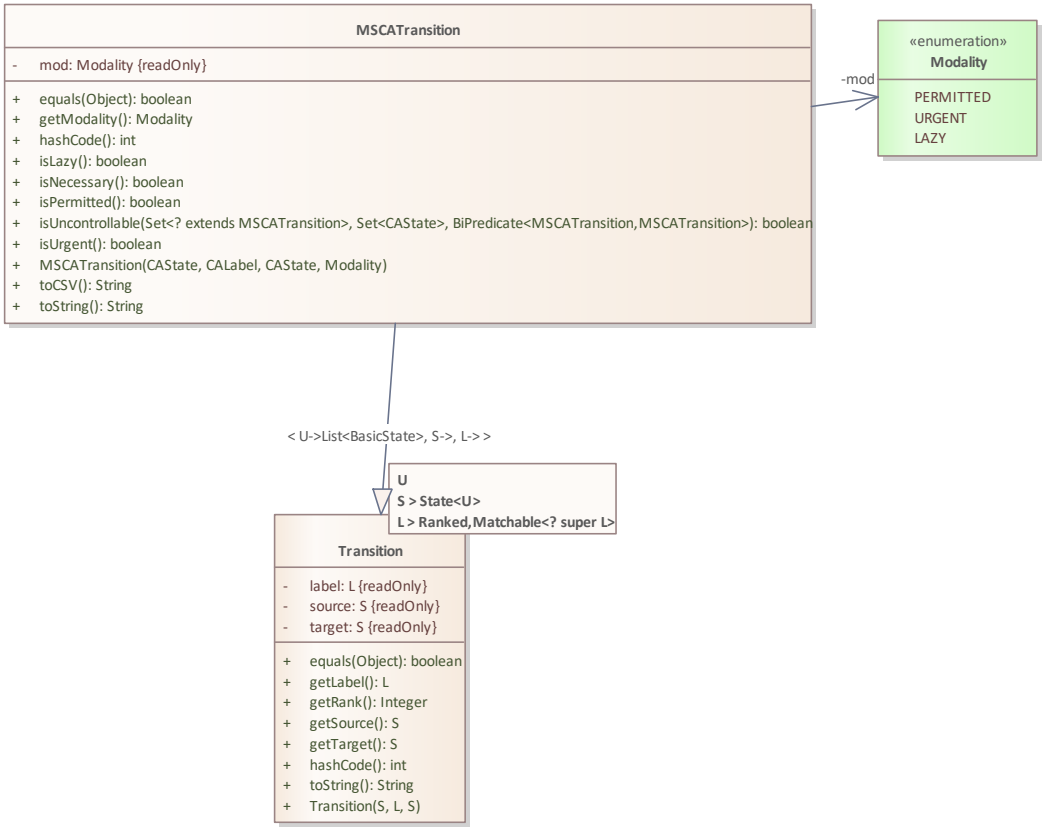

Figure 4: transition

MSCATransition

Class in package 'transition'

Transition of a modal service contract automaton

MSCATransition
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Davide Basile created on 12/9/2021. Last modified 12/9/2021

ELEMENTS OWNED BY MSCATransition

ELEMENTS OWNED BY MSCATransition

Modality : Enumeration

OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from MSCATransition to Transition

[Direction is 'Source -> Destination'.]

ATTRIBUTES

mod : Modality Private Const

[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) MSCATransition

Target: Private mod (Enumeration) Modality

OPERATIONS

equals (obj : Object) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getModality () : Modality Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

static Set<CAState> getSources(Set<? extends MSCATransition> t) { return t.parallelStream()
.map(MSCATransition::getSource) .collect(Collectors.toSet()); }

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isLazy () : boolean Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isNecessary () : boolean Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isPermitted () : boolean Public

OPERATIONS

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isUncontrollable (tr : Set<? extends MSCATransition> , badStates : Set<CAState> , controllabilityPred : BiPredicate<MSCATransition,MSCATransition>) : boolean Public

@return true if the transition is uncontrollable against the parameters

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isUrgent () : boolean Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MSCATransition (source : CAState , label : CALabel , target : CAState , type : Modality) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toCSV () : String Public

@return encoding of the object into comma separated values

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Modality

Enumeration owned by 'MSCATransition', in package 'transition'

the modality of the transition

Modality
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ATTRIBUTES

PERMITTED : Public

[Stereotype is «enum». Is static True. Containment is Not Specified.]

URGENT : Public

[Stereotype is «enum». Is static True. Containment is Not Specified.]

LAZY : Public

[Stereotype is «enum». Is static True. Containment is Not Specified.]

ASSOCIATIONS

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) MSCATransition Target: Private mod (Enumeration) Modality

Transition

Class in package 'transition'

Transition of a Contract Automaton
@param <U> generic type of the instance variable of S
@param <S> generic type of the state
@param <L> generic type of the label

Transition
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INCOMING STRUCTURAL RELATIONSHIPS

Generalization from MSCATransition to Transition
[Direction is 'Source -> Destination'.]

ATTRIBUTES

label : L Private Const
[Is static True. Containment is Not Specified.]

source : S Private Const
[Is static True. Containment is Not Specified.]

target : S Private Const
[Is static True. Containment is Not Specified.]

OPERATIONS

equals (obj : Object) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getLabel () : L Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRank () : Integer Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

getSource () : S Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getTarget () : S Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Transition (source : S , label : L , target : S) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Automaton

Class in package 'automaton'

Class representing an Automaton
@param <L> the generic type of labels of transitions
@param <S> the generic type of states
@param <T> the generic type of transitions

Automaton
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Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Generalization from MSCA to Automaton
[Direction is 'Source -> Destination'.]

ATTRIBUTES

tra : Set<T> Private Const

transitions of the automaton
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) ChoreographySynthesisOperator Target: Private prop (Class) Automaton

OPERATIONS

Automaton (tr : Set<T>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getForwardStar (source : State<?>) : Set<T> Public

@return set of transitions outgoing state source
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getInitial () : S Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getNumStates () : int Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRank () : int Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getStates () : Set<S> Public Const

@return all states that appear in at least one transition
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getTransition () : Set<T> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

public Set<String> geActions(){ return this.getTransition().parallelStream() .map(t->t.getLabel().getAction())
.collect(Collectors.toSet()); }

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MSCA

Class in package 'automaton'

Class representing a Modal Service Contract Automaton

MSCA
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Generalization from MSCA to Automaton

[Direction is 'Source -> Destination'.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) FMCA

Target: Private aut (Class) MSCA

OPERATIONS

getBasicStates () : Map<Integer,Set<BasicState>> Public

@return a map where for each entry the key is the index of principal, and the value is its set of basic states

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getInitial () : CAState Public

@Override public final Set<CAState> getStates() { CAState dummy=null; return getStates(dummy); }

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getUnsignedActions () : Set<String> Public

@return set of string of actions appearing in the transitions of the MSCA without their request/offer sign

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MSCA (tr : Set<MSCATransition>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Ranked

Interface in package 'automaton'

Interface of a ranked object

Ranked
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Realization from Label to Ranked

[Direction is 'Source -> Destination'.]

Realization from State to Ranked

[Direction is 'Source -> Destination'.]

OPERATIONS

getRank () : Integer Public

[Stereotype is «default». Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

converters

Package in package 'contractautomata'

converters
Version 1.0 Phase 1.0 Proposed
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

converters diagram

Class diagram in package 'converters'

converters
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

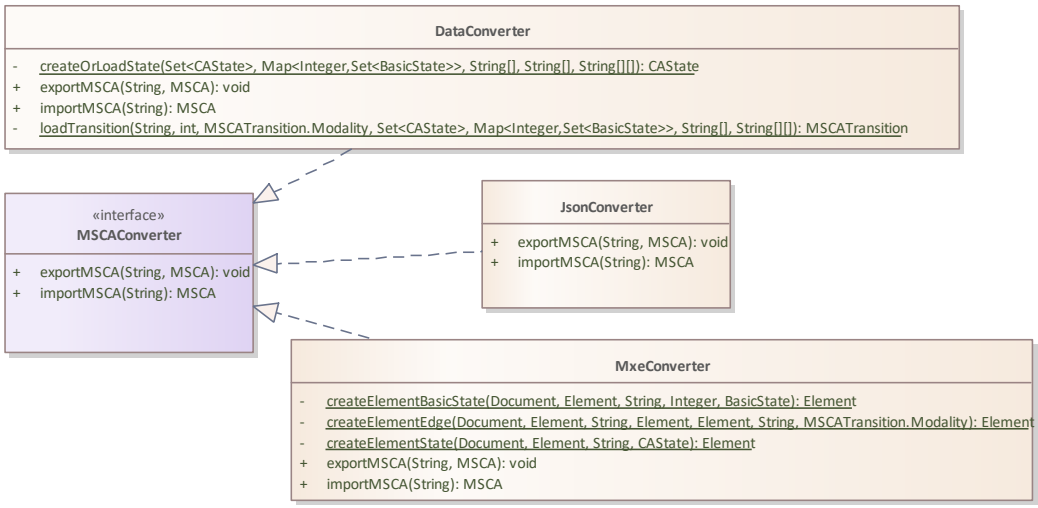

Figure 5: converters

DataConverter

Class in package 'converters'

Import/Export textual DATA format

DataConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from DataConverter to MSCAConverter

[Direction is 'Source -> Destination'.]

OPERATIONS

createOrLoadState (states : Set<CAState> , mapBasicStates : Map<Integer,Set<BasicState>> , state : String[] , initial : String[] , fin : String[][]) : CAState Private

Properties:

OPERATIONS

throws = IOException
[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

exportMSCA (filename : String , aut : MSCA) : void Public

Export the textual description of the automaton in a .data file

Properties:
annotations = @Override
throws = FileNotFoundException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importMSCA (filename : String) : MSCA Public

Import an MSCA described in a text file .data,
@return the object MSCA described in the textfile

Properties:
annotations = @Override
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

loadTransition (str : String , rank : int , type : MSCATransition.Modality , states : Set<CAState> , mapBasicStates : Map<Integer,Set<BasicState>> , initial : String[] , fin : String[][]) : MSCATransition Private

Properties:
throws = IOException
[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

JsonConverter

Class in package 'converters'

Import JSon format (used by VoxLogica tool). The export operation is currently not supported.

JsonConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from JsonConverter to MSCAConverter
[Direction is 'Source -> Destination'.]

OPERATIONS

exportMSCA (filename : String , aut : MSCA) : void Public

Properties:
annotations = @Override
throws = IOException

OPERATIONS

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importMSCA (filename : String) : MSCA Public

Properties:
annotations = @Override
throws = IOException

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MxeConverter

Class in package 'converters'

Import/export in xml (mxe) format. This is the format used by mxGraph library.

MxeConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from MxeConverter to MSCAConverter

[Direction is 'Source -> Destination'.]

OPERATIONS

createElementBasicState (doc : Document , root : Element , id : String , principal : Integer , bs : BasicState) : Element Private

[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

createElementEdge (doc : Document , root : Element , id : String , source : Element , target : Element , label : String , type : MSCATransition.Modality) : Element Private

[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

createElementState (doc : Document , root : Element , id : String , castate : CAState) : Element Private

@param castates
@param arrintstate
@return

[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

exportMSCA (fileName : String , aut : MSCA) : void Public

Export the MSCA aut as a mxGraphModel (used by mxGraph) with XML extension (.mxe)

Properties:
annotations = @Override
throws = ParserConfigurationException,TransformerException

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

importMSCA (filename : String) : MSCA Public

Import the mxGraphModel XML description (used by the mxGraph) into an MSCA object
@return the MSCA parsed from the XML

Properties:
annotations = @Override
throws = ParserConfigurationException,SAXException,IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MSCAConverter

Interface in package 'converters'

The interface used to import/export MSCA

MSCAConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Realization from JsonConverter to MSCAConverter
[Direction is 'Source -> Destination'.]

Realization from MxeConverter to MSCAConverter
[Direction is 'Source -> Destination'.]

Realization from DataConverter to MSCAConverter
[Direction is 'Source -> Destination'.]

OPERATIONS

exportMSCA (filename : String , aut : MSCA) : void Public

Properties:
throws = Exception
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importMSCA (filename : String) : MSCA Public

Properties:
throws = Exception
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

family

Package in package 'contractautomata'

family
Version 1.0 Phase 1.0 Proposed
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

family diagram

Class diagram in package 'family'

family
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

Figure 6: family

converters

Package in package 'family'

converters
Version 1.0 Phase 1.0 Proposed
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converters diagram

Class diagram in package 'converters'

converters
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

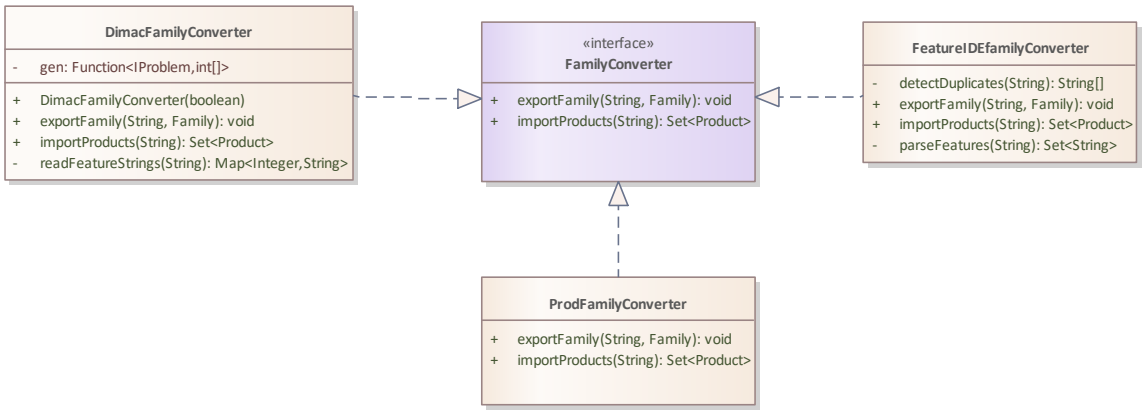

Figure 7: converters

DimacFamilyConverter

Class in package 'converters'

Class for importing and exporting DIMAC models as families of products

DimacFamilyConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from DimacFamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

ATTRIBUTES

gen : Function<IProblem,int[]> Private
[Is static True. Containment is Not Specified.]

OPERATIONS

OPERATIONS

DimacFamilyConverter (allModels : boolean) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

exportFamily (filename : String , fam : Family) : void Public

Properties:
annotations = @Override
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importProducts (filename : String) : Set<Product> Public

Properties:
annotations = @Override
throws = Exception
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

readFeatureStrings (filename : String) : Map<Integer,String> Private

Properties:
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

FeatureIDEfamilyConverter

Class in package 'converters'

Class implementing import/export of products generated by FeatureIDE in family

FeatureIDEfamilyConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from FeatureIDEfamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

OPERATIONS

detectDuplicates (filename : String) : String Private

reads all iff constraints (eq node) and returns a table such that forall i table[i][0] equals table[i][1]

Properties:
throws = ParserConfigurationException,SAXException,IOException
[Is static False. Is abstract False. Is return array True. Is query False. Is synchronized False.]

exportFamily (filename : String , fam : Family) : void Public

OPERATIONS

Properties:
annotations = @Override
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importProducts (filename : String) : Set<Product> Public

loads the list of products generated through FeatureIDE
@return the imported set of products

Properties:
annotations = @Override
throws = ParserConfigurationException,SAXException,IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

parseFeatures (filename : String) : Set<String> Private

Properties:
throws = ParserConfigurationException,SAXException,IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ProdFamilyConverter

Class in package 'converters'

Class implementing import/export from the .prod textual format

ProdFamilyConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from ProdFamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

OPERATIONS

exportFamily (filename : String , fam : Family) : void Public

Properties:
annotations = @Override
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importProducts (filename : String) : Set<Product> Public

Properties:
annotations = @Override
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

FamilyConverter

Interface in package 'converters'

Interface for importing/exporting a family

FamilyConverter
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Realization from FeatureIDEfamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

Realization from DimacFamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

Realization from ProdFamilyConverter to FamilyConverter
[Direction is 'Source -> Destination'.]

OPERATIONS

exportFamily (filename : String , fam : Family) : void Public

Properties:
throws = IOException
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

importProducts (filename : String) : Set<Product> Public

Properties:
throws = Exception
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Family

Class in package 'family'

Class representing a family of products. A family contains its products/configurations and may contain also its subfamilies, organised as a partial order

Family
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

ATTRIBUTES

po : Map<Product,Map<Boolean,Set<Product>>> Private Const

[Is static True. Containment is Not Specified.]

products : Set<Product> Private Const

[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) FMCA Target: Private family (Class) Family

OPERATIONS

equals (obj : Object) : boolean Public

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Family (products : Set<Product>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Family (products : Set<Product> , areComparable : BiPredicate<Product,Product> , compare : BiFunction<Product, Product, Integer>) : Public

This constructor also instantiate the partial order

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getMaximalProducts () : Set<Product> Public

@return all maximal products p s.t. there is no p'greater than p

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getMaximumDepth () : int Public

@return the maximum number of features available for a product i.e. the maximum depth of the po tree

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getPo () : Map<Product, Map<Boolean, Set<Product>>> Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getProducts () : Set<Product> Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getSubProductsofProduct (prod : Product) : Set<Product> Public

OPERATIONS

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getSuperProductsofProduct (prod : Product) : Set<Product> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Feature

Class in package 'family'

Class implementing a feature

Feature
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

name : String Private Const
[Is static True. Containment is Not Specified.]

OPERATIONS

equals (obj : Object) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Feature (name : String) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getName () : String Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

OPERATIONS

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

FMCA

Class in package 'family'

Class implementing a Featured Modal Contract Automata

FMCA
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

aut : MSCA Private Const
[Is static True. Containment is Not Specified.]

family : Family Private Const
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) FMCA — Target: Private aut (Class) MSCA

Association (direction: Source -> Destination)

Source: Public (Class) FMCA — Target: Private family (Class) Family

OPERATIONS

FMCA (aut : MSCA , family : Family) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

FMCA (aut : MSCA , products : Set<Product>) : Public

this constructor instatiates the family of products starting by refining products to remove redundant products (that are already known to have empty orchestrations). Only features of the products that are labels of the automaton aut are retained Those

OPERATIONS

products requiring features not present in the orchestration of aut in agreement are discarded.
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getAut () : MSCA Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getCanonicalProducts () : Map<Product,MSCA> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getFamily () : Family Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getOrchestrationOfFamily () : MSCA Public

@return computes the orchestration of the family by only considering canonical products
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getOrchestrationOfFamilyEnumerative () : MSCA Public

@return computes the orchestration of the family as the union of orchestrations of total products
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getTotalProductsWithNonemptyOrchestration () : Map<Product,MSCA> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

productsRespectingValidity () : Set<Product> Public

respectingValidity see Theorem 3 of JSCP2020 (author Basile), this method exploits the partial order so it starts from maximal products
@return the set of products respecting validity
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

productsRespectingValidity (a : MSCA) : Set<Product> Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

productsWithNonEmptyOrchestration () : Set<Product> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

productsWithNonEmptyOrchestration (aut : MSCA) : Set<Product> Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

selectProductsSatisfyingPredicateUsingPO (a : MSCA , pred : Predicate<Product>) : Set<Product> Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

PartialProductGenerator

Class in package 'family'

Class implementing the partial product generation operator

PartialProductGenerator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

apply (setprod : Set<Product>) : Set<Product> Public

https://en.wikipedia.org/wiki/Quine%E2%80%93McCluskey_algorithm Given two products p1 p2 identical but for a feature f activated in one and deactivated in the other, a super product (a.k.a. sub-family) is generated such that f is left unresolved. This method generates all possible super products. It is required that all super products are such that the corresponding feature model formula is satisfied. This condition holds for the method. Indeed, assume the feature model formula is in CNF, it is never the case that f is the only literal of a disjunct (i.e. a truth value must be assigned to f); otherwise either p1 or p2 is not a valid product (p1 if f is negated in the disjunct, p2 otherwise).
@return the set of all total and partial products generated

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Product

Class in package 'family'

A configuration/product of a product line/family, identified as set of required and forbidden features

Product
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

forbidden : Set<Feature> Private Const
[Is static True. Containment is Not Specified.]

required : Set<Feature> Private Const
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) ProductOrchestrationSynthesisOperator Target: Private p (Class) Product

OPERATIONS

checkForbidden (tr : Set<? extends MSCATransition>) : boolean Public

OPERATIONS

@return true if all forbidden actions are not available in the transitions t
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

checkRequired (tr : Set<? extends MSCATransition>) : boolean Public

@return true if all required actions are available in the transitions tr
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

equals (obj : Object) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getForbidden () : Set<Feature> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getForbiddenAndRequiredNumber () : int Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getRequired () : Set<Feature> Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

hashCode () : int Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isForbidden (t : MSCATransition) : boolean Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isValid (aut : MSCA) : boolean Public

private boolean isRequired(MSCATransition t) { return
(FMCAUtils.getIndex(this.getRequired(),t.getLabel().getUnsignedAction())>=0); }
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Product (required : Set<Feature> , forbidden : Set<Feature>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

Product (r : String[] , f : String[]) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

removeFeatures (sf : Set<Feature>) : Product Public

OPERATIONS

@return a new product where the features in sf have been removed (from both required and forbidden features)
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

retainFeatures (sf : Set<Feature>) : Product Public

@return a new product containing only the intersection of its features with those in sf
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toHTMLString (s : String) : String Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toString () : String Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

toStringFile (id : int) : String Public

@return a string representation of the product to be stored in a file .prod
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

operators

Package in package 'contractautomata'

operators
Version 1.0 Phase 1.0 Proposed
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

operators diagram

Class diagram in package 'operators'

operators
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

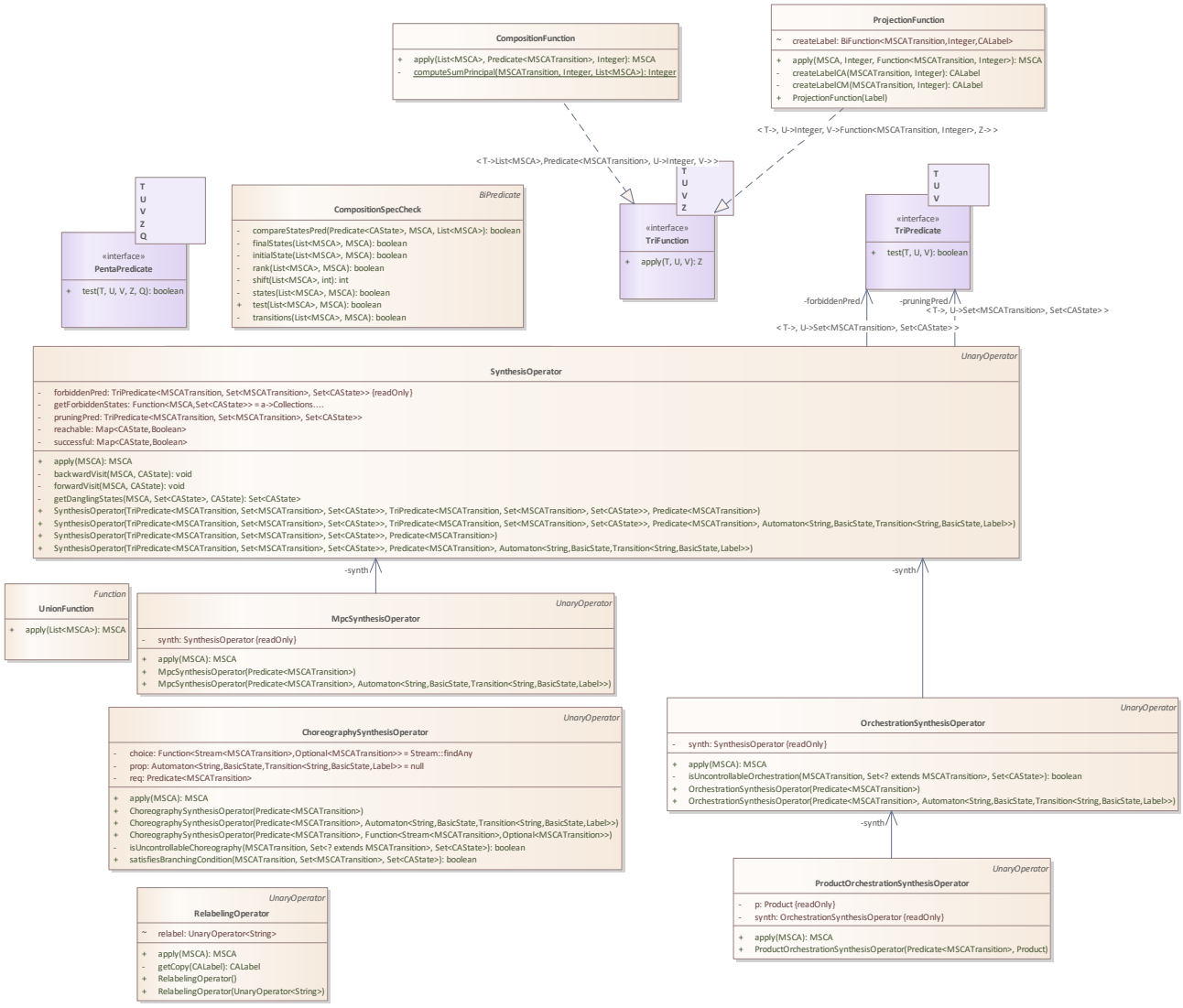

Figure 8: operators

ChoreographySynthesisOperator

Class in package 'operators'

Class implementing the Choreography Synthesis

ChoreographySynthesisOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

choice : Function<Stream<MSCATransition>,Optional<MSCATransition>> Private = Stream::findAny
[Is static True. Containment is Not Specified.]

prop : Automaton<String,BasicState,Transition<String,BasicState,Label>> Private = null
[Is static True. Containment is Not Specified.]

req : Predicate<MSCATransition> Private
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) ChoreographySynthesisOperator Target: Private prop (Class) Automaton

OPERATIONS

apply (aut : MSCA) : MSCA Public

invokes the synthesis method for synthesising the choreography
@return the synthesised choreography, removing only one transition violating the branching condition each time no further updates are possible. The transition to remove is chosen nondeterministically.

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ChoreographySynthesisOperator (req : Predicate<MSCATransition>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ChoreographySynthesisOperator (req : Predicate<MSCATransition> , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ChoreographySynthesisOperator (req : Predicate<MSCATransition> , choice : Function<Stream<MSCATransition>,Optional<MSCATransition>>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isUncontrollableChoreography (tra : MSCATransition , str : Set<? extends MSCATransition> , badStates : Set<CAState>) : boolean Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

satisfiesBranchingCondition (tra : MSCATransition , trans : Set<MSCATransition> , bad : Set<CAState>) : boolean Public

@return true if the set of transitions and bad states violate the branching condition

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CompositionFunction

Class in package 'operators'

Class implementing the composition

CompositionFunction
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from CompositionFunction to TriFunction

[Direction is 'Source -> Destination'.]

OPERATIONS

apply (aut : List<MSCA> , pruningPred : Predicate<MSCATransition> , bound : Integer) : MSCA Public

This is the most important method of the tool, it computes the non-associative composition of contract automata.
@return the composed automaton

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

computeSumPrincipal (etra : MSCATransition , eind : Integer , aut : List<MSCA>) : Integer Private

[Is static True. Is abstract False. Is return array False. Is query False. Is synchronized False.]

CompositionSpecCheck

Class in package 'operators'

The specification of the composition in first-order logic (expressed through Java Streams)

CompositionSpecCheck
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

compareStatesPred (pred : Predicate<CAState> , comp : MSCA , aut : List<MSCA>) : boolean Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

finalStates (aut : List<MSCA> , comp : MSCA) : boolean Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

initialState (aut : List<MSCA> , comp : MSCA) : boolean Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

rank (aut : List<MSCA> , comp : MSCA) : boolean Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

shift (aut : List<MSCA> , j : int) : int Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

states (aut : List<MSCA> , comp : MSCA) : boolean Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

test (aut : List<MSCA> , comp : MSCA) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

transitions (aut : List<MSCA> , comp : MSCA) : boolean Private

```
public CAState getInitialState(List<MSCA> aut) { List<BasicState> ic = new ArrayList<>(aut.stream() .mapToInt(a->a.getRank()) .sum());  IntStream.range(0,aut.size()) .forEach(j->{IntStream.range(0, aut.get(j).getInitial().getState().size()) .forEach(i_bs->ic.set(i_bs+shift(aut,j), aut.get(j).getInitial().getState().get(i_bs)));} );  return new CAState(ic,0,0); }
```

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ModelCheckingFunction

Class in package 'operators'

Class implementing the model checking function

ModelCheckingFunction
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

bound : int Private Const
[Is static True. Containment is Not Specified.]

OPERATIONS

apply (aut : MSCA , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Set<CAState> Public

@return the set of states violating prop

OPERATIONS

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ModelCheckingFunction () : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ModelCheckingFunction (bound : Integer) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MpcSynthesisOperator

Class in package 'operators'

Class implementing the mpc operator

MpcSynthesisOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

synth : SynthesisOperator Private Const
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) MpcSynthesisOperator Target: Private synth (Class) SynthesisOperator

OPERATIONS

apply (aut : MSCA) : MSCA Public

invokes the synthesis method for synthesising the mpc
@return the synthesised most permissive controller

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MpcSynthesisOperator (req : Predicate<MSCATransition>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

MpcSynthesisOperator (req : Predicate<MSCATransition> , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Public

OPERATIONS

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OrchestrationSynthesisOperator

Class in package 'operators'

Class implementing the orchestration synthesis operator

OrchestrationSynthesisOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

synth : SynthesisOperator Private Const

[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) OrchestrationSynthesisOperator

Target: Private synth (Class) SynthesisOperator

Association (direction: Source -> Destination)

Source: Public (Class) ProductOrchestrationSynthesisOperator

Target: Private synth (Class) OrchestrationSynthesisOperator

OPERATIONS

apply (aut : MSCA) : MSCA Public

invokes the synthesis method for synthesising the orchestration
@return the synthesised orchestration

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

isUncontrollableOrchestration (tra : MSCATransition , str : Set<? extends MSCATransition> , badStates : Set<CAState>) : boolean Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OrchestrationSynthesisOperator (req : Predicate<MSCATransition>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OrchestrationSynthesisOperator (req : Predicate<MSCATransition> , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

ProductOrchestrationSynthesisOperator

Class in package 'operators'

Class implenenting the orchestration synthesis for a specific product

ProductOrchestrationSynthesisOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES
p : Product Private Const [Is static True. Containment is Not Specified.]
synth : OrchestrationSynthesisOperator Private Const [Is static True. Containment is Not Specified.]

ASSOCIATIONS	
Association (direction: Source -> Destination)	
Source: Public (Class) ProductOrchestrationSynthesisOperator	Target: Private p (Class) Product
Association (direction: Source -> Destination)	
Source: Public (Class) ProductOrchestrationSynthesisOperator	Target: Private synth (Class) OrchestrationSynthesisOperator

OPERATIONS
apply (aut : MSCA) : MSCA Public @return the synthesised orchestration of product p [Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]
ProductOrchestrationSynthesisOperator (req : Predicate<MSCATransition> , p : Product) : Public [Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ProjectionFunction

Class in package 'operators'

Class implementing the projection function

ProjectionFunction

Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OUTGOING STRUCTURAL RELATIONSHIPS

Realization from ProjectionFunction to TriFunction

[Direction is 'Source -> Destination'.]

ATTRIBUTES

createLabel : BiFunction<MSCATransition,Integer,CALabel> Package

[Is static True. Containment is Not Specified.]

OPERATIONS

apply (aut : MSCA , indexprincipal : Integer , getNecessaryPrincipal : Function<MSCATransition, Integer>) : MSCA Public

compute the projection on the i-th principal
@return the projected i-th principal

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

createLabelCA (t : MSCATransition , indexprincipal : Integer) : CALabel Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

createLabelCM (t : MSCATransition , indexprincipal : Integer) : CALabel Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

ProjectionFunction (lab : Label) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

RelabelingOperator

Class in package 'operators'

Class implementing the relabeling operator

RelabelingOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

relabel : UnaryOperator<String> Package

[Is static True. Containment is Not Specified.]

OPERATIONS

apply (aut : MSCA) : MSCA Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getCopy (la : CALabel) : CALabel Private
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

RelabelingOperator () : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

RelabelingOperator (relabel : UnaryOperator<String>) : Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

SynthesisOperator

Class in package 'operators'

Class implementing the abstract synthesis operator

SynthesisOperator
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ATTRIBUTES

forbiddenPred : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> Private Const
[Is static True. Containment is Not Specified.]

getForbiddenStates : Function<MSCA,Set<CAState>> Private = a->Collections.emptySet()
[Is static True. Containment is Not Specified.]

pruningPred : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> Private
[Is static True. Containment is Not Specified.]

reachable : Map<CAState,Boolean> Private
[Is static True. Containment is Not Specified.]

successful : Map<CAState,Boolean> Private
[Is static True. Containment is Not Specified.]

ASSOCIATIONS

Association (direction: Source -> Destination)

ASSOCIATIONS

Source: Public (Class) SynthesisOperator

Target: Private forbiddenPred (Interface) TriPredicate

Association (direction: Source -> Destination)

Source: Public (Class) SynthesisOperator

Target: Private pruningPred (Interface) TriPredicate

Association (direction: Source -> Destination)

Source: Public (Class) OrchestrationSynthesisOperator

Target: Private synth (Class) SynthesisOperator

Association (direction: Source -> Destination)

Source: Public (Class) MpcSynthesisOperator

Target: Private synth (Class) SynthesisOperator

OPERATIONS

apply (arg1 : MSCA) : MSCA Public

invokes the synthesis
@return the synthesised automaton

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

backwardVisit (aut : MSCA , currentstate : CAState) : void Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

forwardVisit (aut : MSCA , currentstate : CAState) : void Private

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

getDanglingStates (aut : MSCA , states : Set<CAState> , initial : CAState) : Set<CAState> Private

@return states who do not reach a final state or are unreachable

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

SynthesisOperator (pruningPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , forbiddenPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , req : Predicate<MSCATransition>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

SynthesisOperator (pruningPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , forbiddenPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , req : Predicate<MSCATransition> , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

OPERATIONS

SynthesisOperator (forbiddenPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , req : Predicate<MSCATransition>) : Public

This constructor does not use any pruning predicate

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

SynthesisOperator (forbiddenPredicate : TriPredicate<MSCATransition, Set<MSCATransition>, Set<CAState>> , req : Predicate<MSCATransition> , prop : Automaton<String,BasicState,Transition<String,BasicState,Label>>) : Public

This constructor does not use any pruning predicate

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

UnionFunction

Class in package 'operators'

Class implementing the union function

UnionFunction
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

apply (aut : List<MSCA>) : MSCA Public

@return compute the union of the FMCA in aut

Properties:
annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

PentaPredicate

Interface in package 'operators'

PentaPredicate
Version 1.0 Phase 1.0 Proposed
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

test (arg1 : T , arg2 : U , arg3 : V , arg4 : Z , arg5 : Q) : boolean Public

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

TriFunction

Interface in package 'operators'

A function over three arguments, for readability.
@param <T> first argument
@param <U> second argument
@param <V> third argument
@param <Z> returned class

TriFunction
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

INCOMING STRUCTURAL RELATIONSHIPS

Realization from CompositionFunction to TriFunction
[Direction is 'Source -> Destination'.]

Realization from ProjectionFunction to TriFunction
[Direction is 'Source -> Destination'.]

OPERATIONS

apply (arg1 : T , arg2 : U , arg3 : V) : Z Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

TriPredicate

Interface in package 'operators'

A predicate over three arguments. * Used in the synthesis method of MSCA for readability.
@param <T> generic type of the first argument
@param <U> generic type of the second argument
@param <V> generic type of the third argument

TriPredicate
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

ASSOCIATIONS

Association (direction: Source -> Destination)

Source: Public (Class) SynthesisOperator

Target: Private forbiddenPred (Interface) TriPredicate

Association (direction: Source -> Destination)

Source: Public (Class) SynthesisOperator

Target: Private pruningPred (Interface) TriPredicate

OPERATIONS

test (arg1 : T , arg2 : U , arg3 : V) : boolean Public
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

requirements

Package in package 'contractautomata'

requirements
Version 1.0 Phase 1.0 Proposed
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

requirements diagram

Class diagram in package 'requirements'

requirements
Version 1.0
Davide Basile (ISTI CNR Italy) created on 12/9/2021. Last modified 12/9/2021

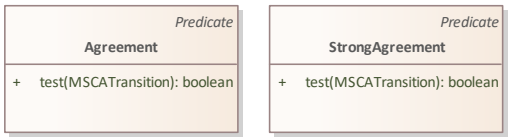

Figure 9: requirements

Agreement

Class in package 'requirements'

The agreement predicate over MSCATransitions

Agreement
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

test (t : MSCATransition) : boolean Public

Properties:
annotations = @Override
[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]

StrongAgreement

Class in package 'requirements'

The strong agreement predicate over MSCATransitions

StrongAgreement
Version 1.0 Phase 1.0 Proposed
Davide Basile created on 12/9/2021. Last modified 12/9/2021

OPERATIONS

test (t : MSCATransition) : boolean Public

OPERATIONS

Properties:

annotations = @Override

[Is static False. Is abstract False. Is return array False. Is query False. Is synchronized False.]