

XML Technology Assisted Research Paper Abstract Writing*

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Abstract

Given its briefness, inherent complexity and massive and critical use in scientific discourse, the research paper abstract (RPA) is a text type particularly interesting for both linguistic modelling (writing and reading) and automatic processing (generation and parsing). Even though the current literature on these fields is large and promising, there are still various gaps to fill, especially in the domain of the interplay between linguistic modelling and the development of applications for the solution of communication problems. Our purpose here is to present the RedACTe Project's approach to the design of software oriented to rhetorical and linguistic assistance in RPA writing.

1 Introduction

The purpose of this paper is to draw on a few descriptive results of the RedACTe Project about some contextual and linguistic properties of the research paper abstract (RPA), and use them in the construction of an XML schema capable of defining the well-formedness and validity of RPA instances.¹ To attain this goal, the paper focuses on Hlavacka (2004)'s generalizations about the correlations between field properties and associated lexicogrammatical patterns realizing the genre category Research Announcement of the RPA. The paper does not address either the motivation or the formal modelling of these descriptive generalizations.² It simply focuses on how to use them in the construction of an XML schema capable of being eventually integrated into appropriate software for helping EFL teachers to assist researchers in RPA writing.

2 An XML Definition of the Research Paper Abstract

XML (eXtensible Markup Language) is a simple and powerful information technology tool for structuring texts and defining their well-formedness and validity conditions. See *XML 1.0 (Third Edition)* at <http://www.w3.org/XML/Core/#Publications>. In this section, we show how to define an XML Schema of the RPA using the XMLSPY⁵ development environment.

2.1 Research Paper Abstract Genre Structure

Figure 1 shows the root element of an XML Schema for the RPA contextual and linguistic properties. We assume below that the user of this schema is an EFL teacher helping the researcher-author of the RPA being written.

According to Hlavacka (2004), contextual and linguistic properties vary in accordance with the discipline within which an RPA is produced. Thus, the Choice Compositor of Figure 1 makes the user choose between the Medical Sciences and Waste Water Engineering.

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¹ RedACTe stands for *Redacción Asistida por Computadora de Textos*. The main long term goal of the project is to develop a computer application capable of assisting scientific researchers in research paper writing.

² The interested reader can consult Hlavacka (2004), Castel (2006a-e; 2005a-c; 2004, 2001), Castel & Diblasi (1999), and Castel & Miret (2004). The generalizations have been significantly simplified and adapted to facilitate the development of the current version of the XML Schema.

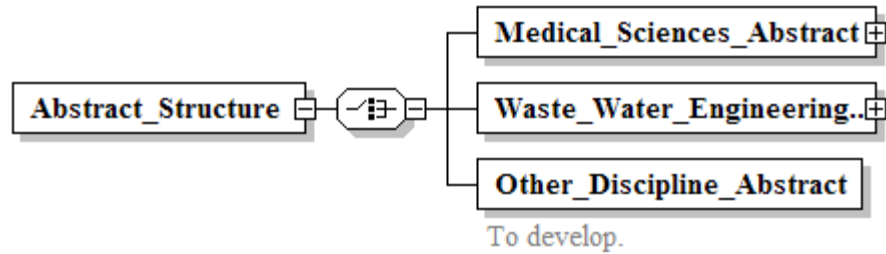


Figure 1. Abstract_Structure

The medical science journals share the property of having Style Sheets which specify highly structured RPAs from the point of view of their genre structure. Most of these Style Sheets require not only that the different RPA sections be (linguistically) realized but also that they be preceded by an appropriate title. This is not the case of other discipline journals such as Waste Water Engineering, Statistics, Geophysics, Arid Zones, Linguistics, etc. whose RPAs do not have section titles. See Figures 2-5.

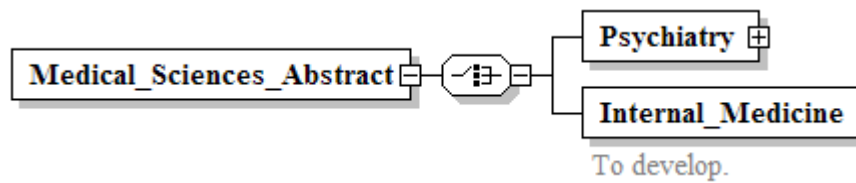


Figure 2. Path of *Medical_Sciences_Abstract*:
Abstract_Structure/Medical_Sciences_Abstract

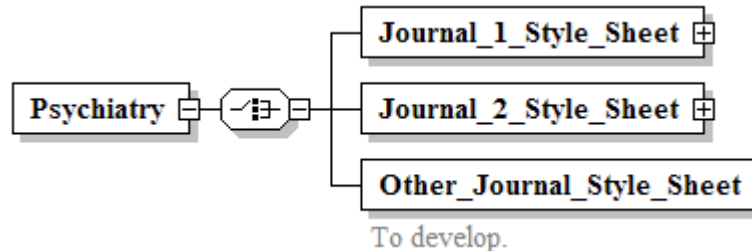


Figure 3. Path of *Psychiatry*:
Abstract_Structure/Medical_Sciences_Abstract/Psychiatry

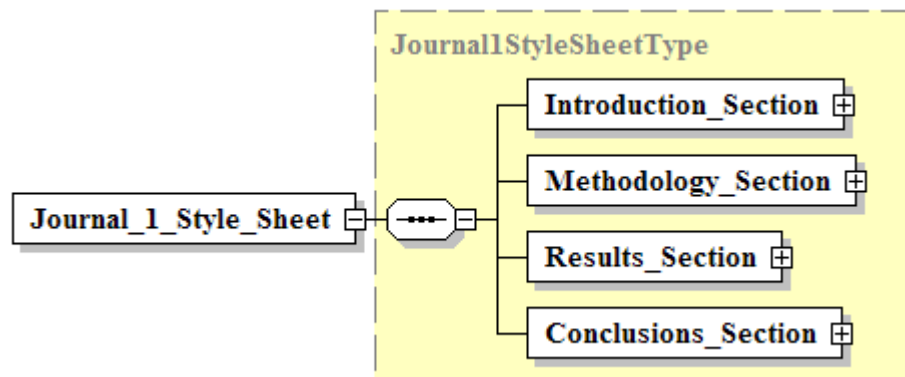


Figure 4. Path of *Journal_1_Style_Sheet*:
Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet

Figure 5 is a definition of the generic structure potential of the RPA which is based on Hlavacka (2004). As such, it is independent of the Style Sheets specified by the different journals of the sample. See the Appendix. Only 5 out of 50 Waste Water Engineering RPAs of the sample lack an Introduction section. All Psychiatry RPAs of the sample (50) have an Introduction section. All sections are obligatory in most medical science journal Style Sheets. For teaching purposes, it seems reasonable to adopt a prescriptive position according to which the Introduction section is obligatory.

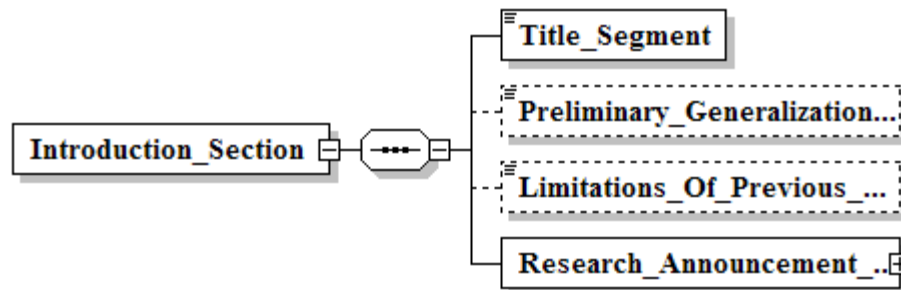


Figure 5. Path of *Introduction_Section*:
Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Journal1StyleSheetType/Introduction_Section

The occurrence of a section title depends on the discipline whose RPA you want to write. For example, if it is Psychiatry, then it must be realized either as Objective or Background depending on the journal's Style Sheet; but if it is, say, Waste Water Engineering, then it has no realization at all.

2.2 Research Paper Abstract Logical Structure

The logical representations offered in this section are based on Lin (1993), Lin & Fawcett (1993), and Fawcett (In preparation).

2.2.1 Research Announcement Logical Structure

Once the genre category *Research_Announcement_Segment* is reached, an appropriate interface implementing the schema would ask the user whether to make a research announcement based on (i) the cognitive activity involved in the research carried out, or (ii) on the verbal activity involved in communicating the research carried out. See Figure 6.

If the user chooses *cognitive_event*, RedACTe's underlying generator (RUG) introduces the following logical structure (LS), which is "transparent" to him:

(1) [cognitive_event (X:Ag_Cog, Y:Ph); {}]

Key: Ag_Cog = Agent_Cognizant; Ph = Phenomenon.

The cognitive mental processes occurring in the sample which instantiate this LS are: *analyse, assay, assess, determine, estimate, evaluate, examine, explore, investigate, study, test, verify*.

If the user chooses *verbal_event*, RUG introduces the following LS:

(2) [verbal_event (X:Ag_Cog, Y:Ph); {}].

The verbal processes occurring in the sample which instantiate this LS are: *characterize, demonstrate, describe, discuss, posit, present, question*. The rest of the paper is devoted to deploying a few properties of the cognitive processes only.

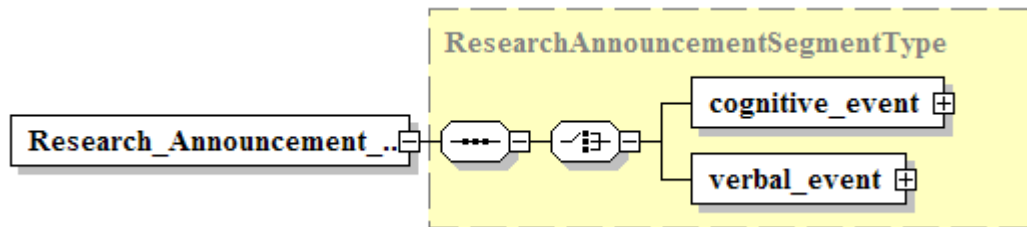


Figure 6. Path of *Research Announcement Segment*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Journal1StyleSheetType/Introduction_Section/Research_Announcement_Segment

The choice of *cognitive_event* triggers the question: How do you want to refer to the cognitive activity involved in the research carried out: (i) as the main event of the research announcement, (ii) as an event subordinate to the objective of the research, or (iii) as an event subordinate to the methodology of the research? See Figure 7. Whatever choice is made, the basic LS contains the predicate **cognitive_event (X:Ag_Cog, Y:Ph)**.

If the user decides to refer to the cognitive activity involved in the research carried out as the main event of the research announcement (*As Main Event*), he chooses to highlight the cognitive activity carried out. Thus, RUG defines (4) on the basis of (3):

- (3) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].
- (4) Output LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].

Notice that no changes are introduced into LS.

If the user decides to refer to the cognitive activity involved in the research carried out as an event subordinate to the objective of the research (*Subordinate To Objective*), he chooses to highlight the objective of the research. Thus, (6) is derived from (5):

- (5) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].
- (6) Output LS: [relational_event (Z:Ca, cognitive_event (X:Ag_Cog, Y:Ph):At); {objective_ob}].

Key: Ca= Carrier; At= Attribute; ob = object.

Notice the subordination of the cognitive predicate to the relational predicate as its second argument associated with the Participant Role Attribute. Notice also the insertion of the object *objective_ob*.

If the user decides to refer to the cognitive activity involved in the research carried out as an event subordinate to the methodology of the research (*Subordinate To Methodology*), he chooses to highlight the methodology of the research. Thus, (8) is derived from (7):

- (7) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].
- (8) Output LS: [action_or_influential_event (Z:Ag, W:Cre, cognitive_event (X:Ag_Cog, Y:Ph):Pur); {}].

Key: Cre = Created; Pur = Purpose.

Notice the subordination of the cognitive predicate to the action or influential predicate as its third argument associated with the Circumstantial Role of Purpose.

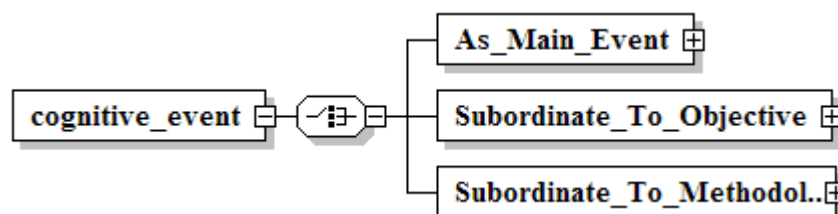


Figure 7. Path of *cognitive_event*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Journal1StyleSheetType/Introduction_Section/Research_Announcement_Segment/
ResearchAnnouncementSegment/cognitive_event

If the option *As_Main_Event* is taken, RUG poses the question: Do you want to make explicit reference to your participation as researcher-author? See Figure 8. If you answer positively, RUG transforms (9) into (10):

- (9) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].
 (10) Output LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob}].

Notice the insertion into LS of the object *researcher_ob*.

If you answer negatively, RUG transforms (11) into (12):

- (11) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].
 (12) Output LS: [cognitive_event (X:Ag_Cog, Y:Ph); {}].

Notice that no object *researcher_ob* is inserted into LS; thus, the output LS is identical to the input LS.

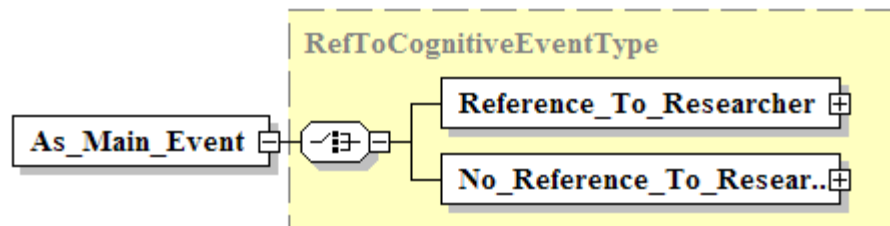


Figure 8. Path of *As_Main_Event*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
 Introduction_Section/Research_Announcement_Segment/
 ResearchAnnouncementSegment/Cognitive_Event/ As_Main_Event

If the option *Reference_To_Researcher* is taken, RUG poses the question: Do you want to make explicit reference to the research carried out? See Figure 9. If you answer positively, (13) is transformed into (14):

- (13) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob}].
 (14) Output LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob, research_ob}].

Notice the insertion into LS of the object *research_ob*.

If you answer negatively, (15) is transformed into (16):

- (15) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob}].
 (16) Output LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob}].

Notice that no changes are introduced into LS.

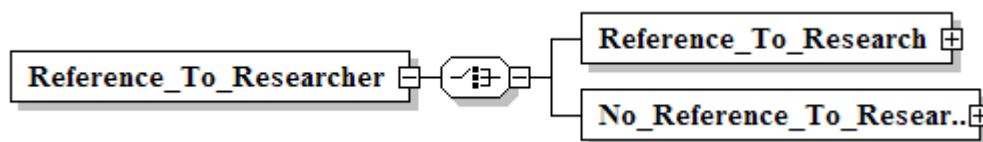


Figure 9. Path of *Reference_To_Researcher*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
 Introduction_Section/Research_Announcement_Segment/ResearchAnnouncementSegment/
 Cognitive_Event/ As_Main_Event/ Reference_To_Researcher

If the option *Reference_To_Research* is taken, you are posed the question: Do you want to make explicit reference to the methodology used to carry out the research? See Figure 10. A positive answer transforms (17) into (18):

(17) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph); {researcher_ob, research_ob}].

(18) Output: [cognitive_event (X:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me); {researcher_ob, research_ob}].

Key: Ra = Range; Me = Method.

Notice that the effect of deciding to make reference to the methodology is the insertion into LS of the predicate *action_event (W:Ag, Z:Ra)* as the third argument associated with the Circumstantial Role of Method of the cognitive predicate.

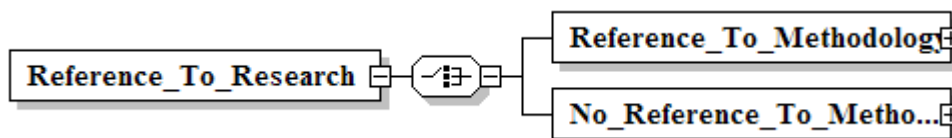


Figure 10. Path of *Reference_To_Research*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Introduction_Section/Research_Announcement_Segment/ResearchAnnouncementSegment/
Cognitive_Event/ As_Main_Event/ Reference_To_Researcher/Reference_To_Research

2.3 Semantic Role Assignments

At this point of the schema traversal, a complete LS has been constructed for the genre category *Research_Announcement*. It is now appropriate for semantic role assignment to take place, i.e. to decide what semantic roles are played by the intervening events and objects.

Suppose the choice of referring to the methodology has been made, i.e. the option *Reference_To_Methodology* is taken. See Figure 11. This decision causes RUG to pose the question: What degree of involvement as researcher-author do you want to have in relation to the main (cognitive) event realizing the research announcement? The answer to this question triggers the assignment of semantic roles to the the objects and events which define LS. Based on Castel & Rossi (1994), we assume that the highest degree of involvement on the main (cognitive) event is expressed by associating the semantic role *Ag_Cog* with the object *researcher_ob*. The remaining available roles are assigned in accordance with the appropriate degree of involvement.

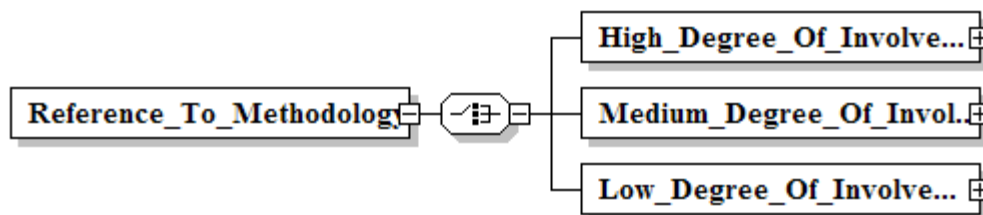


Figure 11. Path of *Reference_To_Methodology*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Introduction_Section/Research_Announcement_Segment/ResearchAnnouncementSegment/
Cognitive_Event/ As_Main_Event/ Reference_To_Researcher/
Reference_To_Research/Reference_To_Methodology

If the option *High_Degree_Of_Involvement_Of_Researcher* is taken, (19) is transformed into LSs (20)-(22):

(19) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph, (action_event (W:Ag, Z:Ra)):Me); {researcher_ob, research_ob}].

(20) Output LS1: [cognitive_event (researcher_ob:Ag_Cog, Y:Ph, (action_event (W:Ag, Z:Ra)):Me); {research_ob}]. Notice replacement of *X* by *researcher_ob*.

(21) Output LS2: [cognitive_event (researcher_ob:Ag_Cog, Y:Ph, (action_event (W:Ag, Z:Ra)):Me, T:Pl); {research_ob}]. Notice the insertion into LS of the variable *T* associated with the role Pl(ace) as the fourth argument of the cognitive predicate.

(22) Output LS3: [cognitive_event (researcher_ob:Ag_Cog, Y:Ph, (action_event (W:Ag, Z:Ra)):Me, research_ob:Pl); {}]. Notice the replacement of *T* by *research_ob*.

Once the *researcher_ob* is associated with the Participant Role *Ag_Cog* (i.e. variable *X* is saturated; see (20)), the remaining variables - *Y*, *action_event*, *action_event (W:Ag, Z:Ra)*, and *T* -, are solved in the following way:

(i) *Y* is treated by the relevant algorithms (here we adopt the dummy **[Complement-Phenomenon:?]** as an abbreviation of the output resulting from such a task which is apparent in Figure 13 below); (ii) the object *research_ob* saturates *T* so that it becomes a Circumstance of Place of the main event (see (22)); (iii) the variable *action_event (W:Ag, Z:Ra)* should be solved by the appropriate algorithms (here we simply assume that it is replaced by the dummy **using [Complement-Range:?]** which eventually fills the element Adjunct-Method of the main clause; see Figure 13 below).

If the option *Medium_Degree_Of_Involvement_of_Researcher* is taken, the following LSs are defined:

(23) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me); {researcher_ob, research_ob}].

(24) Output LS1: [cognitive_event (research_ob:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me); {researcher_ob}]. Notice the replacement of *X* by *research_ob*.

(25) Output LS2: Same as Output LS1 except that it is enriched by the incorporation of *researcher_ob* as Possessor of *research_ob* so that both objects end up defining the reference of our dummy nominal group *our study* which fills the element Subject-*Ag_Cog* of the main clause.

For the resolution of the variable *action_event (W:Ag, Z:Ra)* see above.

Taking the option *Low_Degree_Of_Involvement_of_Researcher* causes RUG to define the following LSs:

(26) Input LS: [cognitive_event (X:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me); {researcher_ob, research_ob}].

(27) Output LS1: [cognitive_event (X:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me, T:Pl); {researcher_ob, research_ob}]. Notice the insertion of *T:Pl* as the fourth argument of the cognitive predicate.

(28) Output LS2: [cognitive_event (X:Ag_Cog, Y:Ph, action_event (W:Ag, Z:Ra):Me, research_ob:Pl); {researcher_ob}]. Notice the replacement of *T* by *research_ob*.

(29) Output LS3: Same as Output LS2 except that it is enriched by the incorporation of *researcher_ob* as Possessor of *research_ob* so that both objects end up defining the reference of our dummy nominal group *our study* which is part of the prepositional group filling the element Adjunct-Place of the main clause.

For the resolution of the variable *action_event (W:Ag, Z:Ra)* see above.

2.4 Linguistic realization³

Having assigned semantic roles to the objects and events defining the LS constructed for the genre space *Research_Announcement*, the XMLSPY⁵ sample generator provides the terminal template (30):

(30) In this study, we examined [Complement-Phenomenon:?] using [Complement-Range:?].

³ We adopt here the Cardiff Grammar dialect of Systemic Functional Linguistics; see Fawcett (2004a-b; 2000), and Fawcett et al. (1993).

where *[Complement-Phenomenon:?]* and *[Complement-Range:?]* are variables to be deployed by the user of the system. Notice that we use the expression *template* to refer to the idea that the generated terminal string contains variables to be completed by the user of the system.⁴

The structure of (30), defined as the Clause given in Figure 13, fills the genre space *Research_Announcement* on the basis of having chosen *High_Degree_Of_Involvement_Of_...*:

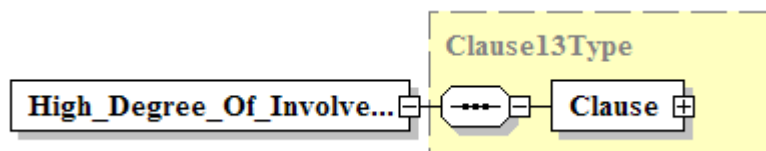


Figure 12. Path of *High_Degree_Of_Involvement_Of_Researcher*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Introduction_Section/Research_Announcement_Segment/ResearchAnnouncementSegment/
Cognitive_Event/ As_Main_Event/ Reference_To_Researcher/Reference_To_Research/
Reference_To_Methodology/High_Degree_Of_Involvement_Of_Researcher

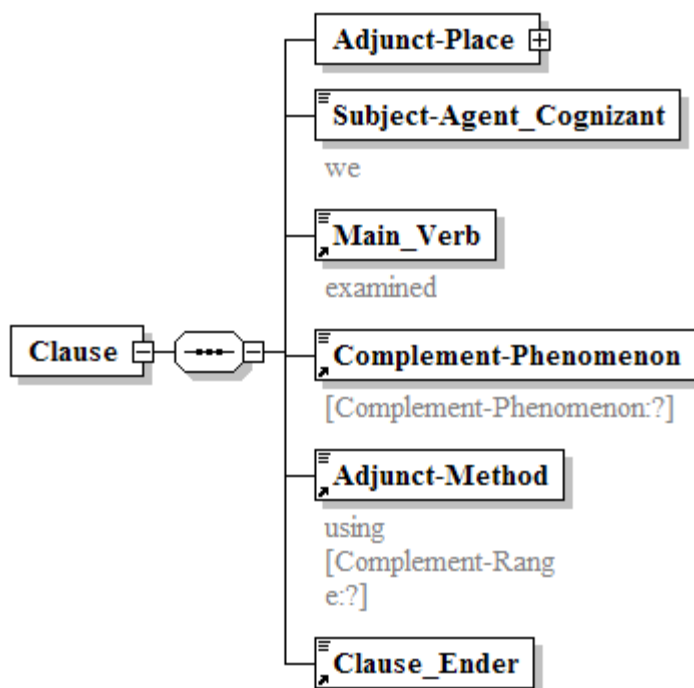


Figure 13. Path of *Clause*:

Abstract_Structure/Medical_Sciences_Abstract/Psychiatry/Journal_1_Style_Sheet/
Introduction_Section/Research_Announcement_Segment/ResearchAnnouncementSegment/
Cognitive_Event/ As_Main_Event/ Reference_To_Researcher/Reference_To_Research/
Reference_To_Methodology/High_Degree_Of_Involvement_Of_Researcher/Clause

3 Using the XML Schema to Generate RPA Instances Automatically

XMLSPY⁵ can also be used to generate sample XML files which are valid in accordance with the schema defined in §2, namely: *Abstract_Structure#1*. Figures 14-16 below illustrate this functionality.

⁴ As long as the RedACTe Project evolves in descriptive coverage and delicacy, the number of template variables should be reduced.

These figures are sample XML files generated automatically which illustrate a few contextual and linguistic properties of RPA instances, specifically of the text space *Research_Announcement*. Figure 14 defines the structure of a Psychiatry RPA whose terminal string (or text proper) is given in (30) above (repeated here for convenience as (31)):

(31) In this study, we examined [Complement-Phenomenon:?] using [Complement-Range:?].

Figure 15 defines the structure of a Waste Water Engineering RPA whose terminal string is given in (32):

(32) In this study, the objective was to analyse [Complement-Phenomenon:?].

Notice that the cognitive clause fills the element Complement-Attribute of the the matrix relational clause.

Figure 16 defines the structure of a Waste Water Engineering RPA whose terminal string is given in (33):

(33) [Subject-Created:?] was constructed to explore [Complement-Phenomenon:?].

Notice that the cognitive clause fills the element Adjunct-Purpose of the matrix action clause. Figure 16 also illustrates another functionality of XMLSPY⁵, namely: the possibility of a contextual menu for lexical item choices; in this example, it offers the user the list of cognitive processes which can be used as Main_Verb of the clause subordinate to the matrix action clause.

The set of all template examples generated automatically using the current shema is given in (34)-(74):

(34) [Subject-Phenomenon:?] was examined.

(35) [Subject-Phenomenon:?] was examined using [Complement-Range:?].

(36) In this study, [Subject-Phenomenon:?] was examined.

(37) This study examined [Complement-Phenomenon:?].

(38) In this study, [Subject-Phenomenon:?] was examined using [Complement-Range:?].

(39) This study examined [Complement-Phenomenon:?] using [Complement-Range:?].

(40) We examined [Complement-Phenomenon:?].

(41) We examined [Complement-Phenomenon:?] using [Complement-Range:?].

(42) In this study, we examined [Complement-Phenomenon:?].

(43) Our study examined [Complement-Phenomenon:?].

(44) In our study, [Subject-Phenomenon:?] was examined.

(45) In this study, we examined [Complement-Phenomenon:?] using [Complement-Range:?].

(46) Our study examined [Complement-Phenomenon:?] using [Complement-Range:?].

(47) In our study, [Subject-Phenomenon:?] was examined using [Complement-Range:?].

(48) The objective was to evaluate [Complement-Phenomenon:?].

(49) The objective was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(50) In this study, the objective was to evaluate [Complement-Phenomenon:?].

(51) The objective of this study was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(52) In this study, the objective was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(53) Our objective was to evaluate [Complement-Phenomenon:?].

(54) Our objective was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(55) In our study, the objective was to evaluate [Complement-Phenomenon:?].

(56) The objective of our study was to evaluate [Complement-Phenomenon:?].

(57) In this study, our objective was to evaluate [Complement-Phenomenon:?].

(58) In our study, the objective was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(59) The objective of our study was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(60) In this study, our objective was to evaluate [Complement-Phenomenon:?] using [Complement-Range:?].

(61) [Subject-Created:?] was designed to evaluate [Complement-Phenomenon:?].

- (62) The objective was to design [Complement-Created:?] to examine [Complement-Phenomenon:?].
(63) In this study, [Subject-Created:?] was designed to evaluate [Complement-Phenomenon:?].
(64) This study designed [Complement-Created:?] to evaluate [Complement-Phenomenon].
(65) In this study, the objective was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(66) The objective of this study was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(67) We designed [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(68) Our objective was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(69) In our study, [Subject-Created:?] was designed to evaluate [Complement-Phenomenon:?].
(70) Our study designed [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(71) In this study, we designed [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(72) In this study, our objective was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(73) The objective of our study was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].
(74) In our study, the objective was to design [Complement-Created:?] to evaluate [Complement-Phenomenon:?].

Based on the schema *Abstract Structure#1* defined in §2, the XMLSPY⁵ built-in generator assigns each of these terminal strings an appropriate RPA structure of the kind illustrated in Figures 14-16. It is important to observe that the process involved in the generation of the template sentences (34)-(74) is independent of potential contextual and linguistic properties of the sentences preceding and/or following them. A more refined version of the schema, which is sensitive to co-text properties, is currently under development.

4 Conclusions

We have shown that it is possible to define an XML Schema to capture correlations between genre properties, logical properties and lexicogrammatical properties. The proposed *Abstract Structure#1* schema, developed with the XMLSPY⁵ environment in the context of the objectives of the RedACTe Project, can be used to generate RPA instances which are not only well-formed but also valid in accordance with the empirical correlations defined by it. This schema is still too simple and gross to express all the complexity of RPAs (see the Appendix below), but we believe that it can be significantly refined and enhanced as long as all sorts of correlations between various classes of properties are identified and formally described.

Appendix

1. Ismail, Baher, Elizabeth Cantor-Graae & Thomas F. McNeli (1998) "Minor Physical Anomalies in Schizophrenic Patients and Their Siblings" *American Journal of Psychiatry* 155: 1695-1702.

Objective:

[Introduction: Research Announcement:] *The aim of this study was to assess the frequency and type of minor physical anomalies in schizophrenic patients and their normal siblings.*

Method:

[Method:] Sixty adult patients with schizophrenia, 21 siblings of these patients, and 75 normal comparison subjects were assessed through use of an extended scale consisting of the Waldrop scale and 23 other minor physical anomalies.

Results:

[Results:] Patients had significantly more minor physical anomalies than comparison subjects in all body areas tested and also more minor physical anomalies in total than their siblings. Hand, eye, and mouth minor physical anomalies best discriminated patients from comparison subjects. Siblings had significantly more minor physical anomalies than normal comparison subjects. Sixty percent of the patients and 38% of the siblings, but only 5% of the comparison subjects, had a higher rate of minor physical anomalies (i.e. six or more). With the exception of ear minor physical anomalies, no association was found between minor physical anomalies in the patient and sibling in the same family.

Conclusions:

[Conclusions:] Higher levels of minor physical anomalies (especially in the eye, mouth, and hand/foot regions) characterize both schizophrenic patients and their normal siblings, but there is little similarity in these anomalies between patients and siblings in the same family. Thus, one or more genetic or shared environmental factors may increase the risk for development of both minor physical anomalies and schizophrenia in these families at large. Minor physical anomalies associated with schizophrenia are frequently found in, but are clearly not limited to, the head or facial region. The Waldrop scale identifies minor physical anomalies strongly associated with schizophrenia. Nevertheless, assessment of the new items clearly indicates that many additional minor physical anomalies are found in schizophrenic patients.

2. Elefsiniotis, P. y W. K. Oldham (1994) "Substrate degradation patterns in acid-phase anaerobic digestion of municipal primary sludge" *Environmental Technology* 15, 8: 741-753.

[Introduction: Research Announcement:] *This study investigated the effect of certain operational and environmental parameters hydraulic retention time (HRT), solids retention time (SRT), pH, and reactor configuration on substrate degradation during the acid-phase digestion of municipal primary sludge.* **[Method:]** Experiments were conducted using two bench-scale, continuous-flow bioreactors having different configurations: a completely mixed reactor (CMR) with clarifier and sludge recycling; and an upflow anaerobic sludge blanket (UASB) unit. **[Conclusions:]** Results indicate that the utilization percentages of the three major constituents of primary sludge (carbohydrates, proteins, and lipids) are significantly affected by variations in HRT and pH. Changes in SRT, however, influence only protein dissimilation, at least in the range investigated. Moreover, carbohydrate and lipid degradation patterns are dependent on reactor configuration, whereas protein utilization appears to be independent of the reactor regime.

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