

Digital MultiCulture in Practice

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Abstract

Semantic Web ontologization, within the context of the Humanities, proceeds from the definite physical experience of the text, the performance, the human in self-expression, as narrator/performer, for an audience present, or at a distance in time and/or space. We demonstrate practical ontologization by focusing on the rhetorics of play, embracing culture in general, and by choosing to confine our terminology within the rigorous formal framework of Sowa's top 12 central categories. Specific play is addressed in the context of the *digital re-discovery of culture* (DrDC) game.

All of our results are bilingually expressed (English/Bulgarian) in the description logic form of the Semantic Web Ontology Language (OWL-DL). Practicality is ensured within the freely available Protégé Editor. For us, Ontology must be practical! We design DrDC games to be played. Such games must be recorded. They are played out, in reality, on the World-Wide Web (WWW).

1 Practical Sense of Ontologizing

We wish to *describe*, formally, those key ideas about which we want to speak categorically. To do this we shall use description logic (DL) (Baader, Calvanese, McGuinness, Nardi, & Patel-Schneider, 2003). The resulting formal description will be called a terminology. Other synonyms such as taxonomy are also in common use. Terminology is suitably abbreviated as TBox (the T being thought of as the first letter in Terminology, Taxonomy, Telling the system). The “practical sense” of the heading is technical. We take it from the French Sociologist Pierre Bourdieu and his seminal work “*Le sens pratique*” (Bourdieu, 1990).

We wish to *practise*, formally, the above categorical ideas by speaking about individuals. Such individuals populate the Abox (that thing for Asking the system about what is known, i.e., about what it “knows”), that real world of extensional knowledge (Nardi & Brachman, 2003) where you the reader and we the writers actually exist. This epitomizes the ontological multicultural reality of the WWW. We prefer the phrase World-Wide Web over the “technology” word Internet.

Although we will assume that Ontologies in the English language will predominate world-wide in our deliberations, we wish to emphasize that interlingual Ontologies are critical for our own purposes — specifically, the categorization of the knowledge used in our multicultural (often multilingual) Digital re-Discovery of Culture (DrDC) Games (Mac an Airchinnigh, 2005a). By multicultural we mean that the Americano-Anglican (a deliberate reversal of the more commonly used phrase Anglo-American) dominant tongue of today will eventually be supplanted by another in some future time and in our personal life-narrative the many languages used in DrDC game practice are principally and currently English, Irish Gaelic, and Bulgarian. Experience and Practice has shown that Greek, Latin, French, German, Russian, Macedonian and Turkish have also turned up extensively in DrDC games. Such is their wide-ranging multicultural nature. Due to limitations of space we can give only a small example of English/Bulgarian equivalents. We discuss the DrDC game in more detail below in Section 3.

What exactly does ontology mean today? We like the succinct definition: “An ontology is similar to a dictionary or glossary, but with greater detail and structure that enables computers to process its content. An ontology consists of a set of concepts, axioms, and relationships that describe a domain of interest.” (IEEE, 2003). This is a grounding in computer science. For us today, no ontology is

acceptable at all without such a computable grounding. Moreover, we must confess that it is not possible to axiomatize everything that we need for the DrDC game. The DrDC ontology which we are in the process of constructing, will determine the categories of things that exist or may exist in our DrDC games. Such categories will represent our ontological commitment. "To be is to be the value of a quantified variable" Quine's criterion, cited in (Sowa, 2000, p. 496). In particular, our use of the Protégé Editor ensures and frames our categories by typed variables. Let us be clear. We ontologize only for one practical reason: to record the play of our DrDC game. Whatever else might spill out or overflow is extra and welcomed.

How does one ontologize in practice? Borgida and Brachman give a very useful step by step method by which to proceed: essentially proposing that one proceed from the particular to the general, from the individual to the group (Borgida & Brachman, 2003, pp. 369-70). The first author has tested this by ontologizing games of "The SIMS I", since January 2005. If one can not ontologize a "computer game" how can one expect to ontologize "reality." Hence we extend (tongue in cheek) Quine's ontological criterion. "To be is to be computable." And we think, were Quine alive, he would approve. Fortunately all of what we propose falls within the ambit of Quine's criterion. Especially, it covers all that is possible on the WWW. That is all we can desire. Other media help us disambiguate (i.e. give meaning to) WWW exchanges, a key feature of the Dialogue aspect of the DrDC game.

The Ontology Development 101 Guide (Noy & McGuinness) is also strongly recommended. We also adhere to certain conventions. First, we make the use of a Noun in its singular form wherever possible in naming a concept/category. See, for example (Martin, 2000) and (Inc., 2001).

To illustrate our tentative approach let us begin with James Joyce (Wikipedia Article), his book Ulysses, and a photograph of Shakespeare and Company Bookshop, Paris 1920 (interestingly, the first author thought that the Bookshop in question was Greene's Bookshop in Clare Street, Dublin and had already presented this "fact" to many acquaintances). The image shown in (Figure 1) is the cover of the first Bulgarian translation of Ulysses (book.store.bg). One of the interesting cultural aspects is the title: Одисей (Odisej). So Ulysses translates to Odisej (that is from a Hero's name in Latin form to the original Hero's name in Greek form usually written in English as Odysseus). For the meaning of our use of the word/concept of Hero see (Vico, 1984). How shall we describe this formally? As a first step (and we do know the nature of the naivety of what we now write down) we introduce the binary relation translatesTo and relate the two individual Titles of the books by writing (Ulysses, translatesTo, Одисей). There are many different ways to write this formal mathematical relation: translatesTo(Ulysses, Одисей) and (translatesTo, Ulysses, Одисей) being two other variants. This is a crude approximation to the (formal ontological) structure we seek. We now mention that Ulysses is the Title of a Book and so on. Using standard librarian notions, we formally move to distinguish between Book, BookEdition as Materialization of a Book (Borgida & Brachman, 2003, pp. 364-6), and BookCopy as that specific thing which one might actually (hold in ones hands or view electronically on the WWW) read. We define a Book to be a Text (Book \sqsubseteq Text) for which there is some BookEdition (written hasMaterialization **some** BookEdition) and has at least one such Edition, (written hasEdition **min** 1). The notation used is a user-friendly form currently employed within the Protégé Editor ("The Protégé Ontology Editor and Knowledge Acquisition System"). A more formal mathematical notation in description logic for the hasMaterialization role is \exists hasMaterialization.BookEdition. There are three formal analogous categories associated with the Book. They correspond to the categories of Play (as Drama), the PlayStaging, and PlayPerformance. Transferring to the digital re-discovery of culture (computer) game, we identify analogous categories of Game, GameStaging, and GamePerformance. This conceptual construction by analogy, leading to the concept of Game, we find particularly applicable to the DrDC game. Alternative ontologies for Game are to be found in the English Natural Language Ontology ("WordNet") and ("Game Ontology Project").

Our primary purpose in the development of a DrDC game ontology is to support recorded game play across the World-Wide Web in anticipation of the real roll-out of the Semantic Web. Having chosen the concept of Game as Text, we can self-pose certain questions. We notice that Актор (Актёр) in a Performance (Представление) corresponds directly to Character (Герой) in a Play (Сценарий).

What is the corresponding category in the Staging (Постановка)? It is the concept of the Role (Роля), of course. Notice that the same Actor might play different Roles in particular PlayStagings. A “young Hamlet” might one day play the Role of the “Ghost of the Father.” This concept is well-established in game play. For example, in chess, one might be in the Role of White in one game and then switch to the Role of Black in the next Performance of the same Game currently being staged. We will tentatively imagine the Game of Chess to be abstract in the same way that a Book is.



Figure 1 James Joyce & Sylvia Beach, outside Shakespeare and Company, Paris 1920

But we will also want to broaden our formal inquiry to other media such as the particular photograph of James Joyce ("Paris, 1920. Joyce and Sylvia Beach outside the door of Shakespeare and Company on the Rue de l'Odéon.") shown in Figure 1 and to film. For a particular film, we have in mind a recent adaptation of Ulysses entitled "Bloom" (Webtrade). Formal description of media such as these is under active consideration ("Image Annotation on the Semantic Web"). We are also interested in making connections between old images and their modern counterparts. For example, the Shakespeare and Company Bookshop still existed in 2004 (Figure 2). What sort of information ought we to keep?

It is, we think, often the case that many (in the Humanities?) take for granted that to computerize is to de-humanize. This prejudice stems principally from the idea that the computer is a machine; the human is not. However, we opine that the Cartesian dogma treated all life, save the human, to be mechanistic, a story nicely told by Umberto Eco in "The Island of the Day Before" (Eco & Weaver, 1995). Human's have "Soul", animals do not. The modern "ethical" counter-attack is (Singer, 1975). Put differently, to be poetic must always be creative and therefore transcend the fixed necessarily-so mechanism. The flaw in this reasoning is to see the computer as a machine. Were we to view the actions of the machine like the extension of our physical bodies then we would immediately grasp the idea that the computing of said machine is like the thinking of said body. Many will worry about the absence of "soul" in this discussion. (Our re-installation of "soul" has been incorporated within the phrase "Physicality of Soul" the import of which may be obtained by googling). Let's ontologize?



Figure 2 Shakespeare and Company, Paris 2004-09-19

2 The Top 12 Central Categories

We who ontologize are human. Computers are not. In our opinion even computed ontologization ought to have a human psychological feel, if only that whatever ontologies are adopted, they will fit naturally within the human frame. We note the ultimate futility of thinking that our ontological proposals shall be “the last word” even in the Americano-Anglican variety of English, taking into account “The Search for the Perfect Language” (Eco, 1997). But whatever it is that we propose that is different and acceptable is, of course, another step forward, at least in the English and Bulgarian languages. Being of equal importance but of lesser geographical spread we expect quite naturally a greater impact in the Slavic linguistic world, which ultimately through translation will impact upon currently hegemonic English.

| | Physical_P / Физически_Ф | | Abstract_A / Абстрактен_А | |
|-------------------------------|--|----------------------------------|---------------------------------|-----------------------------------|
| | Continuant_C Непрекъснат_Н | Occurrent_O Случаен_С | Continuant_C Непрекъснат_Н | Occurrent_O Случаен_С |
| Independent_I Независим_1 | Object_IPC Обект_1ФН | Process_IPO Процес_1ФС | Schema_IAC Схема_1АН | Script_IAO Писмо_1АС |
| Relative_R Относителен_2 | Juncture_RPC Точка_на_съединяване_2ФН | Participation_RPO Участие_2ФС | Description_RAC Описание_2АН | History_RAO История_2АС |
| Mediating_M Опосредстващ_3 | Structure_MPC Структура_3ФН | Situation_MPO Ситуация_3ФС | Reason_MAC Причина_3АН | Purpose_MAO Предназначение_3АС |

Table 1 Sowa's Top 12 Central Categories with Bulgarian equivalents

Sowa's ontological structure (Table 1) has a natural (Western Northern-Hemispherical) human feeling to it. To choose the number 12 is to recognize a fundamental mathematical constant in our world, culturally imposed historically, founded on radical prime number divisors 2 and 3 (to go one more to 5 throws one into the (original) Mesopotamian (base 60) world on which many obvious cultural things

are based — seconds, minutes, degrees); a day formed of 2 times 12 hours; a year formed of 12 months; for Christians the 12 apostles; the European Union flag now fixed at 12 stars; all human knowledge formed by 12 key categories (from an Americano-Anglican hegemonic perspective). Why fight the “magic” of the number 12?

Categories named by Object, Process, Schema, etc., have a certain familiar formal feel to them. Personally, we find the appearance of Juncture as one of the top 12 causes surprise.

A brief account of these 12 categories is available on the WWW (Sowa, 2001). A detailed account is given in the text “*Knowledge Representation*” (Sowa, 2000, pp. 72-5). It is important to note that a category such as Object is a formal concept. To emphasize this formality, Sowa recommends prefixing such as IPC-Object or use of parentheses Object (IPC) where the three dimensional coordinates are explicitly given: Independent, Physical, Continuant, in this case. In keeping with the chosen style, which we use in the Semantic Web Editor Protégé, we write Object_IPC. In our translation to Bulgarian we immediately faced the problem of duplicate initial letters. In particular, the concept words Относителен (Relative) and Опосредстващ (Mediating) both begin with “O”. Instead of searching for different Bulgarian words to disambiguate initial letters we choose to use 1, 2 and 3, happily reflecting Sowa’s Firstness, Secondness, and Thirdness (Sowa, 2000, p. 61). Naturally, we wonder if Sowa named some the top categories (such as Juncture?) to avoid initial letter clashes?

The table of the 12 presents a succinct view of the top **central** categories. Omitted are 6 higher level categories: Actuality (Реалност), Form (Форма), Prehension (Схващане), Proposition (Твърдение), Nexus (Връзка), Intention (Намерение) and the 7 **bases**, in terms of which all are defined: Independent (Независим), Relative (Относителен), Mediating (Опосредстващ); Physical (Физически), Abstract (Абстрактен); Continuant (Непрекъснат), Occurrent (Случаен). To denote that both the Schema and the Script are Forms, we use the standard mathematical notation Schema \sqsubseteq Form, Script \sqsubseteq Form.

In the construction of the Bulgarian equivalents, a very simple method was initially adopted by the **first author**, just to get started. In multicultural work, spread out at a distance over the WWW, such individual exploratory initiatives are essential for effective collaboration. Were it merely a matter of a single language ontology then the method would be analogous but different.

Step 1: EN ==> BG using online dictionary <http://sa.dir.bg/>. Pick the first word given on the assumption that the translation dictionary compilers use an order based on meaning frequency. For example, Juncture ==> (критическо) положение, стечение на обстоятелствата.

Step 2: BG ==> EN using a different online dictionary <http://rdesc.pu.acad.bg/dcs/lingv/index.html> for confirmation. For example, Положение ==> position, situation, juncture.

Step 3: a pragmatic decision on alternatives

Experience shows that the use of such electronic dictionaries is not yet adequate in the construction of multicultural ontologies and naturally will never replace the natural language expertise of the native speaker. For now, the authors have agreed a single term for term translation of the 12 central categories as shown in Table 1 below. This immediately raises two important issues: a one-for-one correspondence might not be possible? If possible, then how are we to get an officially accepted translation within the Bulgarian (academic) community? Such kinds of agreement is an urgent necessity for all who wish to adopt some universal standard upper ontology such as Sowa's conceptual framework (Sowa, 2000) in different linguistic traditions. The second issue concerns the number 12. Of course, we might imagine that Bulgarian requires 13 Categories (or only 10), in which case there must be an agreed mapping (ontology alignment) between linguistic groups for mutual Semantic Web Ontological understanding.

Step 4: The chosen category word is then entered into the Protégé editor and the Bulgarian to English translation from <http://rdesc.pu.acad.bg/dcs/lingv/index.html> is copied into the rdfs:comment field.

The general problem of aligning multi-lingual ontologies (mentioned above) is briefly but eruditely and succinctly discussed in (Sowa, 2000, pp. 409-11). We face this problem now in a practical way in constructing English and Bulgarian ontologies of the same DrDC game reality.

3 Ontologizing the Rhetorics of Play

The whole point of our research into a practical ontology is to use a standard framework by which we might now explore the digital re-discovery of culture (DrDC) game and, in particular, to set up a formal ontology for the Rhetorics of Play (Реторики на Играта) based on (Sutton-Smith, 1997) that is compatible with, and situated within, the context of Sowa's top 12 central categories. Moreover, this practical ontology must be, at the very least, in Bulgarian as well as English.

We have already noted above that it is conventional to use the singular form of a word in a terminology. Hence, we replace words such as Players (Sutton-Smith, 1997, p. 215) by `Player`, etc. In addition, due to lack of space and the need to provide Bulgarian equivalents, not all of the information in Sutton-Smith's table is included here. There are seven categories, the first five of which are shown as table headings (Table 2). Omitted, due to lack of space and unwilling to have the reader look at a sideways table, are the categories of `Discipline` and `Scholar`.

Let us begin our ontological construction by focusing on the two words `Play` and `Game`. Immediately we "bless" these as concepts. In translation, the Bulgarian will be, for both, the word `Игра`. Recall that these words are Nouns. It also seems reasonable for us to type `Game` as a form of `Play`. Now we have an alignment problem in BG to be resolved. Tentatively, using the order $0 < 1$, we ontologize `Game` = `Игра_0` and `Play` = `Игра_1`. In practice, we use the substantive `Playing` = `Играене` instead of `Play` = `Игра`. The ontological alignment is done.

Let us turn now to the central problem of the DrDC game ontology. The 5 elements of the DrDC game are `Backstory` (Wikipedia Article), `URLs`, `Images`, `Goal` and `Keyword`. (Mac an Airchinnigh, 2005b). For definiteness, we give here the `Backstory` written by the first author for a game played in 2005:

"I was in БЕЈГРАД in June 2004 to present my paper "The graven image — digitized and philosophized." A friend of mine, Romana Ribić, from the Summer School on the Digital Preservation of Medieval Manuscripts, Sofia, Bulgaria, 1999, said hello and gave me as a present, a book "The Bridge on the Drina" by a Nobel Prize winner, of whom I had never heard, Ivo Andrić.

I was very surprised that Ivo Andrić had been to Ohrid and described his experience of the lake in a text: " If you bathing in Lake Ohrid on a sunny day and suddenly emerge from its depths, breaking the surface for a moment, you will see on the pale blue expanse all around you silvery, transparent bubbles, big and small. In each of them the Sun is doubly reflected, like two focuses of different sizes. Approaching one of the bigger bubbles, holding your breath for fear it may burst, you can see in it, as in a distorting mirror, the reflection of your face, wet and laughing. And all the time, that bigger sun, like a vast star, hangs over your head. It all lasts for just an instant, like all beauty, yet it is repeated over and over again..."

IVO ANDRIC, Nobel Laureate (excerpt from travelogue "Beside Luminous Lake Ohrid")

These bubbles big and small are just like virtual pearls."

The played game is discussed in detail in a recent paper (Mac an Airchinnigh, 2006). It is the centrality of the `Backstory` that defines the DrDC game as `Narrative`. Currently most, if not all, of the `Backstories` used so far have been first-person narratives. A `Backstory` can be released into the public domain of the game (the `WWW`) without the other elements being revealed at the same time. It is, therefore, the **key** concept underlying the game (much as Aristotle's "*ousia*" is the **key** that defines his own ontology). Within the Protégé Editor this particular `Backstory` is classified as an Individual named: `Backstory_of_DrDC_Game_Ohrid` and the entire text is entered as an `rdfs:comment`.

There are two types of `Player`, the one who initiates the game, who issues the challenge, and the one who responds to the challenge. The designer of a DrDC game, i.e., the `Player` who writes the `Backstory` is clearly a `DeterminantParticipant` who controls the activity of the game from the beginning as the `Initiator` (Sowa, 2000, p. 508).

Since the DrDC game is played out in the WWW then it seems reasonable, that is to say we can *imagine*, to expect artificial agents such as software agents, remote cameras, robots, and so on to feature in a variety of ways in future designs. Given our own focus on the notion of physicality of soul (psyche), we have adopted the notion of ArtificialPsyche with the six functions (after Aristotle): Nutrition, Perception, Desire, Locomotion, Imagery and Thought (Sowa, 2000, pp. 311-32).

| Rhetoric Реторика | History История | Function функция | Form форма | Player Играч |
|---|---------------------------------|------------------------------------|----------------------------------|--------------------------------|
| 1 Progress Развитие | Enlightenment Просвещение | Adaptation Адаптация | Play Игра | Juvenile Младеч |
| 2 Fate Съдба | Animism Анимизъм | Magic Магия | Chance Случай | Gambler Комарджия |
| 3 Power Сила | Politics Политика | Status Статус | Skill Умение | Athlete Атлет |
| 4 Identity Идентичност | Tradition Традиция | Communitas Община | Festival Фестивал | Folk Народ |
| 5 Imaginary (*) Въображение | Romanticism Романтизъм | Creativity Творческа способност | Fantasy (**) Фантазия | Actor Артист |
| 6 Self Аз | Individualism Индивидуализъм | Peak experience върховен опит | Leisure Незаеетост | Avant-garde Авангард |
| 7 Frivolity Несериозност | Work ethic Работна Етика | Inversion Инверсия | Nonsense Безсмислица | Trickster Мошеник |
| 8 Adaptive Variability Приспособимост | Darwinism Дарвинизъм | Evolution Еволюция | Life Живот | Animal Животно |
| 9 Other (***) Друг | DrDC Game ДиПреКул Игра | Understanding Разбиране | Semantic Web Семантична Мрежа | Internaut Интернет-Плавател |

Table 2 Sutton-Smith's 7 Rhetorics of Play, his own (8) and ours (9), with Bulgarian equivalents

Table Notes:

(*) Sutton-Smith chose the word Imaginary in place of the expected Imagination because the latter “has become too limited by its own rationalistic history” (Sutton-Smith, 1997, pp. 127-8). We deliberately choose Въображение for Imagination assuming that it carries no such rationalistic baggage. The associated Discipline is “Art and Literature” and the named Scholars are “Bakhtin, Fagen, Bateson”.

(**) Sowa uses the word Imagery to convey the meaning of Aristotle’s term “*phantasia*” (Sowa, 2000, p. 332). We use Imagery as a key concept in the formal definition of the DrDC game (using \exists hasImage. Imagery).

(***) The Rhetoric of the Other is our own constructed/chosen rhetoric of play. What might be the associated Discipline(s)? We propose “Theory of Culture.” Scholars are yet to be identified.

Why might one want to play a DrDC game? We have designed it specifically to be a re-discovery of the so-called “known world”, the known world of geography, history, culture, psychology, art, etc. The re-discovery of DrDC game is a guided re-discovery which has the ultimate goal of enriching the players’ experience, facilitating (multicultural) conflict resolution, educating of the Self and a bridging to the (culturally-different) Other. The DrDC game is intended to be a **sharing of knowledge** and not just a sharing of information. Hence, there is a need for formal representation of this knowledge. For this we need the formal ontology.

The sharing of knowledge/experience is only possible between “real” people in Play. Since the DrDC game is digital and played out on the game board of the WWW there must be some sort of “real people” contact. To describe this essential aspect we use the phrase “physicality of soul”. We suggest that we find a natural home for our DrDC game within the soulitarian community (Kane, 2004, pp. 91-133). We formally name our players Internauts. We might just as well name them

Soulitarians. But, in our opinion the use of the concept of “soul” in such a manner might be counter-productive.

The DrDC game was originally designed with the idea of Dialogue and Bridging in mind. These are two core concepts. Let us imagine we have two players, the Initiator (designer) of the game and the Other who is challenged? The play of the game may involve all the media at their disposal, including telephone conversation (such as with Skype). They may agree to use English as the primary communication language. But is it to be expected that WWW resources to be accessed may very well be in many other languages, such as Irish Gaelic, Bulgarian, etc. For this reason e-Dictionaries are important DrDC game Accessories. Finally, to integrate the whole with respect to the WWW, we need the Semantic Web, with corresponding Web services based on the formality of OWL-DL.

The DrDC game has rules of play. In our design, we design for fun as players, and being academic we justify our design in a scholarly way. We use the, in our opinion, classic reference text “Rules of Play” (Salen & Zimmerman, 2004). Our Ontologization includes alignment of concepts from this latter source with the Rhetorics of Play of (Sutton-Smith, 1997) and the Play Ethic of (Kane, 2004) and our Rhetoric of the Other.

4 Relevant Existing Resources and a Conclusion

We have looked briefly at some online resources with a view to assisting us in the construction of the DrDC Ontology.

OpenCyc (Cycorp) is an open source version of Cyc. The word Cyc is taken from the word Encyclopedia (Sowa, 2000, p. 54). Concerning Cyc, Sowa remarked that “the Cyc project is so ambitious that the developers have been forced to address every issue of knowledge representation” (Sowa, 2000). OpenCyc was (is still?) an input to the standardization activities of the IEEE (USA) for a Standard Upper Ontology (SUO) in English (IEEE, 2003). In searching (as Guest) for `PLAY` we find that there is no entry at all (2006-03-05)! This is disconcerting. There might be an Americano-Anglican clash, since Play is a Drama in the standard Americano-Anglican English. In searching for Playing we learn that it is a ProcessType and this is satisfactory. After a little searching on all tagged phrases ... it is clear that in our opinion Sowa is right in his assessment.

WordNet (“WordNet”) is regarded as the most widely used ontology for (English?) natural language processing (Sowa, 2000, p. 412). One may access it online (“WordNet Search – 2.1”). The first author is using WordNetX (Taysom, 2003) in conjunction with Sowa’s Top 12 Categories for classification of the DrDC game ontology. For example, let us look up `PLAY`. Choose definition “noun: Play by children that is guided more by imagination than by fixed rules; “Freud believed in the utility of play to a small child.” The corresponding Hierarchy structure is `Act` \sqsupseteq `Activity` \sqsupseteq `Diversion` \sqsupseteq `Game` \sqsupseteq `Doctor`. Now let us look up `Game` and choose definition: “noun: A contest with rules to determine a winner; “you need four people to play this game.” The Hierarchy structure gives: `Act` \sqsupseteq `Activity` \sqsupseteq `Game` \sqsupseteq `Catch`. It is clear that `Diversion` is the extra subcategory by which the two “meanings” differ. For our ontology we have initially chosen `Game` to be an abstract `Text` like a `PLAY` (Drama) and a `Book` and subsequently used the `hasMaterialization` Role for definition. But as mentioned above, for the BG ontology alignment, we now have chosen the substantive noun `Playing` instead of `PLAY`. Our choice is not important. Recording the reason for the choice is critical.

EDR Electronic Dictionary (“EDR Electronic Dictionary”) is mentioned by Sowa to contain 400,000 concept types (English and Japanese) (Sowa, 2000, p. 412). This is of no immediate direct interest, in the short term, for our research work. In particular, there is no open source version. Cultural matters transcend commerciality, though the latter is necessary but secondary.

For our purposes it is very important to note the paucity of axioms for definitions in Ontologies such as WordNet and EDR. In other words, without axioms it is difficult to take advantage of OWL-DL and the Semantic Web.

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Feedback from the anonymous expert reviewers helped us to focus our work in important ways and to write more clearly. We have taken their comments on board and any remaining defects in the paper are certainly our own. Reading what we have written we acknowledge that there remain many defects.

For practical Ontological development work we use at the time of writing the Protégé Editor 3.2 beta (build 301) released 2006-02-03 ("The Protégé Ontology Editor and Knowledge Acquisition System") together with the Description Logic Reasoner RacerPro (KG). We note in passing the origin of the latter within the research work of the University of Hamburg, the host of the Workshop for which this paper is intended.

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