Response to reviewers of the paper
Classifying Processes and Basic Formal Ontology
Mustafa Jarrar and Werner Ceusters

From: ICBO 2017
Date: June 28, 2017 at 7:47:47 PM GMT+3
To: Mustafa Jarrar
Subject: ICBO 2017 notification for paper 14

Dear Mustafa,

We are pleased to inform you that your paper "Classifying Processes and Basic Formal Ontology" has been accepted. The reviews for your submission are provided below. We plan to have all accepted papers listed on the website by Wednesday 5th July. It would be helpful if you confirm that you are happy for us to proceed with this step before this date. However, if you do not hear from you we will assume that you have no concerns.

Please prepare and submit your camera-ready papers to EasyChair by Wednesday 12th July.

As well as presenting you are invited to bring a poster to display your work. If interested, please let us know by Wednesday 12th July.

Thank you for your submission and we look forward to welcoming you to Newcastle. Please note that the deadline for registration is Monday 31st July.

Best Regards,

ICBO 2017 organisers

---------- REVIEW 1 ----------

Overall evaluation: -3 (strong reject)

---------- Overall evaluation ----------

The paper takes up an important issue, namely how the classification of processes discussed in linguistics and integrated into DOLCE can be adapted for inclusion into BFO. There are serious issues with the formalization in the paper which I suppose cannot be fixed on the fly.

→ Some alleged issues aren't issues at all, while others – thank you for spotting them – aren't serious and could be fixed easily.

For this reason, the paper is not yet ready for being presented at a conference.

→ The other reviewers and the Program Committee decided otherwise.

FATAL ISSUES

Definitions R5 and R9

Trivially, the definiens of the R5 definition is always fulfilled

→ The definition this reviewer objects to was stated as such:

p **weak-isotypic-part-of** *q* =def. (R5)
p temporal-part-of *q*
& and there exists some type (universal or defined class (DC)) P such that *p* **instance-of** P and *q* **instance-of** P.

The definiens is not always satisfied (let *p* be an apple and *q* a reviewer) though indeed always for processes, the universal PROCESS itself being the one that qualifies for instantiating both p and q. This is not what we had in mind, rather that there exists some subtype of PROCESS that qualifies. The real issue is that the qualifying universal is not mentioned in the definition as we did in:

p **weak-homeomeric-in** *P* =def. (R7)
all temporal parts of *p* are instances of P.

R7 makes thus R5 not needed. We removed it, thereby thus also eliminating the need for the qualifier 'strong' in:

p **strong-isotypic-part-of** *q* =def. (R6)
p **temporal-part-of** *q*
& *p* **instance-of** all types instantiated by *q*.

In the final submission we changed the name to **isotypic-part-of** but kept in this response in the original form so that the reviewers' comments can still be understood in the correct way. Since the original definition R5 was not used further in any other definition, deleting it was an easy fix in response to the objection of this reviewer.

Trivially, the definiens of the R9 definition is always fulfilled

→ This definition stated:

p **weak-cumulative-with** *q* =def. (R8)
there exists some process type (universal or defined class (DC)) P such that *p* **instance-of** P, *q* **instance-of** P and *p*+*q* **instance-of** P.

The problem is of the same nature as the original R5. As also this definition was not further used, removing it was once again an easy fix that could be done 'on the fly'. It also eliminated the need for the 'strong' and 'weak' qualifiers.

Definitions R 6 and R10

Trivially, the definiens of these definitions is never fulfilled, as p is an instance of the process type "temporal part of q", but q isn't.

→ The definitions objected to are:

p **strong-isotypic-part-of** *q* =def. (R6)
p **temporal-part-of** *q*
& *p* **instance-of** all types instantiated by *q*.
Example (figure 2): p_6 **strong-isotypic-part-of** p_5.

and

p **strong-cumulative-with** *q* =def. (R10)
all process types instantiated by *p* and all process types instantiated by *q* are instantiated by *p*, *q* and *p+q*.
Example (figure 2): p_2 **strong-cumulative-with** p_3; DC1, DC5 and DC6 are the all and only types that are instantiated by both p_2 and p_3, as well as p_1 (the mereological sum of p_2 and p_3).

The reviewer makes here a mistake by assuming that *p is an instance of the process type "temporal part of q"*. There is no process type "temporal-part of q" at all! No action taken.

Hence, the definitions of homeomericity and cumulativity presented here are worthless for process classification.

→ A wrong conclusion from this reviewer: R5 and R9 were not used in any other definition and his claims about R6 and R10 are wrong. None have thus any impact on the definitions remaining.

The definition of telicity R12, finally, is not lege artis. There are variables free in the definiens (i.e., "P" and "Q") that do not occurr in the definiendum. This needs to be fixed.

→ The definition was stated as:

p **is-telic-in** *R* =def. (R12)
p **instance-of** *P*
& there exists some process *q* **instance-of** *Q* and some process *r* **instance-of** *R*, such that
(1) *q* not **instance-of** P, (2) *p* not **instance-of** Q,
(3) *p* **precedes** *q*, and
(4) *p* and *q* are **temporal-part-of** *r*.
Example (figure 2): each of p_4 , p_5, p_7 **is-telic-in** *DC1*.

We disagree. P and Q here are bound through the instances *p* and *q*, although it is true that for both p and q more than one universal may be found that qualifies for P and Q resp. What they exactly are, doesn't matter. See also Stephen Yablo, Definitions, consistent and inconsistent, Philosophical Studies 72 (2-3):147 - 175 (1993). We could make the definition more verbose by adding '*there exist some universal Q*', etc but since we are not using a specific logical formalism here, we don't see the need. No action taken.

Moreover, I think that the pair of definitions R12/R13 also does not live to what it is meant to do. The problem occurs with maximally exented process tokens. Imagine a stone that is unmoved till it starts falling to earth, where it again immediately stops moving. Hence there is an instance p-max of falling which is according to R12 not telic in Moving; hence, according to R13, Falling cannot be telic in Moving, contrary to the example given by the authors.

→ The definition R13 was stated as:

P *is-telic-in* Q =def. (R13)
for all process *p* **instance-of** P, *p* **is-telic-in** Q.
For example: falling is-telic-in moving, 'walking leg swing' is-telic-in 'walking'.

We agree that the hypothetical example of falling given by this reviewer would not be telic as per R12. But that does not make R12 invalid and thus neither R13. Thus the alleged problem can only be in the example. However, we specified that we were talking about '*falling under natural Earth conditions*'. It seems to us that the reviewer's example is thus purely hypothetical as we cannot imagine any falling where the motion would stop at the same time as the falling: the stone might bounce on a hard surface, in sand it would penetrate in the sand, etc. This is a bit like arguing that an ontology of normal anatomy is

a fantasy since nobody's body, nor all parts thereof, are perfectly normal. We elaborated on this in the paper.

MINOR ISSUES

- The example given by means of Fig. 2 was not transparent to me.

→ We added a paragraph describing the figure in more detail

- Legend for Fig. 1: Telic --> Telicity

→ We changed it.

- Legend for Fig. 1: and states --> and states in DOLCE ((assuming this is what you mean))

→ corrected

- elucidation after R3: What is "spr"?

→ Just a token specifier as in 'process p', or 'temporal region r', thus here 'spatiotemporal region spr'. We changed it to 'str'.

- Sometimes variables for particulars are in italics, sometimes not. Why? Variables for classes are never in italics. Why?

→ We follow generally the conventions of Chapter 7 in Arp R, Smith B, Spear AD. 2015. Building ontologies with Basic Formal Ontology. MIT Press. We added italics for particular varaibles for more readability. Any inconsistency found is a mistake and has been corrected.

- I think that "weak" and "strong" function as adverbs in many occurrences in §2, hence authors should use "weakly" and "strongly".

→ Has been corrected

- §2.1, page 3: From R5 it follows --> From R5 and R7 it follows ((!!!))

→ Corrected

- for any of the relations R5---8 stong homeomericity hold --> strong homeomericity holds for any of the relations defined in R5---8 ((BUT I even in this variation I do not understand that sentence: Firstly, strong homeomericity holds, if ever, for processes, not for relations. Secondly, R8 just IS the definition of strong homeomericity in a process type ...))

→ This sentence came out wrongly through some 'track changes' issue and does indeed not made sense. It has been corrected.

- "-in P" etc.: Maybe rather "with respect to P"???

→ That makes the name too long

- §3: two instances of a perdurant --> two instances of a type of perdurants

- §3: of the same perdurant --> of the same type of perdurants

→ Both adjusted

- Do not italizise quotes.

→ We checked, but given our old eyes …

- use emphases only parsimoniously, and when you use them, use only italics (and not: italics, bold font and underscores at the same time ...)

→ We use it only when needed. Different fonts indicate different strength of emphasis.

- page 5, first line: if some process --> if a process

- page 5, §3: we discussed --> we discuss

- page 5, §3: we used them --> we use them

- page 5, §3: are not presented in this paper for space limitations but: delete

- page 5, §3: most top level processes --> most top-level processes

- page 5, §3: Such processes --> Such process types

- page 5, §3: cannot be judged: strange verb here. Maybe "cannot be classified according to criteria such as ...)" or "cannot be uniquely asigned to classes like ..."

- page 6: of all Gene processes --> of all Gene Ontology processes

- Fig. 4: top level GO processes --> top-level GO processes

→ All changed as requested

- page 6: such as is there: awkward!

→ rephrased

- remove indention from Vendler reference

- column heading: Jarrar et al. --> Jarrar & Ceusters

→ both done

---------- REVIEW 2 ----------

Overall evaluation: 2 (accept)

---------- Overall evaluation ----------

The authors address a long-standing need for an upper-level process ontology that is BFO compatible. To ground their analysis in prior work, they of necessity begin with what has been mostly linguistic analysis of the ways human language treats processes, rather than the underlying reality of processes themselves. However, they do quickly transition from looking at representations to looking at reality, in order to make sense of this literature. In that endeavor they are highly successful and overall the work is a major contribution.

Specific, highly important results include (1) homeomericity is a property of process universals, not process instances, (2) high-quality definitions of both instance-instance and instance-universal relations between processes and process universals, (3) differentiation of weak vs. strong homeomericity and cumulativity, (3) the relationship between homeomericity and cumulativity (if a process in homeomeric in P it is also cumulative in P), (4) a formal treatment of instantaneity (although further work on "peak moment" is clearly needed), and (5) the fact that atomicity is a pure linguistic construct and has no logical interpretation as to how processes are in reality.

The analysis of the top-level process classes in the Gene Ontology shows that applying their work to a real-world ontology is feasible. It also helps to hint at how the work described here ultimately might be applied to ontological artifacts, namely that it might be that non-homeomeric processes are asserted to be subtypes of homeomeric processes, and thus helping to identify and resolve inconsistencies in the process hierarchy of an ontology.

→ Thanks, we agree.

That said, however, the practical implications of this work including its extension to the addition of classes to BFO remain to be worked out. Given space limitations for manuscripts that is understandable, but even if the implications of one example of an inconsistency had been demonstrated, it would have made the work more compelling.

→ Example added.

What might the computer incorrectly conclude and more importantly what could be the untoward consequences of that conclusion, if it concluded that something were true of a process based on its being represented as a subtype of a homeomeric process, where in fact it is a non-homeomeric process?

→ The point would be to then correct the mistake in the GO, of course. What is the point of having a classification which contains mistakes?

---------- REVIEW 3 ----------

Overall evaluation: 1 (weak accept)

---------- *Overall evaluation* ----------

This paper describes an attempt to bring work from other upper ontologies into BFO, enabling a further classification of processes. The authors introduce four new concepts with processes being homeomeric, cumulative, telic or instantaneous. Its an interesting paper, clearly relevant to the ICBO audience, and to the wider community.

→ Thanks, we agree

As it stands, though, the paper has a significant number of problems, both with its underlying philosophy and with its presentation. Generally, I would talk about presentation last, but in the case of a such a dense paper, clear presentation is particularly important, and the authors have missed the mark here by a long shot. Their use of examples is badly written and often confusing.

Fig 2 which they refer to in many places is not explained at all, and the logic of their conclusions about the concepts described in it is therefore unclear.

→ We now understand this Fig.2 is only understandable by readers familiar with process profiles as covered in the referenced paper: Smith B. 2012. Classifying processes: an essay in applied ontology. Ratio. December 1; 25(4): 463–488. We added a detailed explanation of Fig.2

Fig 3 is pointless.

→ We removed it.

The syntax that they use is not explained, poorly readable.

→ We use the syntax which is standard in all BFO literature, starting with the paper 'Relations in biomedical ontologies' by Barry Smith, Werner Ceusters, Bert Klagges, Jacob Köhler, Anand Kumar, Jane Lomax, Chris Mungall, Fabian Neuhaus, Alan L Rector and Cornelius Rosse, in Genome Biology20056:R46, DOI: 10.1186/gb-2005-6-5-r46

Little or not attempt is made to explain the definitions and their implications in English.

→ We gave examples on the basis of Fig2. We hope the extra explanation about this figure will make matters clearer.

One of their key definitions (temporal-part-of) is not correct, containing mismatching brackets making it very hard to understand.

→ This mistake was copied from the original paper (Smith 2012). We corrected it

Moving on to the philosophy. Again, their examples are problematic. Consider, for example, homeomericity. They state that sitting is homeomeric while walking is not, but they do not explain this further and taking at face value it makes no sense. In fact, it really does make no sense, and they have the example wrong, at least according to the reference they cite; … walking might be (and is) homeomeric but walking from London to Birmingham is not. It is the specification of the start and end location that cause the non-homeomericity. This poor example is likely to cause confusion;

→ We don't state that, but as clearly indicated, that is what in the DOLCE documentation is stated. And we agree it does not make sense as stated in the paper, be it in a more friendly way.

… walking might be (and is) homeomeric but walking from London to Birmingham is not. It is the specification of the start and end location that cause the non-homeomericity. This poor example is likely to cause confusion;

→ But that is exactly the nonsense part: we stated clearly that an entity cannot become an instance of a different class when it is described in a different way. That is the mistake DOLCE makes all over! We emphasize this stronger in the paper.

In fact, we can see this if we look at their analysis of GO where they state that "locomotion is homeomeric" where locomotion is "Self-propelled movement of a cell or organism from one location to another". Walking is a kind of locomotion, so they are contradicting themselves here.

→ What you can see is that these are thorny issues. First, the GO annotations in Table 4 are made in the DOLCE style. For DOLCE, homeomericity is a one-place property, for us, homeomericity is a relation. We made this clear in the paper. Second, it is not clear at all whether walking is a kind of locomotion, or whether locomotion is an occurrent-part of walking. And what if one is walking on a treadmill, then there is no locomotion! We mentioned such issues in the future work part of the paper.

Strangely, they note this problem in their description of cumulativity: flying from London to New York is not cumulative, while flying itself is cumulative, they state. Having noted these problems with cumulativity, they state that this makes no sense from a BFO perspective, and then give a definition with respect to BFO without explaining the difference.

→ This is not strange at all, this observation is exactly the reason why we need to follow a different path. We stated the difference clearly, so we thought, by specifying that DOLCE applies homeomericity to descriptions/predicates, while in BFO it should in the first place be applied to that what the descriptions are about. Reviewer 2 grasped this correctly from our paper. Nevertheless, we rephrased our position for more clarity.

Their description of telicity is okay, although it raises all of the same arguments that we already have wrt to function and biology. The authors do not mention this.

→ It is not clear to us why we should have brought functions in the picture here. This paper is about processes, while functions are continuants.

On the issue of function, they disagree with the notion that a telic process can be interrupted before it's goal; I think this means that if you intend to do something, but fail then your process is atelic.

→ First, in our view, a process is not just 'telic', it is 'telic in some universal'. Thus some process can be telic in one universal and atelic in another one. Second, although some intention can be at the origin of some process, such intention does not determine what type that process is an instance of, nor whether it would be telic in one or other universal. We elaborated on this in the resubmission.

This seems to be counter to the BFO definition of function which can existing in an entity even if it never realises its process (a broken tool for instance).

→ We believe not: it is in the case of a planned process the intention which may be seen as some sort of equivalent to the function. But the intention itself is not what makes the planned process executed. We think this is irrelevant for the paper in its current form. No action taken.

Again, looking at their GO analysis, there are concerns about the applicability: they state that "immune response" is telic (because it finishes once the threat is over), while regulation is not (because it goes on for ever). But, immune responses also go on for ever, or vaccination would not work.

→ Same remark as with walking and locomotion.

As a minor point, here, they use a poor example: a rock cannot fall to the earth for ever.

→ That is why falling is telic in moving under normal earth circumstamces!

A strong counter-example would be the moon.

→ We are not sure what it is counter example of. Is the Moon falling?

On instantaneity, they suggest that no process can happen in zero time. But this contradictions the notion of homeomeric; if the parts of a homeomeric process are the same process, then this should including infinately small parts.

→ They do, until you end up with something that doesn't have any temporal parts: a process boundary. But note that process boundaries are not processes! All our definitions contain references to processes only!

These definitions are used in physics all the time: both motion and acceleration are definied over zero time intervals.

→ Zero time intervals are not processes, neither are the occurrents that occupy them: process boundaries!

Finally, the authors argue against including atomicity because it's granularity dependent.

→ No rather, as we wrote, because the descriptions in the literature are problematic, or at least, we don't understand them.

But, then this argument also applies to many of the other properties that they are describing: sitting, for example, is an active process, involving perception, balance and movement, none of which are sitting processes.

→ Sure, but these are not ***temporal*** parts, they are ***occurrent*** parts!!! With the granularity comment re atomicity, we talk about ***temporal*** parts!

So, sitting is homeomeric at one level of granularity, but if you look more closely, this distinction falls away.

→ Not if you look closer at the ***temporal*** parts, rather than the ***occurrent*** parts (and if sitting were a process at all. Be careful not to take what DOLCE says as something that we contend to simply because we mention DOLCE's view in the paper. We made sure in the resubmission to eliminate any such non-intended interpretations).

In conclusion: It's good that the authors are trying to bring more classification options to processes, but the work is as unclear, and the application of these to real biological problems is unlikely to be balanced or repeatable.

→ This is ongoing work, sure!

On the whole, though, this is still worth presenting at ICBO, as a first step to refining these definitions into something useful.

→ Thanks, we will.