**On the Relationship of Complexity Metrics With Cognitive Load and Visual Behavior: A Multi-Granular Eye-Tracking Analysis**

Appendix

# Complexity metrics

## Essential complexity

Table 1 presents a subset of the metrics that have been associated to model-related characteristics in [Mendling2008] and [Mendling2012].

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Description** | **Name/symbol** | **References** |
| *FROM [Mendling2009]* |  |  |  |
| Size | The number of nodes in the model (e.g., tasks, gateways, events). | Size, diameter (Diam) | Mendling2008, Sanchez-Gonzalez2010, Mendling2012 |
| Density (‘Connection’ in [Mendling2012]) | Relates the number of edges (possible flows) to the size of the model. | Coeff. of connectivity (Conn. Coeff.), average degree of a connector (Avg dc), maximum degree of a connector (Max dc) | Mendling2008, Mendling2012 |
| Partitionability  (‘Modularity’ in [Mendling2012]) | Considers the relationship of subcomponents to the overall model | Separability (Π), Sequentiality (Ξ), depth (Λ), Structuredness (Φ) | Mendling2008, Figl2011,  Mendling2012 |
| Connector interplay | Considers the interactions and effects of the different connector types | Connector Heterogeneity (CH), Control Flow Complexity (CFC) | Cardoso2006, Mendling2008, Mendling2012 |
| Cyclicity  (merged in ‘Complex behavior’ in [Mendling2012]) | Counts the number of nodes for which a cycle exists then provide the ratio of this number to the total number of nodes of the model. | Cyclicity (CYC) | Mendling2008, Mendling2012 |
| Concurrency  (merged in ‘Complex behavior’ in [Mendling2012]) | Explores the possible concurrent paths of a model. The Token split metrics counts the control tokens associated with the control (e.g. AND or OR) designed in the model | Token split (TS) | Mendling2008, Mendling2012 |

Table 1 - List of metrics addressing essential complexity.

## Accidental complexity

Table 2 summarizes a list of metrics provided by [Bernstein2015] and [Burattin2017] (detailed formulas can be found in the cited studies) with name and the description of each feature category:

|  |  |  |  |
| --- | --- | --- | --- |
| **Categories** | **Description** | **Name / Symbol** | **Reference (support the features)** |
| *From [Bernstein2015]* |  |  |  |
| Edges style | A measure of the style of the edges as the ratio of simple (default) or ‘broken’ (with breaking points) edges to the total number of edges. | %simpleEdges (%sE), %brokenEdges (%bE) | [Purchase1997], [Schrepfer2009], [Effinger2010] |
| Crossing edges | Ratio of the number of crossing edges to the total number of edges | %totalCross (%tC) | [Purchase1997], [Schrepfer2009], [Effinger2010] |
| Angles | Ratio of the number of orthogonal segments to the total number of segments.  *Orthogonal segments are parts of edges which are aligned with a grid layout of the model.* | %orthogonalSegments (%oS) | [Purchase1997], [Effinger2010] |
| Symmetry in blocks\* | Symmetry of the elements’ arrangement inside a block of the model. | %symmetricalPatterns (%sP) | *(See note on symmetry in blocks afterwards)* |
| *From [Burattin2017]* |  |  |  |
| Consistency flow | Measure how the flow (the general direction) in the model can change or not its general direction. | Metric based on behavioral profiles (M-BP) | [Effinger2010] |

Table 2 - List of metrics addressing accidental complexity proposed by [Bernstein2015] and [Burattin2017]. (\*) Authors in [Bernsetin2015] propose the concept of symmetry in blocks as a category of visual features that affect positively the reading/understanding of models, but did not provide any quantification.

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