Modeling Human Behavior:
Process Modeling Language Requirements

Gemma Di Federico

June 7, 2021

Table 1 shows the procedure carried out to identify the main characteristics of the process modeling languages. The list of languages is inspired by the book *Van der Aalst, W., 2016. Process Mining.* Table 2 compares the requirements of a human behavioral process with the characteristics of the process modeling languages. The objective is to identify which class of process modeling languages best reflects the needs of a process representing human behavior.

	True concurrency	Interleaving	Hierarchy	Basic workflow patterns	Data flow conditions	External data provisioning	Deterministic model	Stochastic model	Discrete system	Continuous system	End to end process	Formal operational semantic	White box
BPMN	✓	✓	✓	✓	-	✓	✓	-					
EPCs			✓	✓	-	✓	✓	-	✓		✓		✓
Causal Nets			-	✓	-	-	✓	-	✓	-	✓	✓	✓
YAWL	✓	✓	✓	✓	-	✓	✓	-	✓	-		✓	✓
Structured Data Nets	✓		-	✓	✓	✓	✓	-			✓	✓	✓
Coloured Petri Net			-	✓	✓	-	-				✓	✓	✓
Stochastic Petri Net			-	✓			-	✓			✓	✓	✓
Petri Net	✓	✓	-	✓	-	-	✓				✓	✓	✓
Markov Chain			-	-	✓	-	-	✓	✓	✓			✓
Hidden Markov Model			-	-	✓	✓	-	✓		✓			-
Transition System		✓	✓	✓	-	-	✓	-	✓	-	✓	✓	✓
DCR Graphs	✓	✓	-	✓	-	✓	✓	-	✓	-		✓	✓
DECLARE	✓	✓	-	✓	-	✓	✓	-	✓	-		✓	✓
Ontologies	-	✓	✓	-	✓	✓	✓	-			✓	-	✓
Knowledge Graphs	-	-	✓	-	-	✓	✓	-			✓	-	✓
Process Tree	✓	✓	✓	✓	-	-	✓	-	✓	-	✓	✓	✓
Decision Tree	✓		✓	-	✓	-	✓	-	✓	✓	✓	✓	✓
Directly Follows Graph	-		✓	-	-	-	✓	-	✓	-		✓	✓

Table 1: Characteristics of process modeling languages

	True concurrency	Interleaving	Hierarchy	Basic workflow patterns	Data flow conditions	External data provisioning	Deterministic model	Stochastic model	Discrete system	Continuous system	End to end process	Formal operational semantic	White box
Behavior is a set of sequences of observable units (that are activities), with corresponding likelihood (2), which can be affected by the context.				✓	✓	✓		✓					
Behavior is hierarchical.			✓										
Behavior is a concept, and can be instantiated, giving value to all the measures of a context.												✓	
Different instances of the same behavior ,could be observed in a sequence.			✓	✓									
Instances of different behaviors could be observed at the same time.	✓												
Different instances of the same behavior could result in different sequences of observable units (within the same set).				✓	✓	✓		✓					
The set of sequences of observable units of a behavior could change (the sequence or the likelihood).								✓	✓	✓			
Context is a set of measures (a direct or a computed value, internal or external to process instance) that characterize an instance.					✓	✓				✓			
A set of sequence does not have a fixed start and a fixed end.											✓		
The model must have a clear semantic.												✓	
The model should express structure, data and execution requirements												✓	✓

Table 2: Characteristics of behavioral processes