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Language resource management — Comprehensive Annotation Framework (ComAF) —

Part 3:
Diagrammatic semantic authoring (DSA)

ICS: 01.020

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Foreword

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This document was prepared by Technical Committee ISO/TC 37, language and terminology, Subcommittee SC 4, language resource management.

A list of all parts in the ISO 24627 series can be found on the ISO website.

Introduction

Graphs (diagrams consisting of nodes and links) have been used for decades to represent and visualize both documents (instance data) and data schemas. This standard, DSA, concerns graph-based representation (not visualization) of documents (not data schemas).

Graph-based representation and visualization of documents are addressed by concept maps,[15] mind maps, argument maps, and so on. Theoretical linguistics and artificial intelligence have also used graph-based content visualization associated with semantic network, mental space,[3] discourse representation structure,[13] and so forth.

Graph-based visualization of data schemas (or ontologies, terminologies, metamodels, etc.) is a more usual practice. Ontologies are often visualized as graphs in which nodes are classes (and datatypes) and links are properties (relations). ISO 24156-1[6] specifies a UML-based visualization of concept modelling. Other metamodels are usually represented as similar diagrams, too.

This standard, DSA (Diagrammatic Semantic Authoring), is to specify a data schema of graph documents to facilitate composition and comprehension by making logical document structure explicit. It neither specifies visualizations or manipulations of graphs nor defines annotations to existing documents, but specifies graphical/diagrammatic representation of documents for the sake of semantic authoring: i.e., for people to directly view and manipulate syntactic/semantic structures on computer displays or their future alternatives. The linearity of traditional text documents is due to the linearity of speech languages, which constrains the interaction between people and documents, making it hard for people to read and write. DSA defines graphical/diagrammatic documents with more explicit structures than in text in order to make it easier for people to read and write. DSA documents, together with some user interfaces involving appropriate visualizations and easy operations, could enhance collaborations among people and between people and machines.

Figure 1.1 shows a workflow involving DSA and other types of documents. The DSA documents in the upper half could be automatically converted (while preserving propositional content) to and from machine-understandable documents based on appropriate standards on semantic representations and annotations. It is possible to automatically generate traditional text documents from these machine-understandable documents (while preserving the propositional content, too), though the inverse conversion cannot generally be automated. Since DSA documents (together with some appropriate user interfaces) are easier for people to compose and interpret than text documents, people may usually touch and see DSA documents whereas traditional documents could be used for legacy procedures (such as patent applications) and oral presentations.

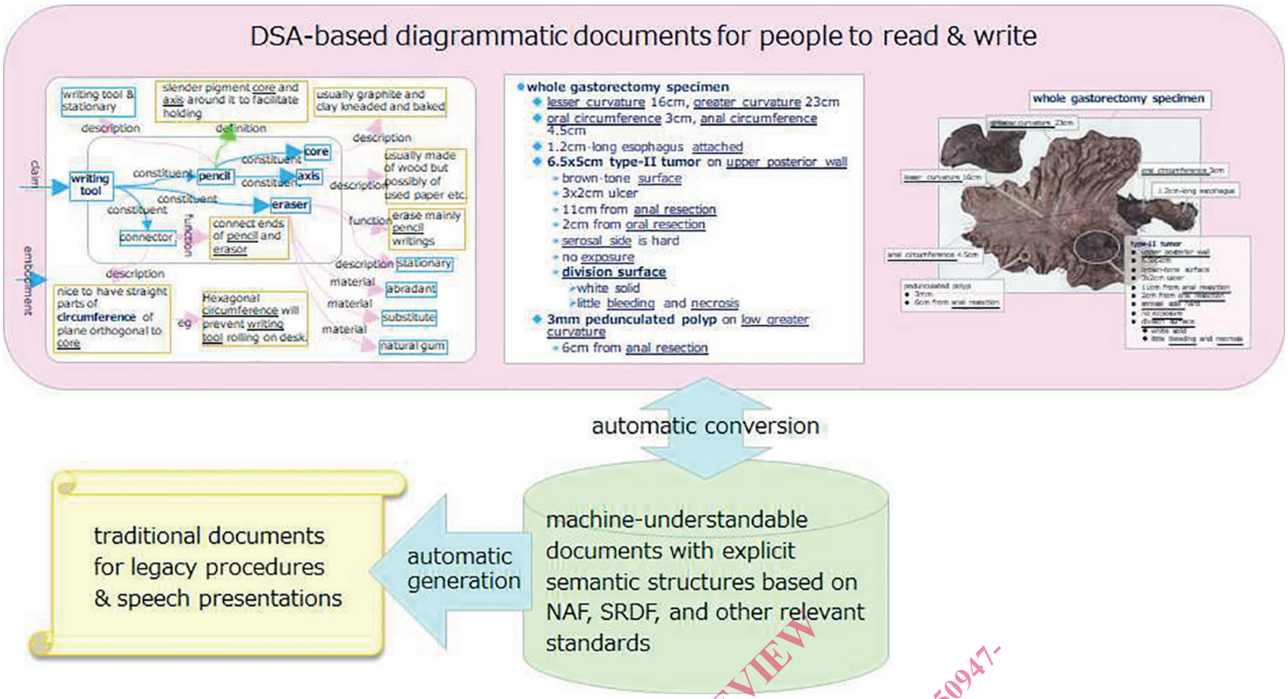

Figure 1.1 — Document workflow involving DSA

DSA is a minimal metamodel for SemAF-DS (ISO TS 24617-5),[11] which in turn is based on Linguistic DS (Description Scheme) in MPEG-7 (ISO/IEC 15938.5:2003/Amd.1:2004).[12] The machine-understandable documents in Figure 1.1 are assumed to use other standards devised by ISO/TC37/SC4, among others, including SynAF (ISO 24615:2010),[7] LAF (ISO 24615:2010)[8] and SemAF,[9][10] while also incorporating insights from other relevant literature[1][2][3][4][5][13][14][15][16][17][18].

Language resource management — Comprehensive Annotation Framework (ComAF) —

Part 3:
Diagrammatic semantic authoring (DSA)

1 Scope

DSA specifies how to represent (not visualize) documents (instance data, not data schemas) as graphs. It does not specify how to visualize or operate on document data, but it aims at making documents easier for people to compose and comprehend by allowing for various graph-based flexible user interfaces possibly incorporating document-visualization practices mentioned above. In this connection, DSA does not specify annotations to existing documents either, but specifies a schema of documents with explicit logical structures.

DSA mainly deals with syntactic or document structures, in order to help people intuitively understand the outline of documents, thereby efficiently compose them and collaborate with one another. It addresses some fragmentary semantic structures as well, but more systematic semantics (formal mapping between documents and their meanings or logical forms) will be provided by another specification so that machines better 'understand' DSA documents and thereby better assist information sharing and consensus building among people.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

2.1 hypernode

node which is a graph segment

2.22 segment

DSA segment or referenceable part of a DSA document

2.3 semantic authoring

composition of documents while making their logical structures explicit

3 Specification

Figure 4.1 shows DSA, which is a metamodel (ontology) of graph documents. Each markable (referenceable) part of a DSA document is called a **segment**. Each DSA document itself is a segment, too. A segment should be either a graph segment or a data segment (text, image, audio, video, etc.).

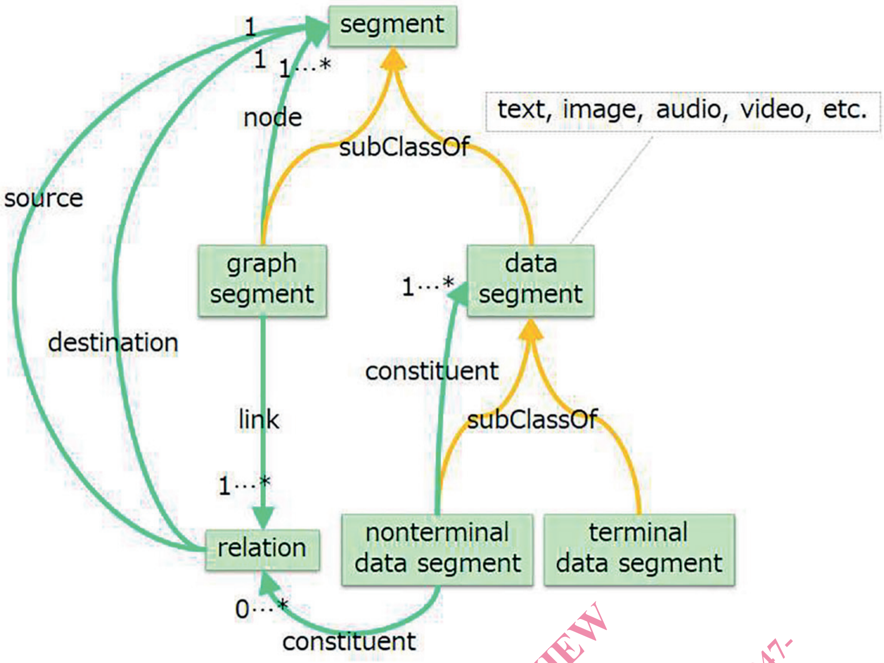

Figure 4.1 — DSA metamodel (ontology)

A graph segment is a labelled directed graph comprising nodes and links. A node is a segment and a link is a relation between two endnodes (source and destination segments).

Note that a node in a graph segment may be another graph segment. A node which is a graph is called a hypernode. So a graph segment may embed other graph segments as hypernodes, which are rarely used in concept maps. Arbitrarily large DSA documents can hence be made of small graph segments which are hypernodes of each other.

A data segment should be either a nonterminal data segment or a terminal data segment. A nonterminal data segment shall embed smaller data segments as constituents. For instance, a discourse may be a text/audio/video segment embedding sentence utterances as smaller text/audio/video segments, which may further embed still smaller text/audio/video segments such as phrases, and so forth.

DSA is exactly the above metamodel, which formally specifies multimodal graph documents involving hypernodes, but does not specify how to visualize or operate on them. The diagrammatic visualizations in the following Annex are not part of DSA but they are informative examples. DSA users may adopt any sorts of diagrammatic visualization as far as the logical document structures are made explicit enough for their purposes.

Annex A
(Informative)

Examples

Some example applications of the above specification are presented in this annex.

A.1 Graph Segments

In the figure below, graph segments are visualized as rounded boxes. The smaller graph segment is a hypernode in the larger one. Most nodes in this figure are text segments, but nodes may be other types of segments as well. Links in this example represent discourse relations and thematic roles. For instance, a 'core' and an 'axis' are constituents of a 'pencil' and a function of an 'eraser' is to 'erase mainly pencil writings.'

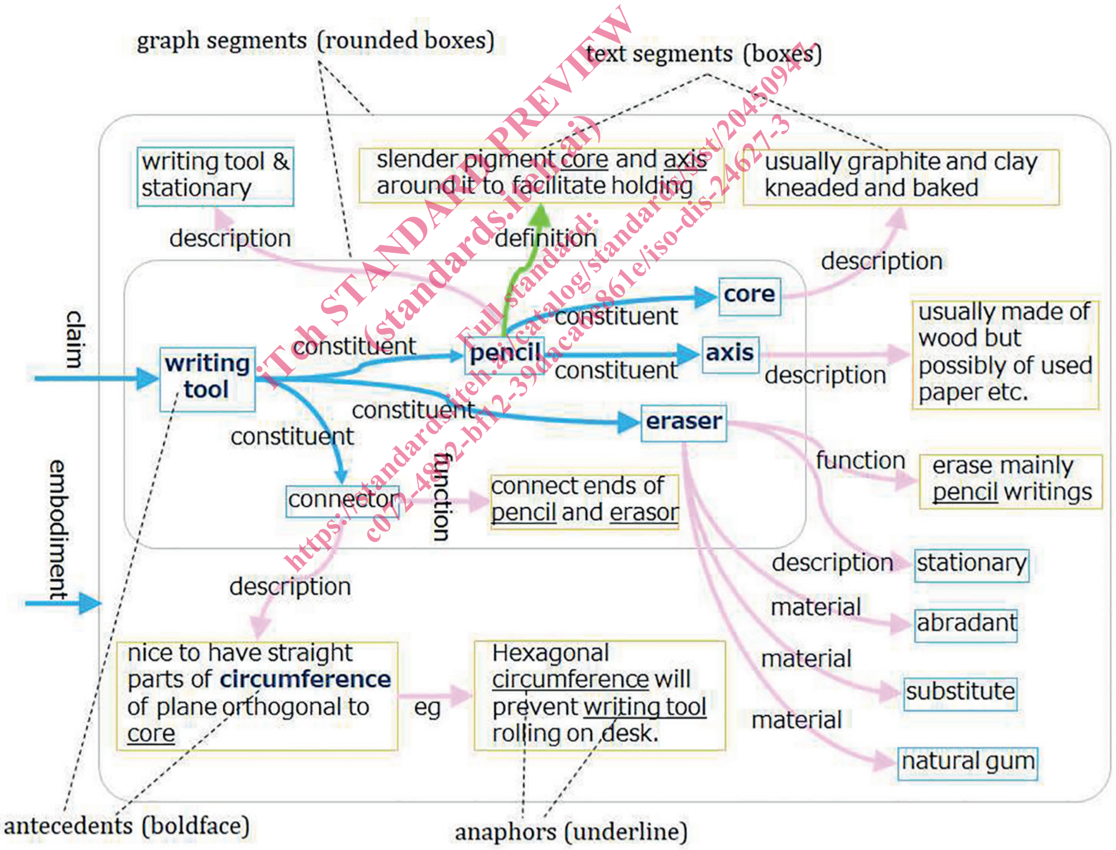

Figure A1.1 — A graph segment representing part of patent document

Throughout this document, anaphors are underlined and their antecedents are in boldface characters. Anaphoric relations may be explicitly visualized as links such as shown below. Note here that some endnodes of these anaphoric links are text segments embedded in larger graph/text segments and thus those endnodes do not belong to the graphs to which the anaphoric relations belong. A problem here is that a graph visualizing too many such anaphoric relations would be hard for people to understand and compose. As discussed later, this problem is partially addressed by visualizing graphs as trees.

