TOVE Digital City Programming Manual  
Change Pattern Reasoning

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# Introduction

This report documents the Python OWLReady2 (Lamy, 2017) functions that support the use of the ISO/IEC 5087-1 Change Pattern defined in OWL and can be found at: <http://ontology.eil.utoronto.ca/5087/Change>.owl.

In the remainder of this report, we use the following ontology prefix’s:

|  |  |
| --- | --- |
| **Prefix** | **IRI** |
| 5087-1 | http://ontology.eil.utoronto.ca/5087/5087-1/ |

# Change Representation

As per 5087-1, the change pattern enables the representation of an instant whose property values may change over time. Consider the class Vehicle. The change representation makes it possible to record a snapshot of an instance each time it changes by creating a new manifestation when a snapshot is to be taken. The functions maintain the properties of the Manifestation class as needed.

Diagram, schematic

Description automatically generated

Table 3: Key classes in the Change Ontology.

|  |  |  |
| --- | --- | --- |
| **Object** | **Property** | **Value Restriction** |
| Manifestation | existsAt | exactly 1 time:TemporalEntity |
| hasNextManifestation | exactly 1 Manifestation |
| hasPreviousManifestation | exactly 1 Manifestation |
| hasFirstManifestation | exactly 1 Manifestation |
| FirstManifestation | subClassOf | Manifestation |
| hasLastManifestation | exactly 1 Manifestation |

Table 4: Key properties in the Change Ontology.

|  |  |  |
| --- | --- | --- |
| Property | Characteristic | Value (if applicable) |
| hasNextManifestation | Domain | Manifestation |
| Range | Manifestation |
| Functional |  |
| hasPreviousManifestation | Domain | Manifestation |
| Range | Manifestation |
| Functional |  |
| hasFirstManifestation | Domain | Manifestation |
| Range | FirstManifestation |
| Functional |  |
| hasLastManifestation | Domain | FirstManifestation |
| Range | Manifestation and not (FirstManifestation) |
| existsAt | Range | time:TemporalEntity |

# Change Functions (http://ontology.eil.utoronto.ca/dt/code/change.py)

|  |  |
| --- | --- |
| **manifestFirst(object, ddt, ns)** | |
| *Creates an instance of object and FirstManifestation. It sets the property existsAt to ddt* | |
| **object** | The class (which is a subclass of Manifestation) to create the first manifestation of. |
| **ddt** | a DateTimeDescription specifying the instant that the first manifestation exists |
| **ns** | Namespace for the instantiated Manifestation |
| **Returns** | instance of object and FirstManifestation |
|  | |
| **manifest(firstManifestation, ddt, ns=None)** | |
| *creates a manifestation of object and links it to the firstManifestation of the object, and sets the existsAt to ddt. It also copies the properties from the last manifestation into the new one.* | |
| **object** | The class (which is a subclass of Manifestation) to create the first manifestation of. |
| **firstManifestation** | Instance of FirstManifestation for the object – must already exist |
| **ddt** | a DateTimeDescription specifying the instant that the this manifestation exists |
| **ns** | Namespace for Manifestation instance. If None, then uses the namespace of the firstManifestation |
| **Returns** | instance of object |
|  | |
| **findManifestation(firstManifestation, ddt)** | |
| *Finds the manifestation at exists at the instant defined by ddt* | |
| **firstManifestation** | Instance of FirstManifestation for the object – must already exist |
| **ddt** | a DateTimeDescription specifying the instant of the manifestation |
| **Returns** | Returns the Manifestation, or if it does not exist for that time, None |

# References

Lamy JB. 2017. Owlready: Ontology-oriented programming in Python with automatic classification and high level constructs for biomedical ontologies. Artificial Intelligence In Medicine 2017;80:11-28