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[ieeerawg] First Proposed IEEE Ontologies for Robotics and Automation (ORA) Draft Standard

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À : ieeeraswg@googlegroups.com

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Dear Craig,

To remind who I am, Serge Stinckwich presented during your last face-to-face seminar in Tokyo the results coming from the PROTEUS project and namely the ontology on which robotml is based upon (see <http://europe.bourges.univ-orleans.fr/?q=node/40>).

I am sorry not to have answered earlier but some proposal writing and contracts closure were impeding my work on your document. I had many more comments but I limited myself due to time constraints and clarity of comments done.

I don't know how standards are working thus my contribs / requests / questions whatever have to be taken as they are... amateur work. So use this work as you like.

In order to position the different comments I used an easy tagging method: page.line and eventually (comment number on the line).

Hope this work will be of some help

Regards

Bruno Patin (ex PROTEUS coordinator, part of the team working on the ontology supporting RobotML DSL)

Page numbering

it would be useful to have pages numbered along with lines numbering.

Title

I propose to use : "Draft standard for Core ontology for robotics and automation"

rationale: the wording standard for standard is never used in the document apart from the introduction. Only the wording "core" is used throughout the document and it is the reality of this proposal

ToC

I think that you should add a section that would illustrate the ontology use wrt domains described as your targets in the introduction (not part of the standard), industrial, service and autonomous robotics. Moreover, you could have illustrated your points using some inference engine.

Introduction

7.9: behavior used. Is it US english or UK english that is to be used in the document?

7.13: "among various stakeholders" - I take this sentence in order to ask the question of what goal has the standard. If I read from lines 3 to 8 I have the feeling it is to create a protocol between machines and between machines and humans. Reading this second paragraph I see a standard allowing stakeholders to build interoperable systems. This is not the same thing. The first one asks for knowledge representation, mechanisms such contract nets... Something in the line of FIPA. For the second section you are closer to a common modelling representation. Stakeholders able to build common pieces from sub parts.

7.22-23: "working with industry, academia and government organisations" when analysing those participating to the creation of the standard, there is not one industry person. I think that you cannot consider you are relying on industry and government organisation in such a display of names (probably you should have a mixed chair, vice chair and secretary organisation (one to academia, one to industry, one to government)).

7.26: autonomous robotics is not a domain and certainly not a market, it is a modality of the robots and it can vary with time. You are probably referring to mobile robotic. You may use the eurobotics roadmap and align to it in order to define these different domains.

7.30: developing -> the development

7.32: behind R&A -> supporting R&A description (this ontology is not in the backyard. It will be present throughout the other development and must be known. behind could mean transparent and not to be known)

7.33: sub-ontologies -> derived-ontologies (sub could mean less important when we want to state dependancy, specialisation)

7.34: what a robot is -> what a robot is in the scope of the standard (as it is you will never be able to agree with everybody on what a robot is)

1.1. Scope

9.16: "defines a methodology": the methodology used is postponed as an annex of the document when the document is the result of the methodology. I think the wording should be more "This standard defines a core ontology needed for the representation..." and somewhere could appear "This standard has been put in place using the methodology introduced in annex A"

9.17 (1): you introduce "knowledge" but it is not defined in section 3. This is needed because it is as ambiguous a word as "robot".

9.17 (2): "in the robotics domain": you introduced the fact that you have the need to define interactions between human and robots. To specify only robotics domain can be understood as disqualifying ontologies for the interaction between robot and human.

1.2. Purpose

9.25: same as 16

9.28: "this standard ... ontologies": this sentence supports the claim in 17 (2) because it is emphasised the transfer of knowledge between humans as well... it is much larger than robotics. Moreover, the word used for describing the other alternative of the interaction to human is not "robot" but "artificial systems".

10.12: surprisingly, the goal is to precise interaction between human and robot but in the list of examples there is not one wrt service robotic when everybody is stating it is the next horizon.

2. Normative references

10.17: this sentence is not useful as all the references are dated here.

3. Definitions

Question: are the definitions complete? Those reading the document are not all able to access the online dictionary and thus cannot consider roaming through it to verify completeness.

Question: is it of any interest to discuss the definitions (I'll wait for your answer as there are many points that are not unambiguous)?

10.28: is it not a reference that should be quoted in the second section? It would be better than the footer note. Moreover is there not any versioning, date associated to the dictionary?

4 Core ontology for R&A: Axioms

13.13: I think it would be of interest to distinguish between SUMO and SUO-KIF terms and thus I would be in favour of providing the SUMO namespace at least or define in an annex the SUO-KIF reserved words.

4.1 SUMO

As an introduction it would have been necessary to state why this is SUMO that should be the underlying ontology. Considering the list of projects using the ontology they seem old and outdated (perhaps there are some more?) and more to the point do industrial projects/products rely upon this ontology. Moreover, I tried to install the SUMO browser to see it was not so easy thus w/o any support. In other words, I think the rationale of the choice is to be presented.

There I have to provide the rationale behind the ontology construction in PROTEUS:

1/ use the existing modelling and normalised approach thus the choice of UML/SysML and the like to verify at every point we can translate to this target the ontologies defined

2/ use a mathematical basis on which to build verification and proof beyond the limited first order logic accessible to ontologies and ability to use that directly on what information is transferred Thus the use of DEVS.

3/ Align (but only align) to underlying upper ontology thus the creation of alias to the opencyc ontology for the time being with no follow-up inferences

13.22: there is nothing as objects present only in time. This is a platonician way of thinking that specifies that ideas exist without any support in the material world. This is a basic choice for this ontology and should be slightly discussed (or reintroduced as it is in fact a SUMO concept). However, considering the protocols our robots (and humans by the way) will use, there will be states in memories, neuronal states, paper written and so on and so forth. I think that if you want to represent the fact that knowledge is an "image", an "abstraction" of the world as extracted by robots or human, you have to put forward transformations of these information through material world objects (turing machine is always implemented in an actual processor).

14.3: things->entities

14.4: endurantist/perdurantist are qualities of objects of the material world and more to the point, there is nothing that is totally a perdurantist object. The universe will disappear at some point. Thus perdurandism is a quality with respect to the actions underway. It is something stable with respect to those evolution that occurs in time. I think that these qualities are interesting to qualify but that they should be relative to the timeframe envisioned.

4.2.1 CORAX:Design

15.25-26: the definition here is not the one shown in the picture that is much more specific. CORAX:about should be drawn between proposition and entity

15.28: this rule shows that if there is an instance of a DesignObject then there is an instance of the Design and an about relation between the two of them. The drawing above is not an instance drawing it is a class drawing. In this class drawing you have to respect the comment above.

16.4: it seems to me two parenthesis are lacking

16.27: ...one parenthesis...I did not verify all th expressions wrt their closure.

4.2.2 CORAX:PhysicalEnvironment

16.48: I think the dichotomy between the region and the object is not an image of the existing physics theory and that could lead to askew representations. A physical object IS the region and defines BY DEFINITION a referential. Nevertheless in rder to know if this is working idea would be to follow comment in ToC.

4.2.3 CORAX:Interaction

18.29: PlaysRoleInEvent has never been introduced. It may be drawn in Figure 4.

4.2.4 CORAX:ArtificialSystem

18.33: function has never been defined. It probably should.

19.2: syntax error in the figure, Interacion->Interaction

4.3.1 CORA:Robot

20.2: autonomy of a robot is not to be sub classified. The same robot may be at some point totally autonomous wrt human (and for example not energetic resources) because of lack of communications and at another point totally controlled. Derived from this simple argument, the fact that it is a quality of the robot.

4.3.4 CORA:xxxautonomousRobot

21.26: ...autonomous... -> ...Autonomous...

21.31: this sentence supports the approach as point in 20.2 and it should lead to deletion of the three classes in figure 5

21.35: autonomy relates to a process AND to the object with wich there is autonomy at stake. Here as an exmple we are clearly speaking of autonomy with respect to human in charge.

4.3.7 CORA:RoboticEnvironment

23.33: to what use do we have to define such type of environment at the general level?

4.3.8 CORA:xxxRoboticSystem

24.13: The composition is one of the main property of the system description. It is used the first time in robot group, it is used in 4.3.2 and it used also after. It means that composition / aggregation should be a generic relation.

5 RPARTS

26.15: many of the subsection provide list of elements w/o any specific associated properties. I think that in a standard taht wants to avoid ambiguities, it is not possible. Either there will be properties allowing to

distinguish between elements of these lists or they have to be deleted.

5.1 RPARTS:Sensor

27.2: there are no relationship as such with CORAX:Interaction. That is very weird reading what the two concepts are.

27.5: exteriocceptive->exteroceptive

27.8 (1): there are no definition at all for Proprioceptive and Exteriocceptive. It is needed or the concepts are useless.

27.8 (2): see 27.5

5.3 RPARTS:Actuator

28.3: see 27.2

5.4 RPARTS:EndEffector

29.3: to be an end effector is a property. What is to be expressed is that some devices cannot be something else than end effector thus this property should always be respected. Probably it could be inferred from some rule specifying they are located at the end of the robot.

5.1 RPARTS:Sensor

27.2: there are no relationship as such with CORAX:Interaction. That is very weird reading what the two concepts are.

6.1. POS:PositionMeasure

32.6: we disagree here. There is a position concept that is intrinsic to objects. There is also ways to measure that that will refer to coordinate system. Nevertheless w/o any coordinate system the Where always exist (perhaps only as a relative concept in fact). To differentiate the position with its measure allows someone to manipulate several units, values coordinate systems to the very same location.