Mathematical Notation and Event Representation by using Pre-conceptual Schemas

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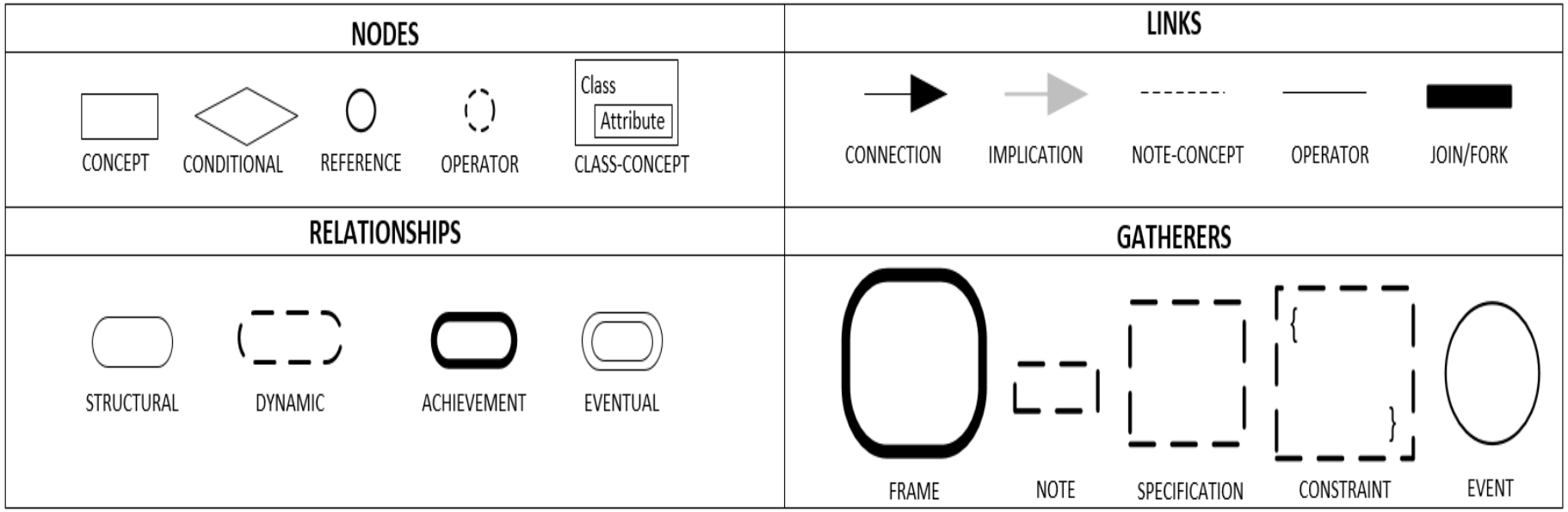

(Zapata, 2012)

PRE-CONCEPTUAL SCHEMA

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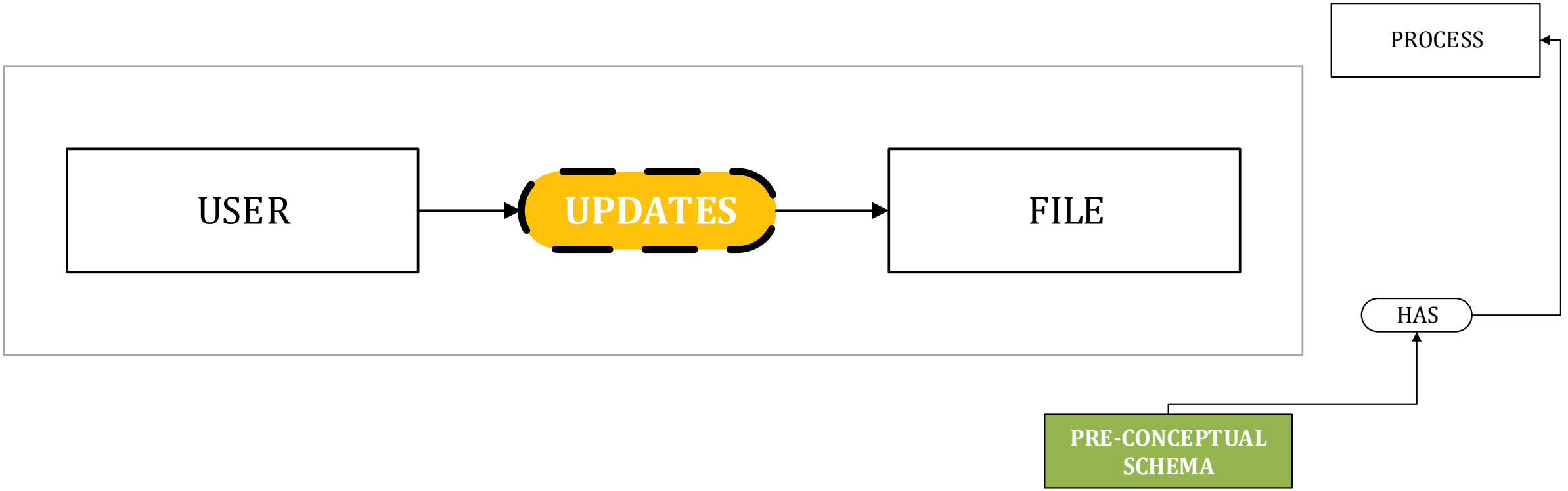

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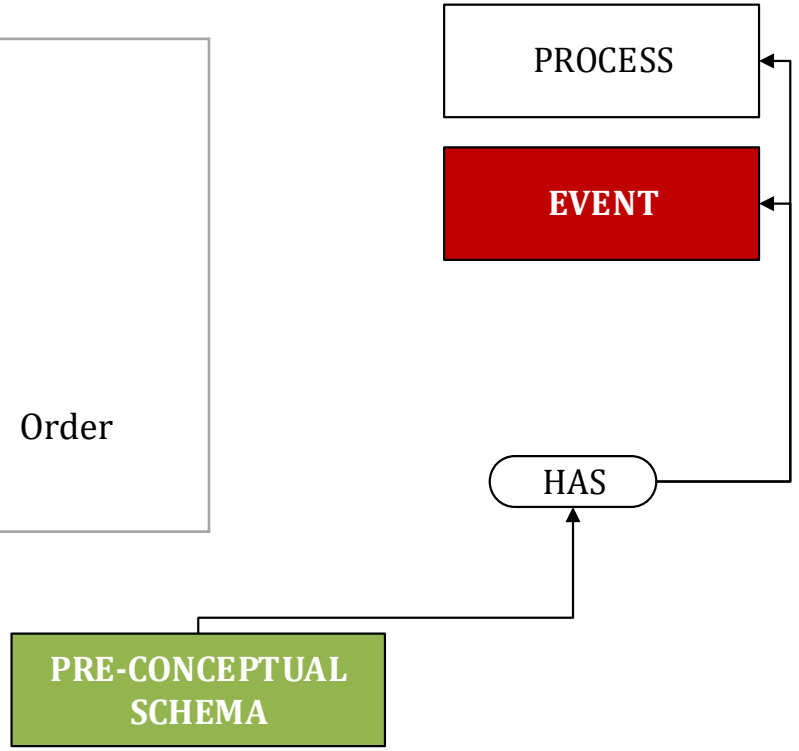
Space	Temporality
Orientation Direction Sequence  pixabay.com (Kim, 2009)	Duration  pixabay.com Order



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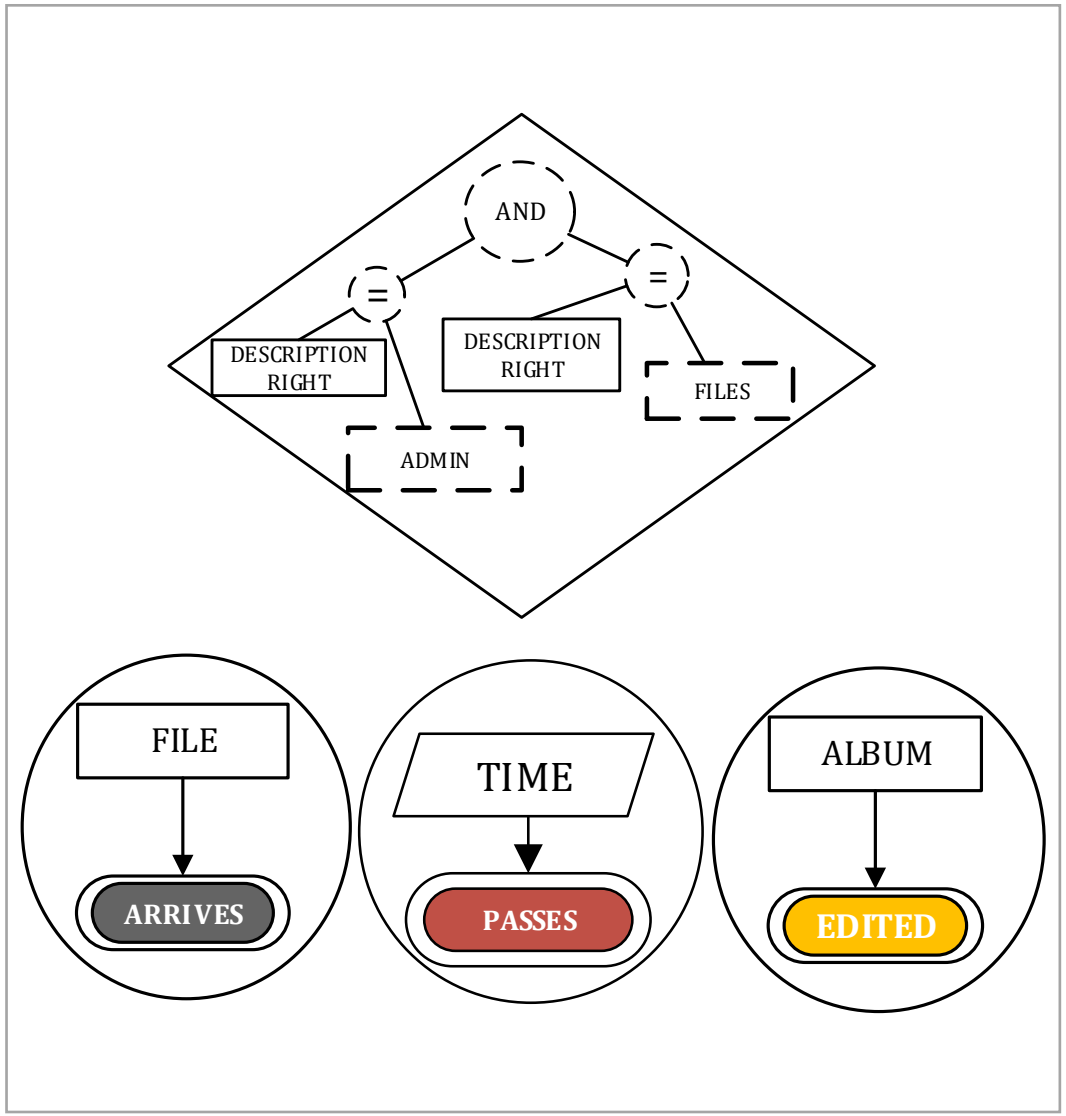

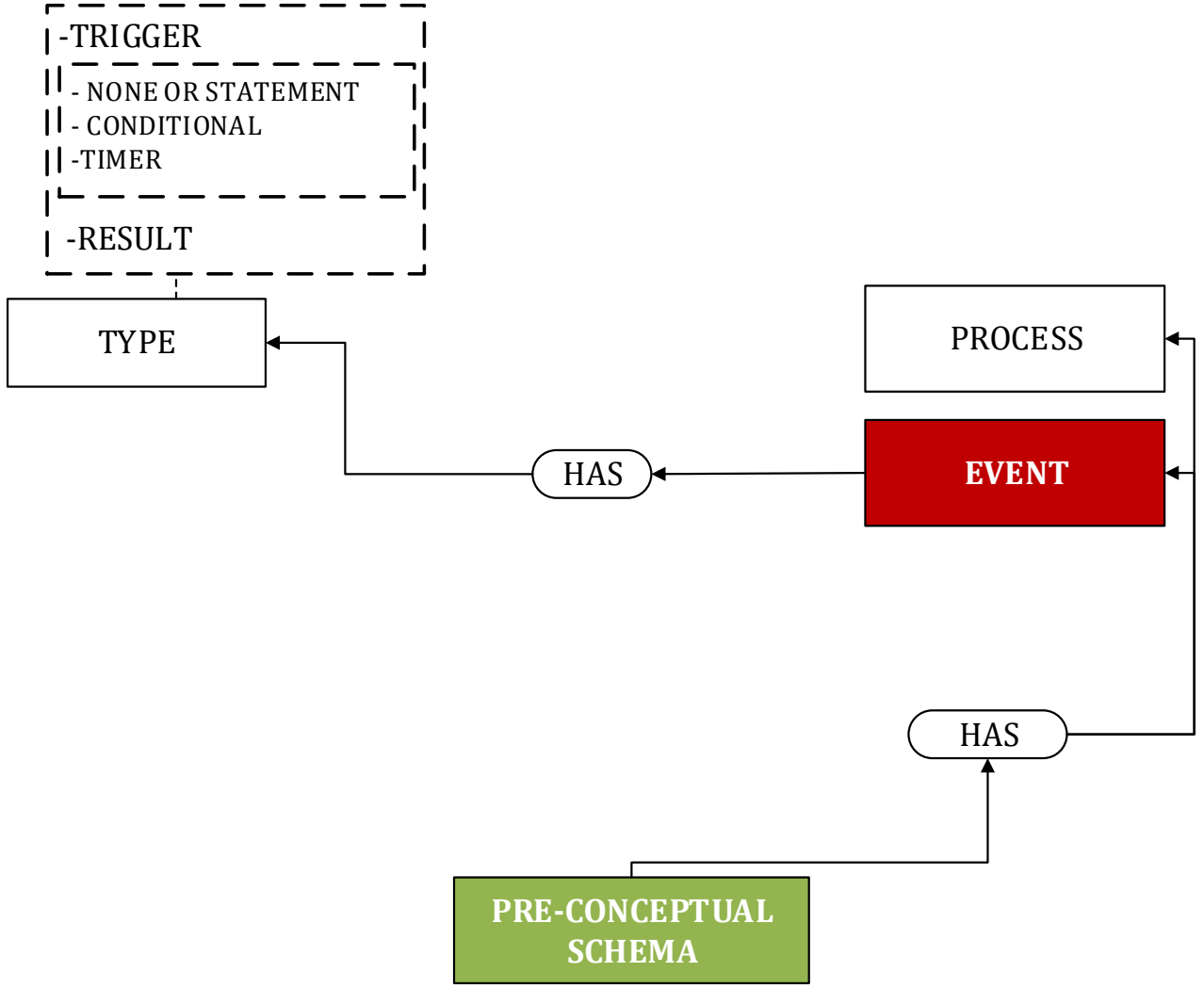

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-TRIGGER

- NONE OR STATEMENT
- CONDITIONAL
-TIMER

-RESULT

TYPE

NAME

CONSTRAINT

HAS

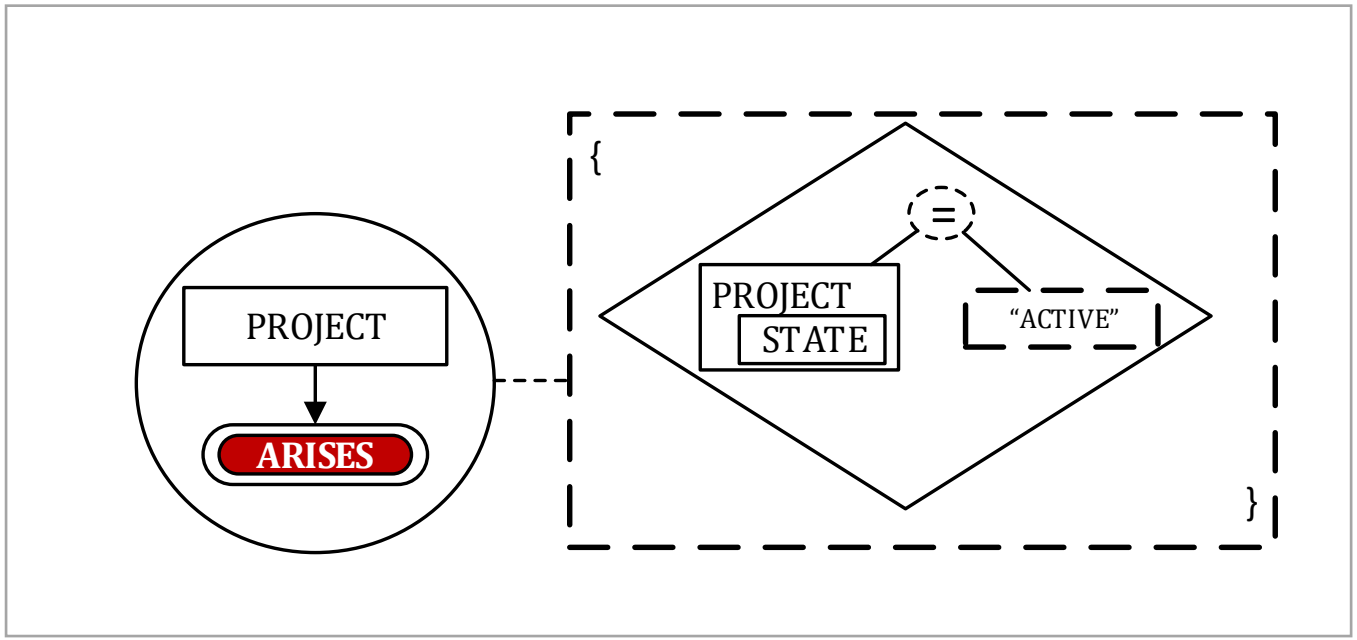
PROCESS

EVENT

HAS

PRE-CONCEPTUAL SCHEMA

NAME="PROJECT ARISES"



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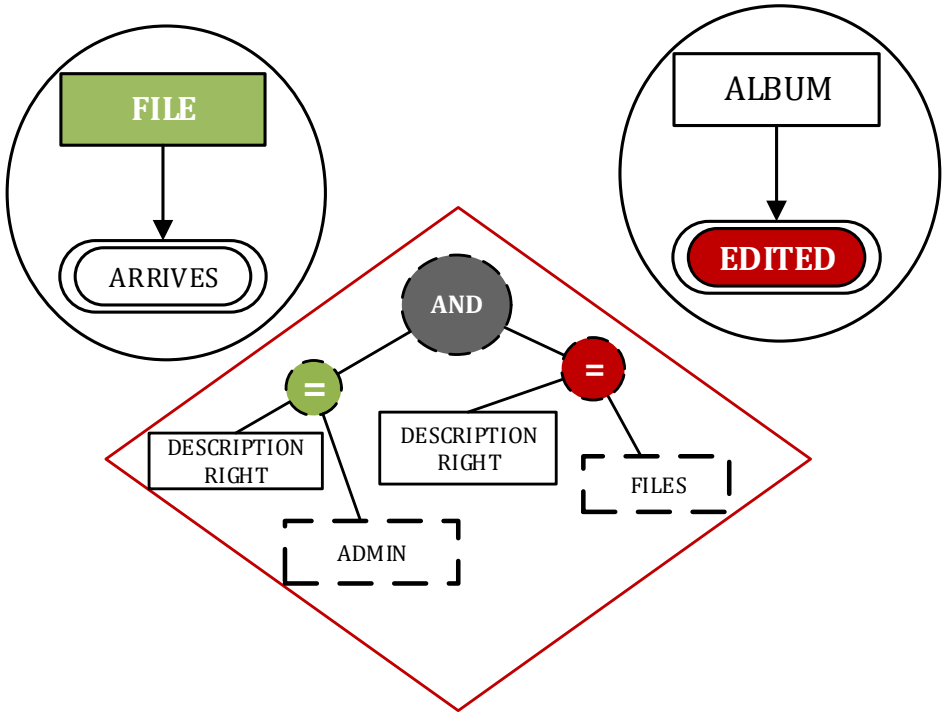
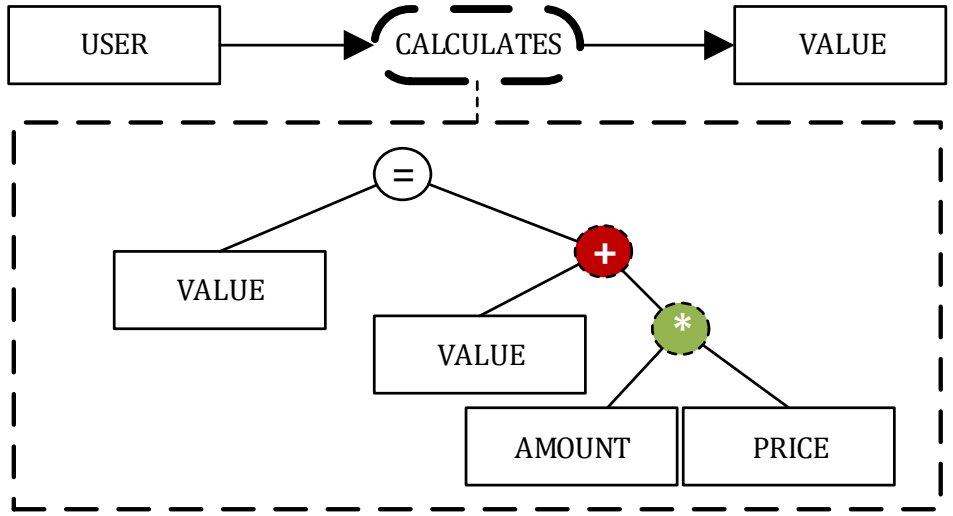
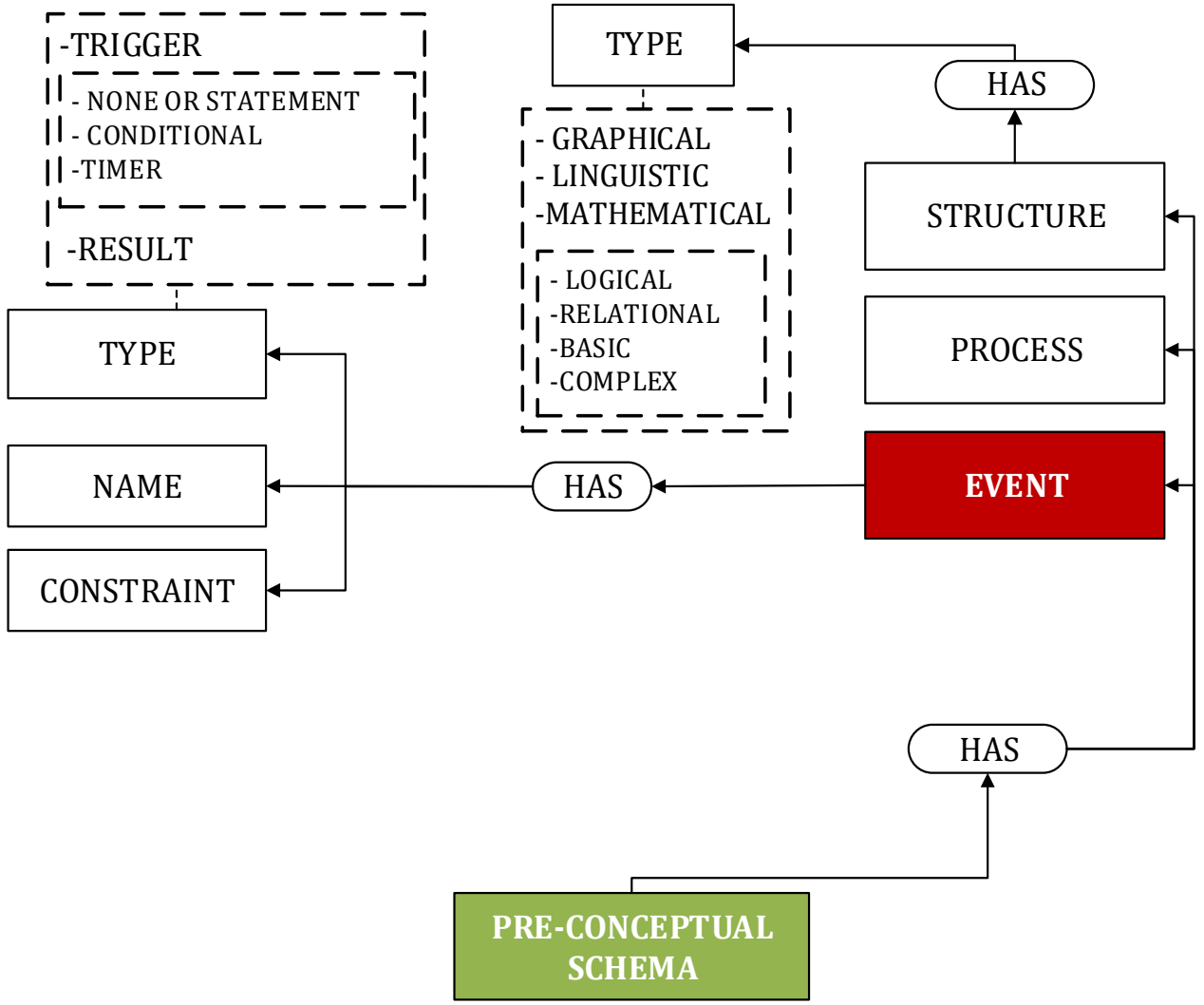




(Chaverra, 2011)



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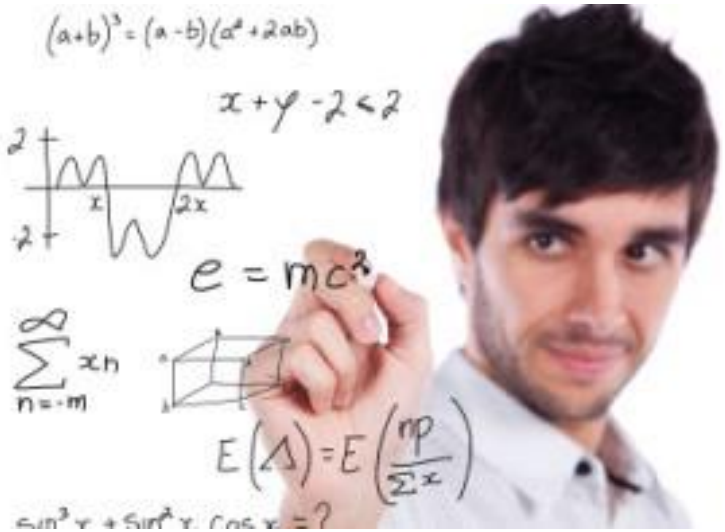

-SCIENTIFIC
-ENGINEERING
-SCIENCES
-MATH
-BUSINESS
-SOFTWARE
-ADMINISTRATION
-ECONOMY

-TRIGGER
- NONE OR STATEMENT
- CONDITIONAL
-TIMER
-RESULT

TYPE
- GRAPHICAL
- LINGUISTIC
-MATHEMATICAL
- LOGICAL
-RELATIONAL
-BASIC
-COMPLEX

HAS
STRUCTURE
PROCESS
EVENT

TYPE
NAME
CONSTRAINT
HAS

TYPE
HAS

PROJECT
ARISES

{
PROJECT
STATE
≡
"ACTIVE"
}

HAS

ANALYST
USES
PRE-CONCEPTUAL SCHEMA
SCIENTIFIC SOFTWARE DOMAIN

REPRESENTS
DOMAIN
IS

RECOGNIZES

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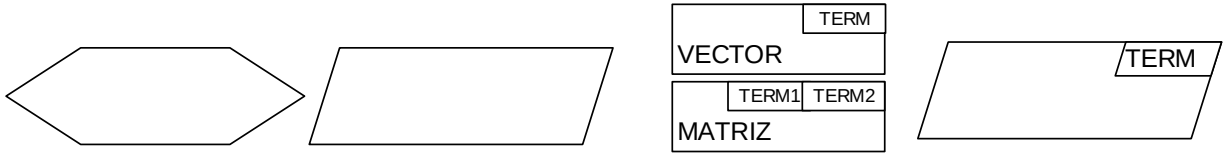
Mathematical Notation

NODES



PARAMETER | INDEPENDENT VARIABLE | ARRAYS | INDEPENDENT ARRAY

GATHERERS

CLASS CONCEPT	
TERM	**ATTRIBUTE**
0	Atributte value at term 0
…	…
N	Atributte value at term N

ARRAY TABLE

INITIAL CONDITIONS

INITIAL CONDITIONS

MATHEMATICAL OPERATORS

Sqrt — SQUARE ROOT

Exp — EXPONENTIAL FUNCTION

Log — NATURAL LOGARITHM

Abs — ABSOLUTE VALUE

ARRAY OPERATORS

Push — PUSH

Pop — POP

TRIGONOMETRIC OPERATORS

Sin — SINE

Cos — COSINE

Tan — TANGENT

Csc — COSECANT

Ctg — CONTANGENT

Sec — SECANT

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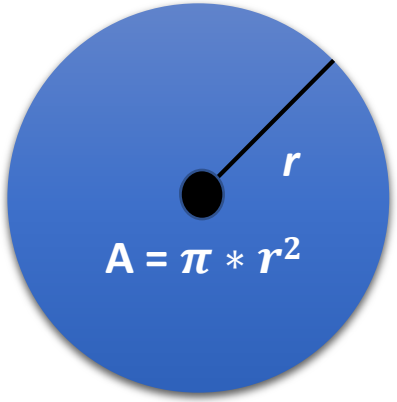
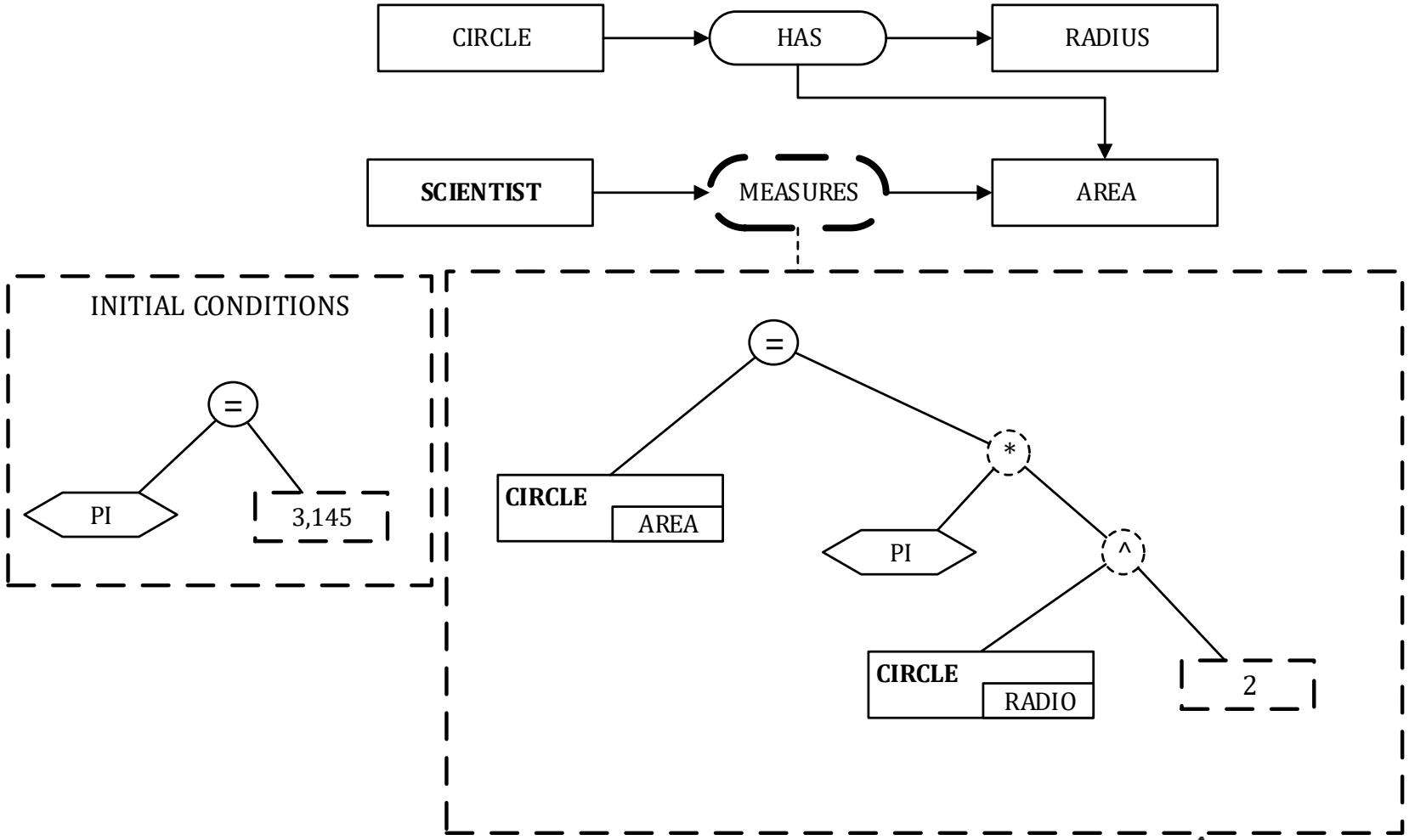
Mathematical Notation





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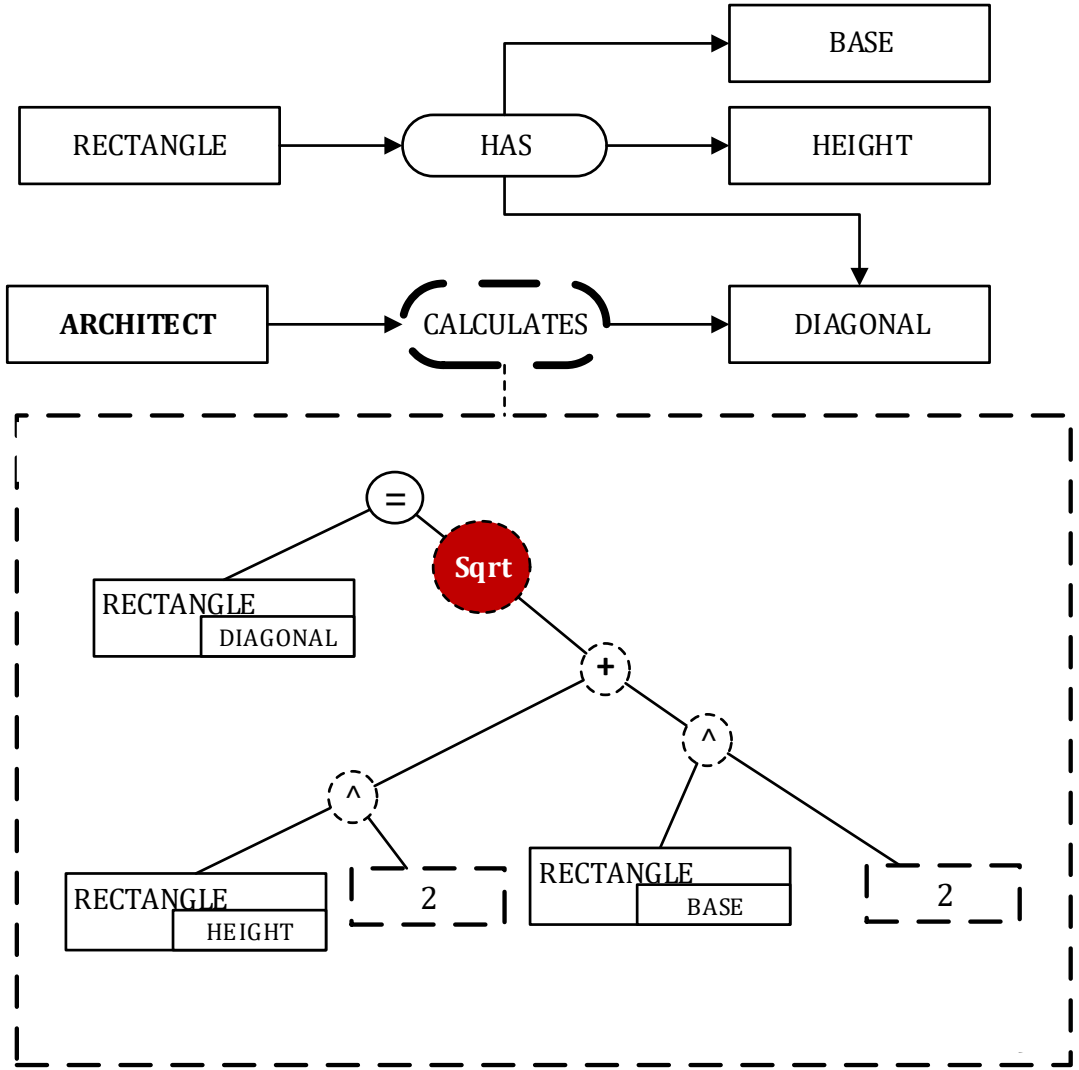
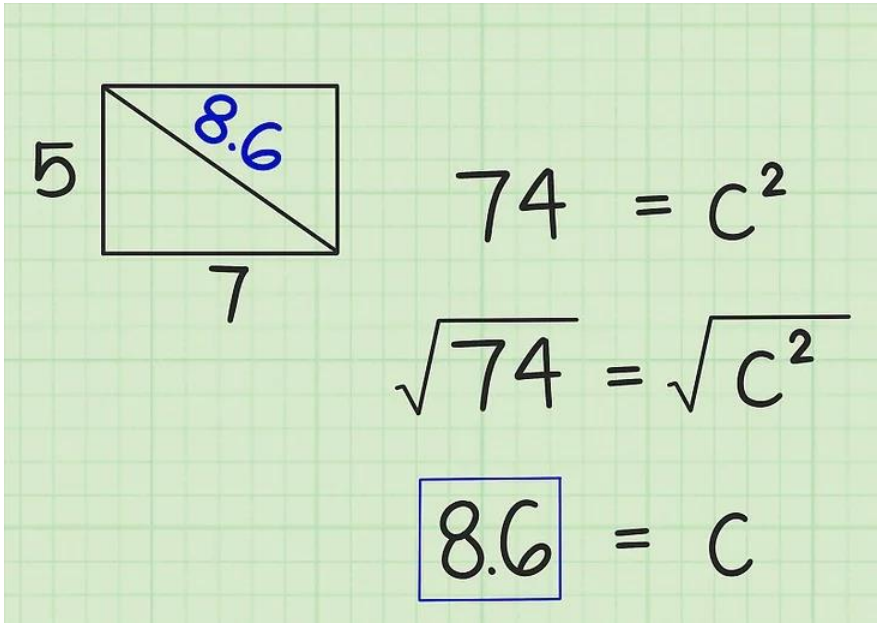
Mathematical Notation





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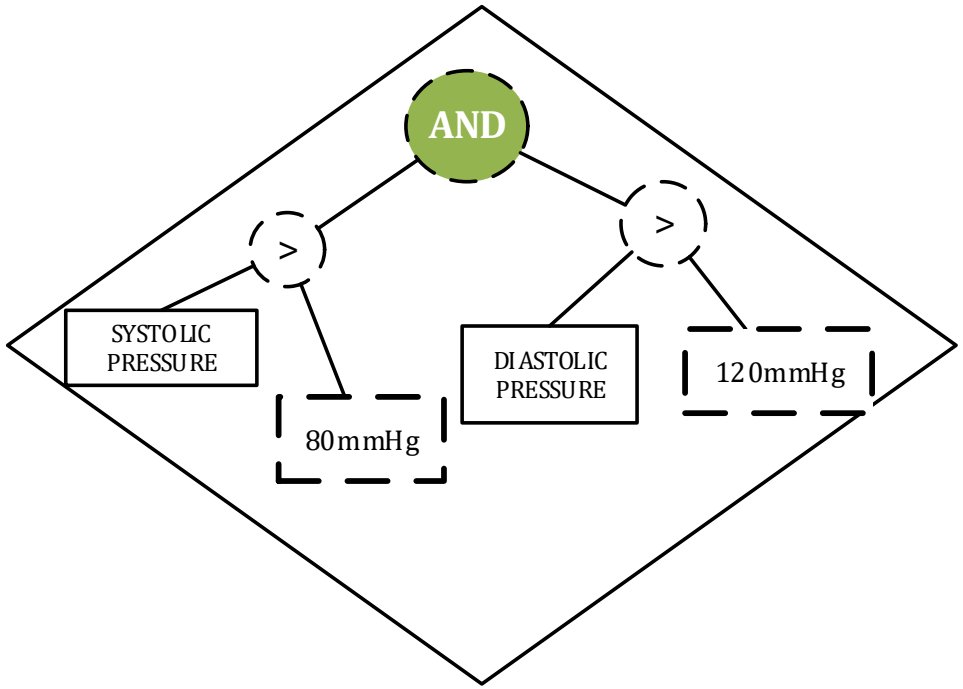
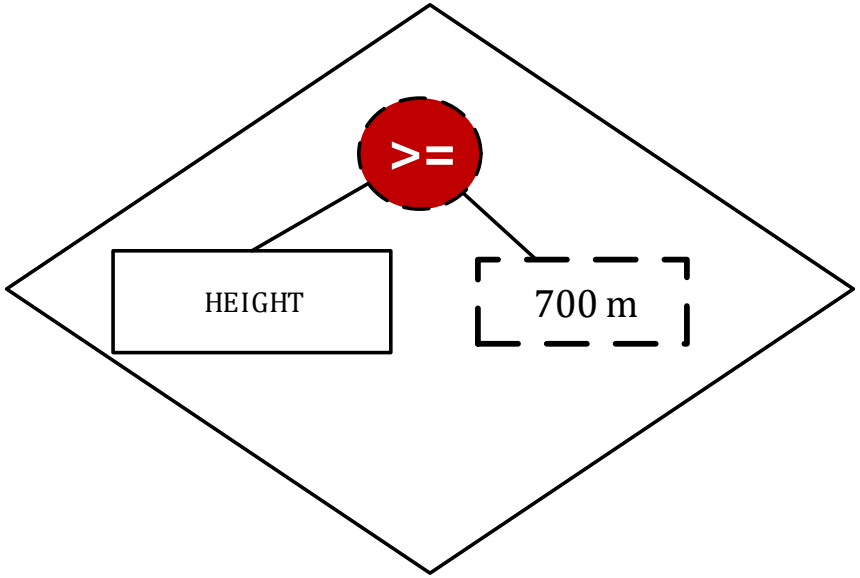
Event Representation



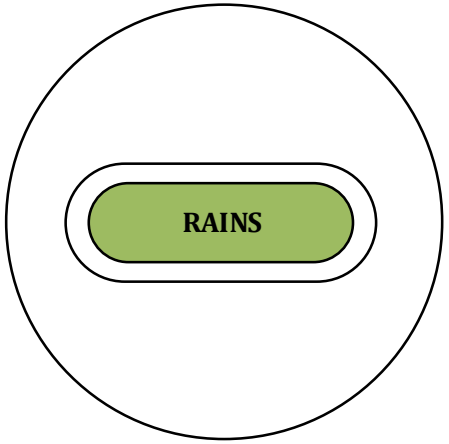


Conditional Event

Event Representation

Eventual Relationship	Example of event	Semantic Role		
		Actant		Circumstant
		Quantity	Type	
Rain	It rains	0	It does not require semantic role	Cause
Thunder	It thunders	0	It does not require semantic role	Cause
Hail	It hails	0	It does not require semantic role	Cause
Snow	It Snow	0	It does not require semantic role	Cause

None or statement



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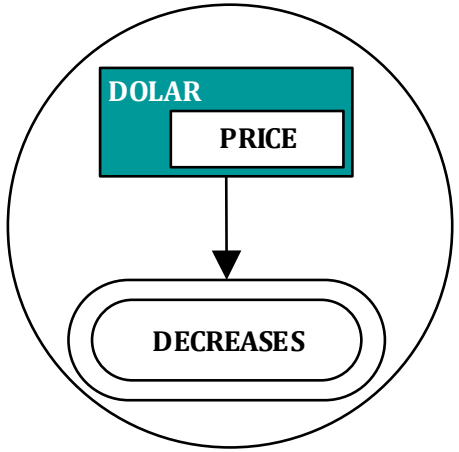
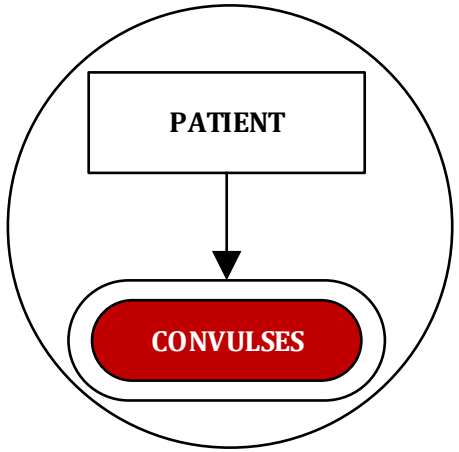
Event Representation

Eventual Relationship	Example of event	Semantic Role		
		Actant		Circumstant
		Quantity	Type	
Rise	Voltage rises	1	Experiencer	Strength, cause
Erupt	Volcano erupts	1	Experiencer	Strength, cause
Bleed	Patient bleeds	1	Patient	Cause
Convulse	Patient convulses	1	Patient	Cause
Decrease	DolarPrice decreases	1	Experiencer	Cause
Increase	DolarPrice increases	1	Experiencer	Cause
Grow	Population grows	1	Experiencer	Cause
Start	Service starts	1	Experiencer	Cause
Sound	Alarm sounds	1	Experiencer	Cause
Fall	Lightning falls	1	Experiencer	Strength, cause
Expire	Product expires	1	Experiencer	Cause
Arrive	Cholesterol arrives	1	Experiencer	Cause





None or statement

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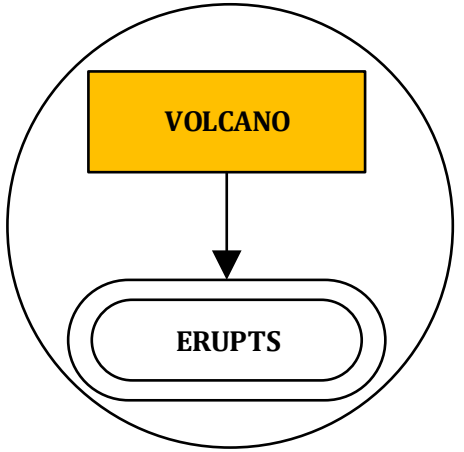
Event Representation

Eventual Relationship	Example of event	Semantic Role		
		Actant		Circumstant
		Quantity	Type	
Emerge	Bacteria emerges	1	Experiencer	Cause
Come	Signal comes	1	Experiencer	Cause
Tinkle	Bell tinkles	1	Experiencer	Cause
Ring	Bell Rings	1	Experiencer	Cause
Fly	African bee flies	1	Experiencer	Cause
Boil	Magma boils	1	Experiencer	Cause
Appear	Electric wave appears	1	Patient	Cause
Sleep	Patient sleeps	1	Patient	Cause
Sneeze	Patient sneezes	1	Patient	Cause
Die	Animal dies	1	Patient	Cause



None or statement

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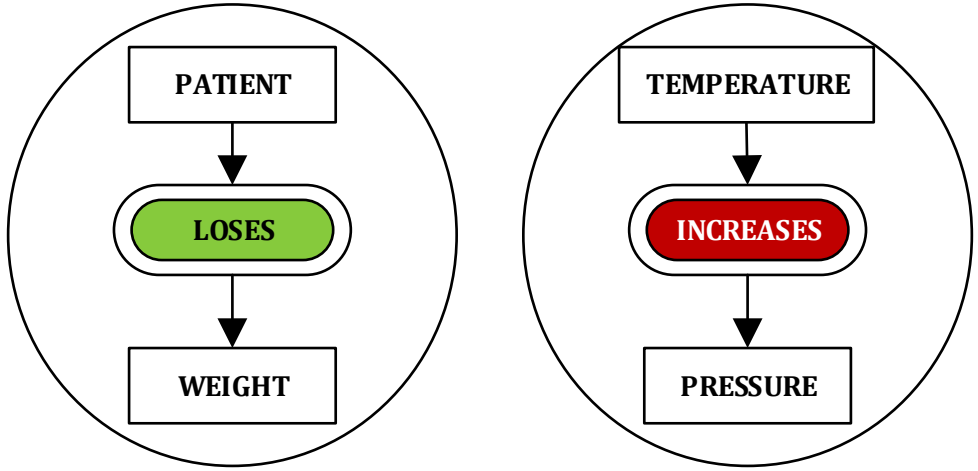
Event Representation

Eventual Relationship	Example of event			
				Circumstant
		Quantity	Type	
Suffer	Patient suffers hemorrhage	2	Patient	Cause
Present	Patient presents abdominal pain	2	Patient	Cause
Block	Lipid blocks vein	2	Experiencer	Cause
Increase	Temperature increases pressure	2	Experiencer	Cause
Loss	Patient loses weight	2	Patient	Cause
Gain	Patient gains weight	2	Patient	Cause

None or statement



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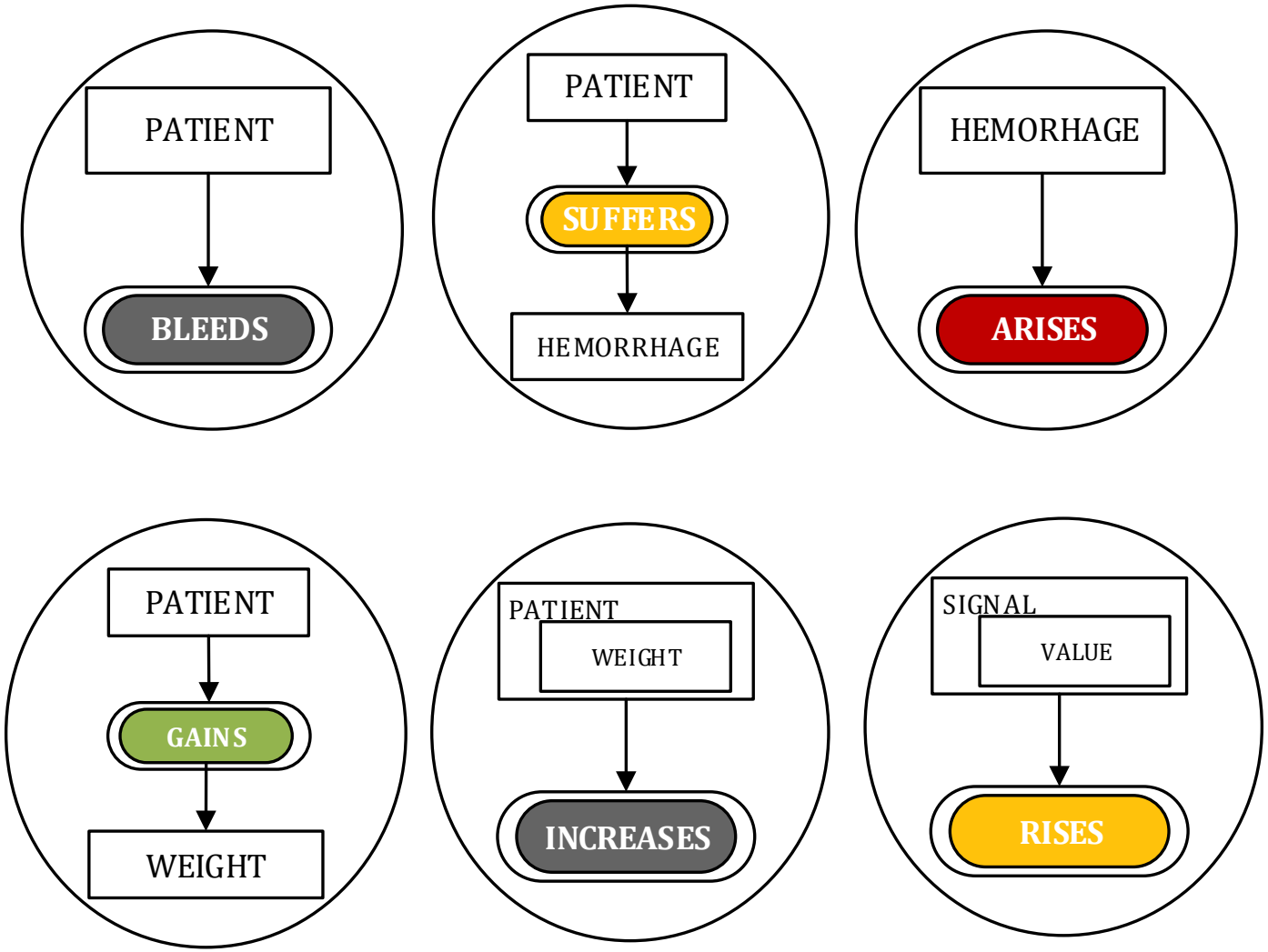
Event Representation



None or statement

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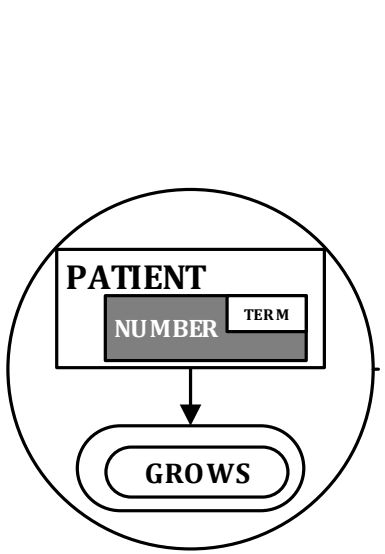
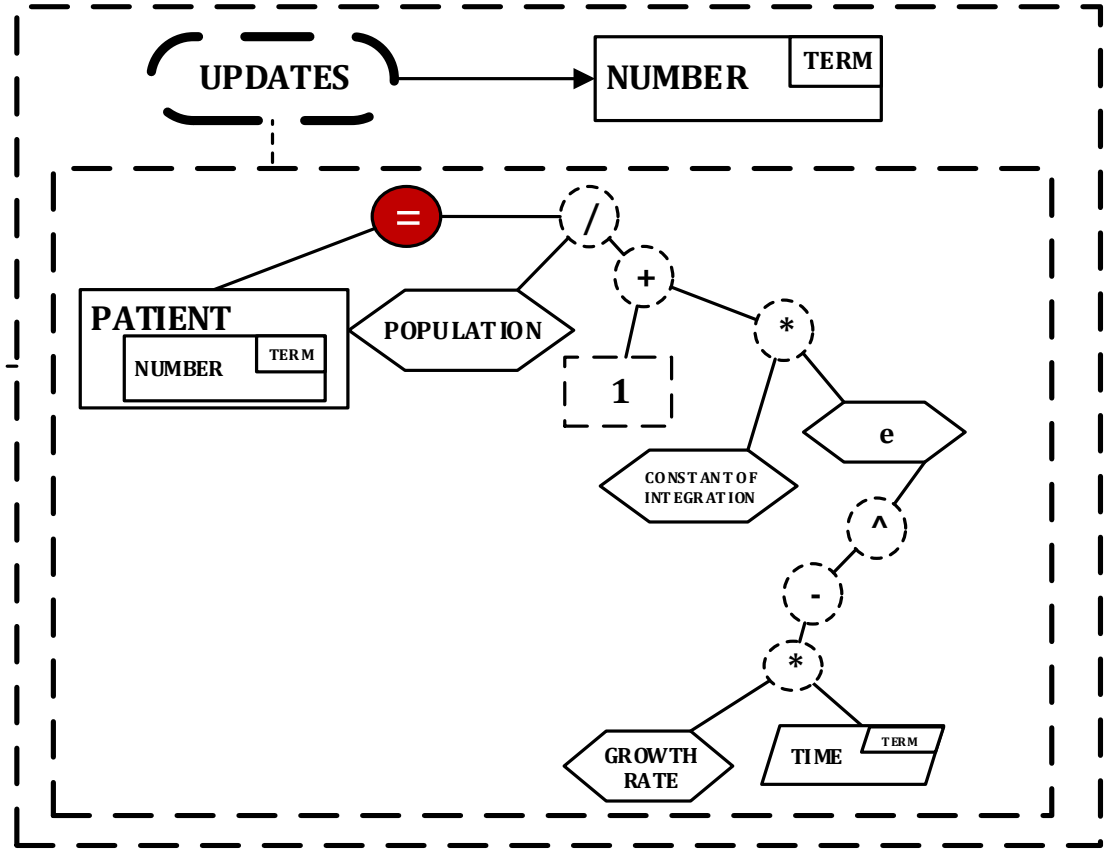
Example

$$f(t) = P / (1 + B * e^{-ct})$$

$$PatientNumber\ [term] = Population / (1 + Constant\ of\ integration * e^{-growth\ rate\ *\ time[term]})$$



None or statement



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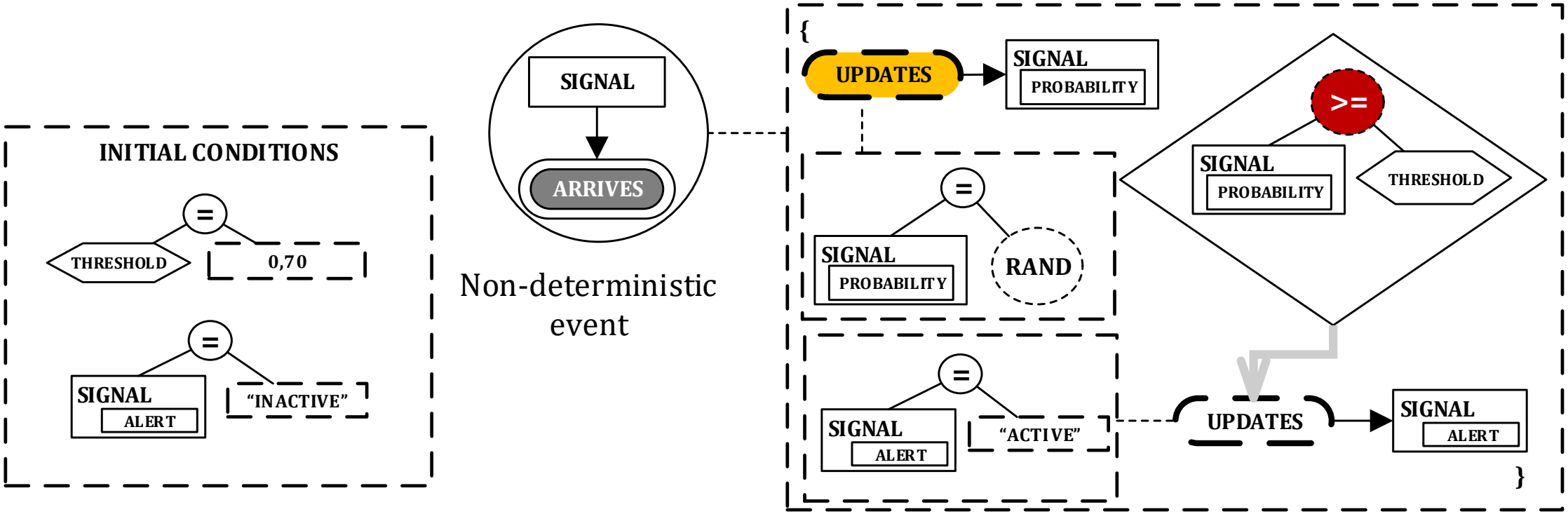
Example

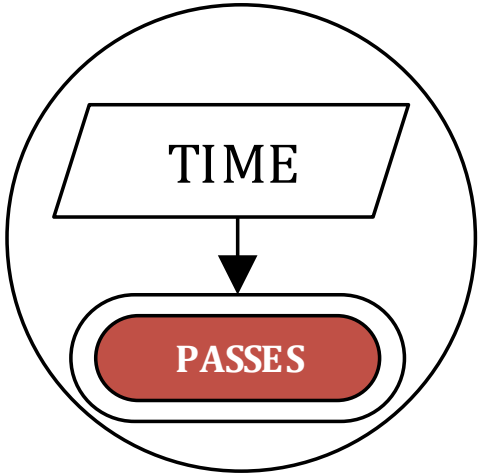


Events in Statistics

Event Representation

Eventual Relationship	Example of event	Semantic Role		
		Actant		Circumstant
		Quantity	Type	
Pass	Time passes	1	Experiencer	Cause

Timer event



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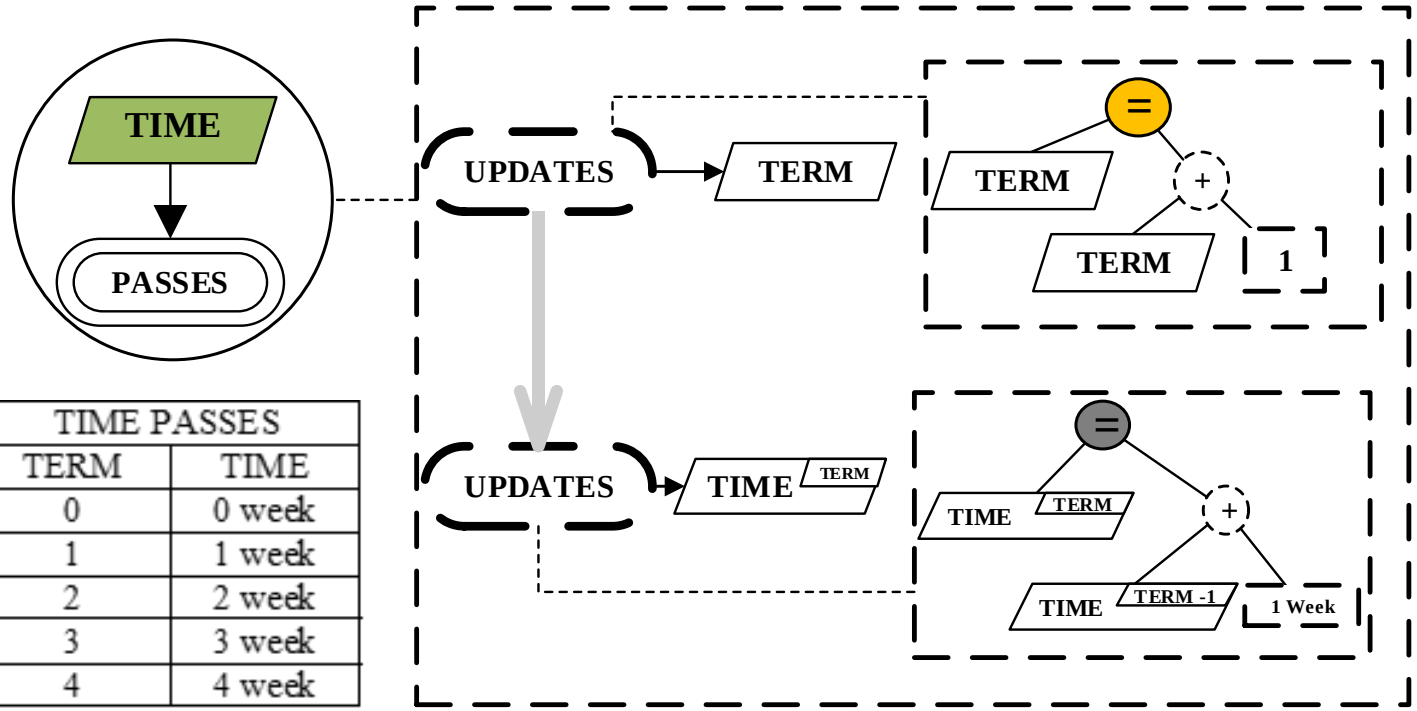
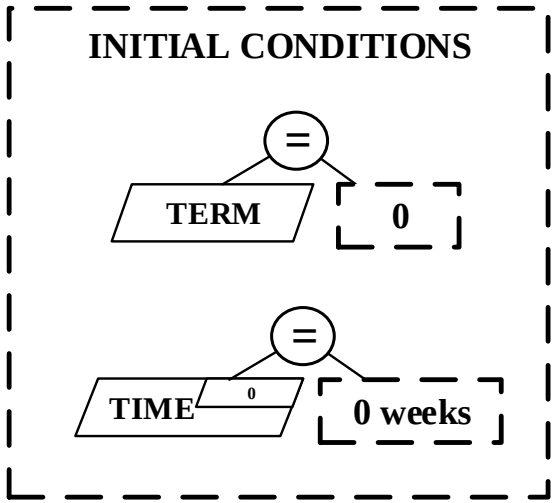
Example



TIME PASSES	
TERM	TIME
0	0 week
1	1 week
2	2 week
3	3 week
4	4 week

Timer event



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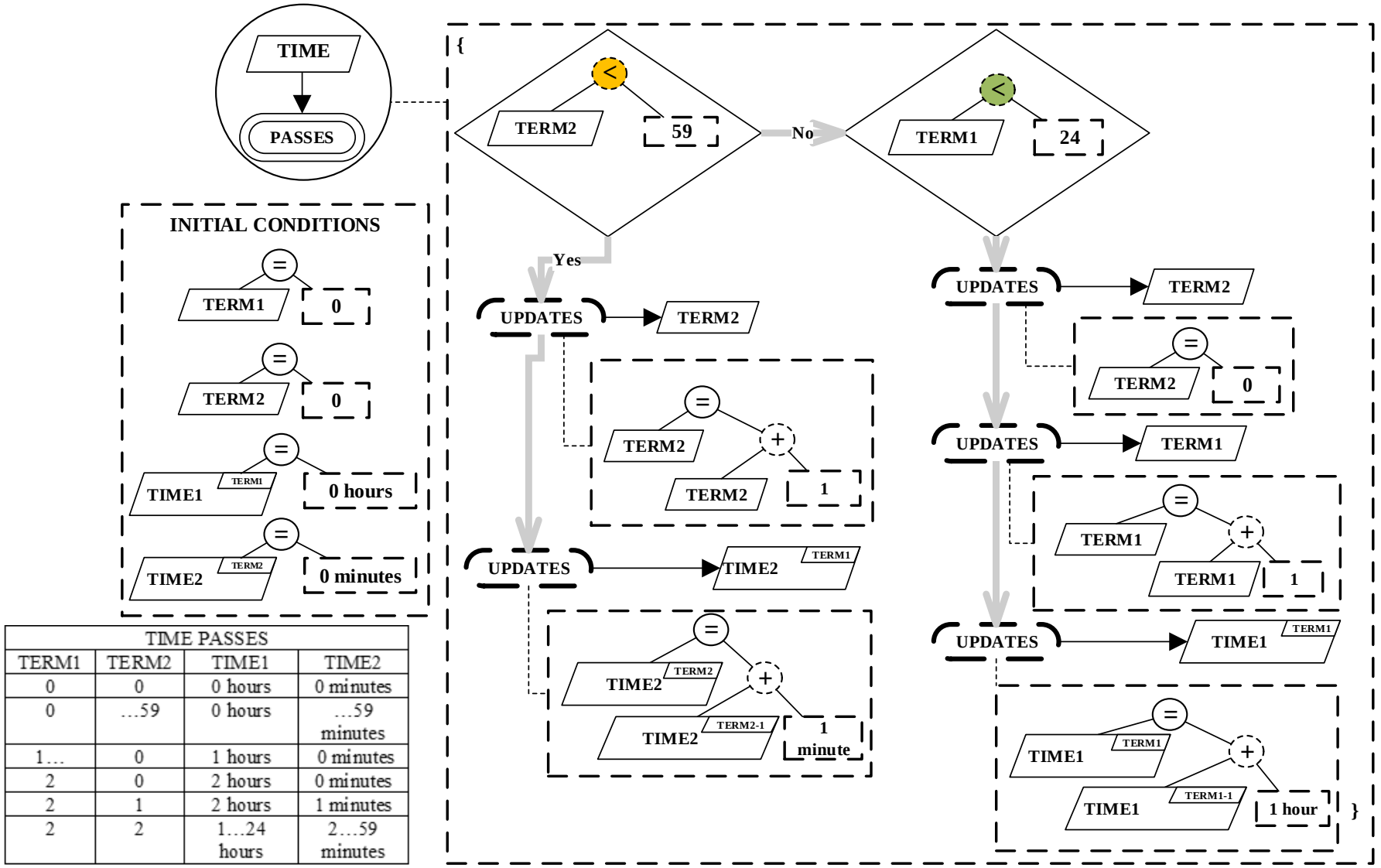
Example



TIME PASSES			
TERM1	TERM2	TIME1	TIME2
0	0	0 hours	0 minutes
0	…59	0 hours	…59 minutes
1…	0	1 hours	0 minutes
2	0	2 hours	0 minutes
2	1	2 hours	1 minutes
2	2	1…24 hours	2…59 minutes

Timer event

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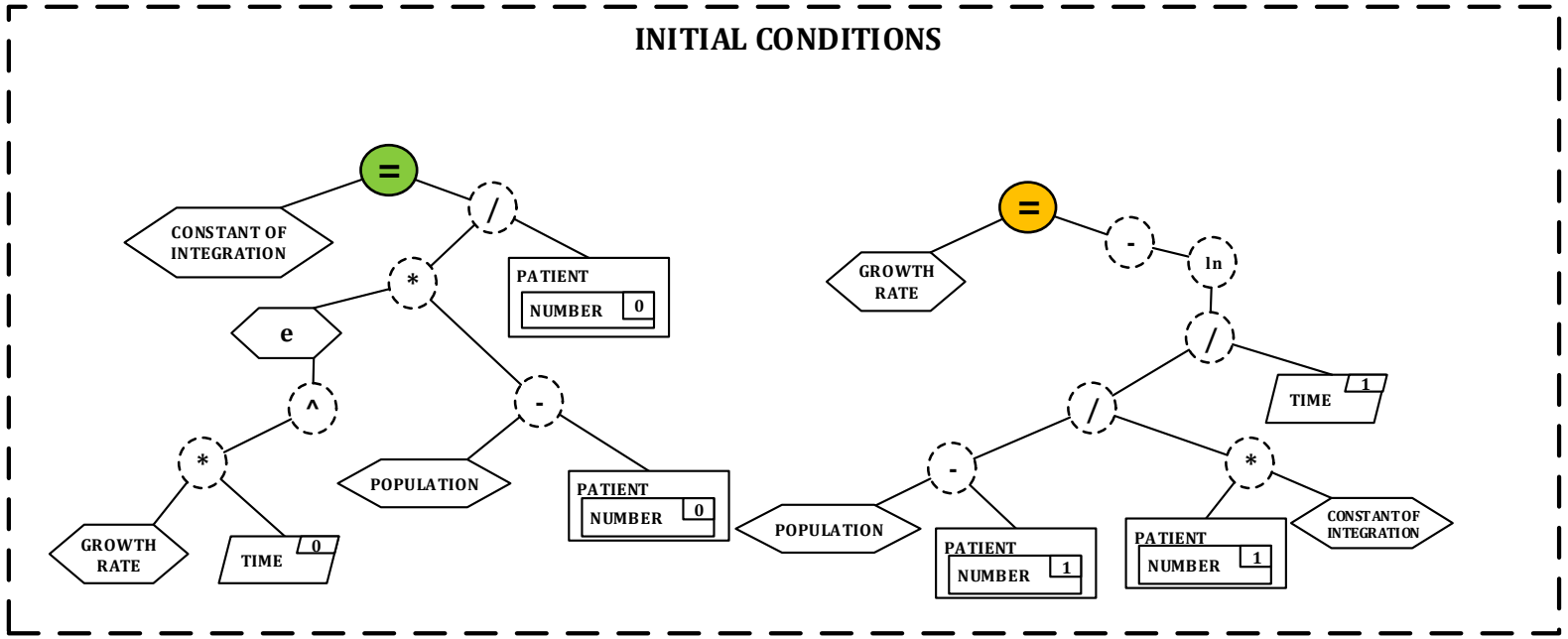
Example

*Constant of integration= ($e^{growth\ rate\ *\ time[0]}$*Population-NumberPatient[0])/ NumberPatient[0]*

*Constant of integration= $e^{growth\ rate\ persons/weeks\ *\ 0\ weeks}$*500.000 persons-200persons)/ 200persons=2499 persons*

*Growth rate=-ln((Population-NumberPatient[1])/(NumberPatient[1]*Constant of integration))/time[1]*

*Growth rate=-ln ((500.000persons-500persons)/(500persons*2499persons))/1week=0.916891 persons/week*



Scientific Domain

Statistics

Pre-conceptual Schema:

Population growth

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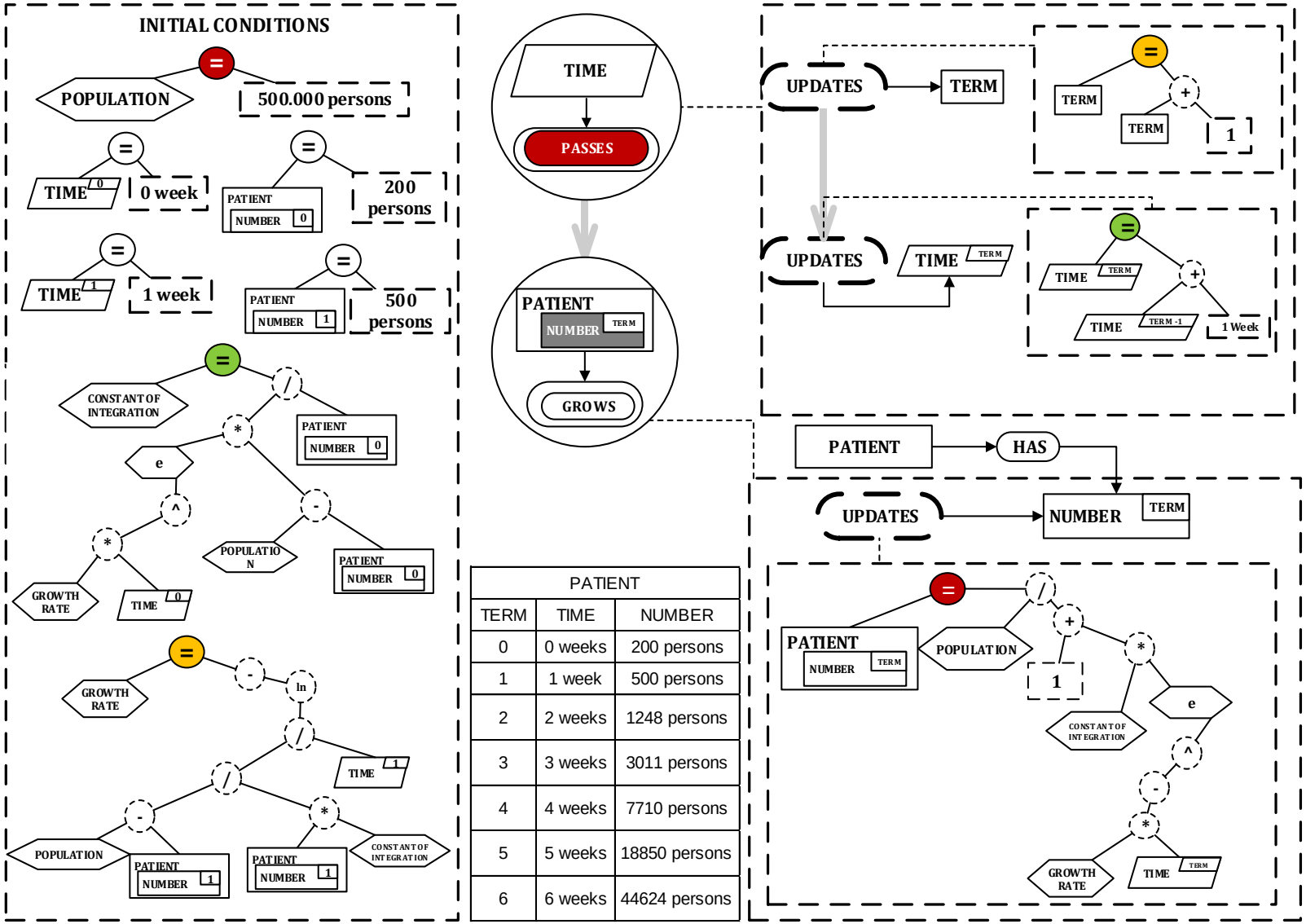
Example



PATIENT		
TERM	TIME	NUMBER
0	0 weeks	200 persons
1	1 week	500 persons
2	2 weeks	1248 persons
3	3 weeks	3011 persons
4	4 weeks	7710 persons
5	5 weeks	18850 persons
6	6 weeks	44624 persons

Constant of integration= 2499 persons

Growth rate=0.916891 persons/week

Scientific Domain

Statistics

Pre-conceptual Schema:

Population growth

*PatientNumber [2]=500.000 persons / (1 + 2499 persons * $e^{-0.916891\ persons/week * 2\ weeks}$ =1248 persons*

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