Towards an ontology of religious and spiritual belief

Stefan Schulz
\(^a\) Medical University of Graz, Austria
\(^b\) AVERBIS GmbH, Freiburg, Germany

Ludger Jansen
\(^a\) University of Rostock, Germany
\(^b\) Ruhr University Bochum, Germany
Motivation of this work

- Discussion on BFO list 11/17

  Robert Rovetto:
  Q1: Would bfo be inclusive of God, Soul, Spirit, etc.?
  Q2: Does (or would) bfo exclude them (and if so why)?
  Q3: If a user wants to include terms for God, Spirit, Soul, etc., how would they do so in bfo?
  Q4: Would bfo be able to correctly characterize them according to the view of the user?
Motivation of this work

- Discussion on BFO list 11/17
- Relevance of faith-related concepts in human culture
- Impact on well-being, health, social behaviour
- Interest in developing a framework for terms of controversial reference in a realist ontology\cite{1,2}, using a simple logic (OWL-DL)
- If this can be shown for religion / spirituality: blueprint for other domains: fiction, law, history, philosophy
- Preliminary work

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\cite{2} Schulz, S; Martínez-Costa, C; Karlsson, D; Cornet, R; Brochhausen, M; Rector, A. An Ontological Analysis of Reference in Health Record Statements. Proceedings of the 8th International Conference on Formal Ontology in Information Systems . 2014; 267: -8th International Conference on Formal Ontology in Information Systems (FOIS); Sept 22-25, 2014; Rio de Janeiro, Brazil.
### Entities in religious / spiritual discourse

<table>
<thead>
<tr>
<th>Concepts / Repeatables</th>
<th>Uncontested</th>
<th>Contentious</th>
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<tr>
<td>Religious ceremonies</td>
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<td>Deities, angels, devils, elfs</td>
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<td>Worshipping</td>
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<td>Souls, Spirits</td>
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<td>Holiness, Enlightenment</td>
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<td>Religious narratives</td>
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<td>Reincarnations</td>
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<tr>
<th>Individuals</th>
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</thead>
<tbody>
<tr>
<td>Muhammad, St. Paul</td>
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<td>Abraham</td>
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<tr>
<td>Martin Luther</td>
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<td>Noah</td>
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<td>Pope Francis</td>
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<td>Herod's Temple</td>
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<td>Heaven, Hell, Purgatory</td>
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<td>Bible, Quran, Talmud,</td>
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<td>Nirvana</td>
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<tr>
<td>“Abraham”, “Ibrahim”</td>
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<td>The final judgement</td>
</tr>
</tbody>
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Reference without existence

- Ontology pattern\(^{[1]}\) of denotation by information content entities (ICE):

  \[
  DL: \ ICE_A \equiv \ ICE \quad \text{and} \quad \text{represents}_k \text{ only } A
  \]

  \[
  FOL: \ \forall x (ICE_A(x) \leftrightarrow ICE(x) \land \exists y (\text{represents}_k(x,y) \rightarrow A(y)))
  \]

\(^{[1]}\) Schulz, S; Martínez-Costa, C; Karlsson, D; Cornet, R; Brochhausen, M; Rector, A. An Ontological Analysis of Reference in Health Record Statements. Proceedings of the 8th International Conference on Formal Ontology in Information Systems. 2014; 267: -8th International Conference on Formal Ontology in Information Systems (FOIS); Sept 22-25, 2014; Rio de Janeiro, Brazil.
Reference without particular referents

- Ontology pattern\(^1\) of denotation by information content entities (ICE):

  \[ DL: ICE_A \text{ equivalentTo } ICE \text{ and represents}_k \text{ only } A \]
  \[ FOL: \forall x (ICE_A (x) \leftrightarrow ICE (x) \land y (\text{represents}_k (x,y) \rightarrow A (y)) \]

- Example:
  \[ CancerDiagnosis \text{ equivalentTo } Diagnosis \text{ and ‘represents health condition’ only } Cancer \]
  \[ CancerDiagnosis \text{ equivalentTo } Diagnosis \text{ and } btl2:represents \text{ only } (Cancer \text{ or not } HealthCondition) \]

\(^1\) Schulz, S; Martínez-Costa, C; Karlsson, D; Cornet, R; Brochhausen, M; Rector, A. An Ontological Analysis of Reference in Health Record Statements. Proceedings of the 8th International Conference on Formal Ontology in Information Systems . 2014; 267: -8th International Conference on Formal Ontology in Information Systems (FOIS); Sept 22-25, 2014; Rio de Janeiro, Brazil.
Challenges

- Representing (possibly) non-denoting concepts
  - Logical expressions that extend to defined classes (may be empty), without violation of logical constraints:
- Elements of narratives
  - Individual characters: information entities that extend to classes that may have one or zero members
- Representing beliefs
  - Beliefs as dispositions
  - Beliefs having a propositional content

*Examples using the btl2 domain upper ontology (could be others)*

[1] A. Barton. Towards an ontology of beliefs. JOWO 2018
Representing (possibly) non-denoting concepts

- *Creation* equivalentTo *btl2:process* and
  - *btl2:is realization of* some *btl2:plan* and
  - *btl2:has outcome* some *btl2:universe*

- *Immortal soul* equivalentTo *btl2:immaterial entity* and
  - *btl2:at some time* some
    - (*btl2:is part of* some *Human body*) and
    - *btl2:is agent in* some *Intellectual process* and
  - not (*btl2:is bearer of* some
    - (*btl2:disposition* and *btl2:has realization* some *Dying*)))
Elements of narratives

- ‘btl2:is part of’ (AbrahamCharacter, TheBookGenesis)
- AbrahamHuman EquivalentTo Human and ‘btl2:is represented by’ value AbrahamCharacter
- AbrahamCharacter Type Character and btl2:represents only (Human and (‘btl2:is bearer of’ some MaleQuality) and (‘btl2:is agent in’ some Marrying))
- Ascribing subclassOf btl2:process and (‘btl2:is part of’ some Narrating) and (‘btl2:has agent’ some (‘btl2:is bearer of’ some AuthorRole)) and (‘btl2:has patient’ some Character) and (‘btl2:has outcome’ only $P$)
Conceptualizing deities

- ‘btl2:is part of’ (YahwehCharacter, TheBookGenesis)
  ‘btl2:is part of’ (AllahCharacter, Quran)
  
(...)

- ‘God character’ = {YahwehCharacter, AllahCharacter, ZeusCharacter,...}
  Deity EquivalentTo bfo:Continuant and
  ‘btl2:is represented by’ some ‘God character’

- ‘Deist God character’ equivalentTo ‘God character’ and
  btl2:represents only
    (‘btl2:is agent in’ some
      ((Creating and ‘btl2:has outcome’ some btl2:universe) or
       not ‘Causal intervention’))
Conceptualizing belief and believers

- ‘Belief B’ subclassOf ‘Belief disposition’ and ‘btl2:inheres in’ some (‘btl2:is bearer of’ some (‘Belief proposition’ and btl2:represents only B))
- ‘Belief proposition that souls exist’ equivalentTo ‘Belief proposition’ and (btl2:represents only Soul)
- Deist equivalentTo Human and ‘btl2:is bearer of’ some (‘Belief proposition’ and (btl2:represents only (‘btl2:is represented by’ some ‘Deist god character’))))
Open issues

- Deities that are material objects (e.g. Sun), qualities, …
  - Impact on foundational ontologies

- Representing other flavours of mental representations
  - Disbelief: not believing $\neq$ believing that not
    (Negation: belief in holy cats implies belief in holy animals; disbelief in holy animals implies disbelief in holy cats)
  - Hoping, expecting, considering, hypothesising,…

- Representing propositional content as filler of universally quantified roles:
  - Representational “trick”
  - Need for higher order logics ?
Outlook

- Use cases for ontologies of beliefs / religious entities?
- Beliefs may imply risks
  - Non-compliance with medical advice due to belief in destiny
  - Omission of reasonable decisions due to belief in astrology
- Related areas (cf. Keynote Peter Simons), requiring the representation of propositional content
  - Law: disagreements, e.g. Conflicting witness statements,
  - Statements of policy, opinion
  - Compliance with plans / regulations
  - Psychiatry
  - Fiction
• Thank you for your attention
• Contact: stefan.schulz@medunigraz.at
• BioTop ontologies: http://biotopontology.github.io/
• Prototype Ontology of Religious and Spiritual Belief: http://purl.org/biotop/orsb.owl
• Acknowledgements:
  • Robert Rovetto and members of the bfo-discuss list
  • Janna Hastings (aspects of IAO and MFO)