

Курсов проект по Представяне и моделиране на знания

Онтология за книги

проект тип А

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1.Идея на проекта

Идеята на проекта е чрез онтология да се моделират различни понятия свързани с книги, като целите му са следните:

- търсене на книги по автор
- търсене на книги по жанр
- търсене на всички книги, за които ревьюиращ е написал ревью
- извличане на ревьюта за книга
- търсене на книги по издадетлство
- намиране на поредица от книги

2.Елементи на онтологията

- Класове

Person \sqsubseteq Thing
Book \sqsubseteq Thing
Location \sqsubseteq Thing
Genre \sqsubseteq Thing
Review \sqsubseteq Thing
PublishingHouse \sqsubseteq Thing
Author \sqsubseteq Person
Reviewer \sqsubseteq Person
Country \sqsubseteq Location
City \sqsubseteq Location
Fiction \sqsubseteq Genre
NonFiction \sqsubseteq Genre
Mystery \sqsubseteq Fiction

SingleAuthorBook \doteq [AND Book [= 1 :isWrittenBy]]
CoAuthorBook \doteq [AND Book [EXISTS 2 :isWrittenBy]]
AtLeastFourAuthorsBook \doteq [AND Book [EXISTS 4 :isWrittenBy]]
ReviewedBook \doteq [AND Book [EXISTS 1 :hasReview]]
PopularBook \doteq [AND Book [EXISTS 2 :hasReview]]
SequenceBook \doteq [AND Book [EXISTS 1 :isAfter]]
FictionBook \doteq [AND Book [ALL :hasGenre Fiction]]
ReviewedSequenceBook \doteq [AND Book [EXISTS 1 :isAfter] [EXISTS 1 :hasReview]]
CoAuthoredSequenceBook \doteq [AND Book [EXISTS 1 :isAfter] [EXISTS 2 :isWrittenBy]]

○ Свойства

Object properties:

Domain	Property	Range	Characteristics
Person	isFrom	Location	
Author	hasWritten	Book	inverseOf isWrittenBy
Book	isWrittenBy	Author	inverseOf hasWritten
Reviewer	hasWrittenReview	Review	inverseFunctionalProperty of reviewsWrittenBy
Review	reviewsWrittenBy	Reviewer	functionalProperty, inverseOf hasWrittenReview

Book	publishedBy	PublishingHouse	
Book	hasReview	Review	
Book	hasGenre	Genre	
Book	isAfter	Book	TransitiveProperty

Datatype properties:

Domain	Property	Range	Characteristics
Review	hasRating	xsd:integer	FunctionalProperty
Person	hasName	xsd:string	FunctionalProperty
Person	birthDate	xsd:string	FunctionalProperty
Book	hasTitle	xsd:string	FunctionalProperty
Book	numberOfPages	xsd:integer	FunctionalProperty
Review	description	xsd:string	FunctionalProperty

○ Индивиди

Kabul → City
Afghanistan → Country
KhaledHosseini → [AND Author [FILLS :hasName "Khaled Hosseini"] [FILLS :birthDate "04-03-1965"] [FILLS :isFrom [AND Kabul Afghanistan]]]
LiteraryFictionGenre → Fiction
ObsidianPublishingHouse → PublishingHouse
LissaTroy → [AND Reviewer [FILLS :hasName "Lissa Throy"] [FILLS :birthDate "09-08-1995"]]

ReviewKiteRunnerBookLissa → [AND Review [FILLS :reviewsWrittenBy LissaTroy] [FILLS :hasRating 5] [FILLS :description "WOW! This book was beautiful, exquisite. This book follows the story of a rich boy named Amir who grows up playing with his buddy Hassan who is the son of his father's servant. This story is one of friendship, betrayal, love, redemption, and family. There were so many different twists in this book that I never saw coming. It was also so real that I had to Google, \"Is The Kite Runner based on a true story?\" If you are wondering, no, it is not. Honestly, this book was so moving and beautiful that I was crying at multiple spots in the book. It would be hard to convey how much I love this book. Even typing this review, I am tearing up. Love in real life is not a Hallmark movie or a Lifetime show. Even people we love let us down and disappoint from time to time. The world doesn't always give us an easy hand in life. However, this author perfectly depicted imperfect characters who were doing their best."]]
KiteRunnerBook → [AND Book [FILLS :hasTitle "The Kite Runner"] [FILLS :hasPages 352] [FILLS :isWrittenBy KhaledHosseini] [FILLS :hasGenre LiteraryFictionGenre] [FILLS :hasReview ReviewKiteRunnerBookLissa] [FILLS :publishedBy ObsidianPublishingHouse]]
Toronto → City
Canada → Country
LouisePenny → [AND Author [FILLS :hasName "Louise Penny"] [FILLS :birthDate "01-07-1958"] [FILLS :isFrom [AND Toronto Canada]]]
DetectiveFictionGenre → Fiction
MysteryThrillerGenre → Fiction
Crime → Genre
SoftPressPublishingHouse → PublishingHouse
PhrynnAngela → [AND Reviewer [FILLS :hasName "Phrynn Angela"] [FILLS :birthDate "11-12-1979"]]
ReviewStillLifeBookPhrynn → [AND Review [FILLS :reviewsWrittenBy PhrynnAngela] [FILLS :hasRating 4] [FILLS :description "This was a pleasure to read. Imagine a detective who is happily married and is not an alcoholic! Discovering Chief Inspector Armand Gamache is a pleasure in itself!\nI really enjoyed the setting, a small town in Quebec, and I became quite attached to several of the characters. They were quirky and a

couple verged on going over the top but overall the author held it together. An easy, comfortable read with just a bit of bite to it to keep it interesting. Consider me hooked on the series:)""]]

StillLifeBook → [AND Book

[FILLS :hasTitle "Still Life"]

[FILLS :hasPages 342]

[FILLS :isWrittenBy LouisePenny]

[FILLS :hasGenre DetectiveFictionGenre]

[FILLS :hasReview ReviewStillLifeBookPhrynnne]

[FILLS :publishedBy SoftPressPublishingHouse]]

FergusNeil → [AND Reviewer

[FILLS :hasName "Fergus Neil"]

[FILLS :birthDate "11-12-1967"]]

ReviewAFatalGraceBookFergusNeil → [AND Review

[FILLS :reviewsWrittenBy FergusNeil]

[FILLS :hasRating 5]

[FILLS :description "Louise Penny is a

Supernova in the Canadian literary firmament. And her warmth and human compassion is especially endearing, as is her supercharged inspiration in concocting such an endlessly labyrinthine structure for her book. Her writing is excellent. And enchanting. I loved it.""]]

AFatalGraceBook → [AND Book

[FILLS :hasTitle "A Fatal Grace"]

[FILLS :hasPages 323]

[FILLS :isWrittenBy LouisePenny]

[FILLS :hasGenre [AND DetectiveFictionGenre

MysteryThrillerGenre]

[FILLS :hasReview ReviewAFatalGraceBookFergusNeil]

[FILLS :publishedBy SoftPressPublishingHouse]

[FILLS :isAfter StillLifeBook]]

ReviewTheCruellestMonthPhrynnneAngela → [AND Review

[FILLS :reviewsWrittenBy PhrynnneAngela]

[FILLS :hasRating 5]

[FILLS :description "Inspector Gamache is

back in Three Pines investigating yet another suspicious death. Is it possible to die of fright? That is the determination of many in the small town, yet Gamache wants to look deeper. I really liked number two in the series yet this continuation lacked the same punch. It's more character driven with the plot revolving around the central players. Even with my familiarity, I was less interested in the asides and wanted more mystery and action.""]]

TheCruellestMonthBook → [AND Book

[FILLS :hasTitle "The Cruellest Month"]

[FILLS :hasPages 310]

[FILLS :isWrittenBy LouisePenny]

[FILLS :hasGenre [AND MysteryThrillerGenre

DetectiveFictionGenre]]

ReviewTheCruellestMonthPhryneAngela] [FILLS :hasReview [FILLS :publishedBy SoftPressPublishingHouse] [FILLS :isAfter AFatalGraceBook]]
ARuleAgainstMurderBook → [AND Book [FILLS :hasTitle "A Rule Against Murder"] [FILLS :hasPages 322] [FILLS :isWrittenBy LouisePenny] [FILLS :hasGenre Crime] [FILLS :publishedBy SoftPressPublishingHouse] [FILLS :isAfter TheCruellestMonthBook]]
Devon → City
Crowborough → City
England → Country
AgathaChristie → [AND Author [FILLS :hasName "Agatha Christie"] [FILLS :birthDate "01-07-1958"] [FILLS :isFrom [AND Devon England]]]
ArthurConanDoyle → [AND Author [FILLS :hasName "Arthur Conan Doyle"] [FILLS :birthDate "22-05-1859"] [FILLS :isFrom [AND Crowborough England]]]
ChristmasMysteriesBook → [AND Book [FILLS :hasTitle "Christmas Mysteries"] [FILLS :hasPages 296] [FILLS :isWrittenBy [AND AgathaChristie ArthurConanDoyle]] [FILLS :hasGenre [AND MysteryThrillerGenre DetectiveFictionGenre]] [FILLS :publishedBy SoftPressPublishingHouse]]
Dorchester → City
ThomasHardy → [AND Author [FILLS :hasName "Thomas Hardy"] [FILLS :birthDate "02-06-1840"] [FILLS :isFrom [AND Dorchester England]]]
NewChristmasMysteriesBook → [AND Book [FILLS :hasTitle "New Christmas Mysteries"] [FILLS :hasPages 296] [FILLS :isWrittenBy [AND AgathaChristie ArthurConanDoyle LouisePenny]]

ThomasHardy]]
[FILLS :hasGenre [AND MysteryThrillerGenre
DetectiveFictionGenre]]
[FILLS :publishedBy SoftPressPublishingHouse]
[FILLS :isAfter ChristmasMysteriesBook]]

3. Примери за разсъждение на базата знания

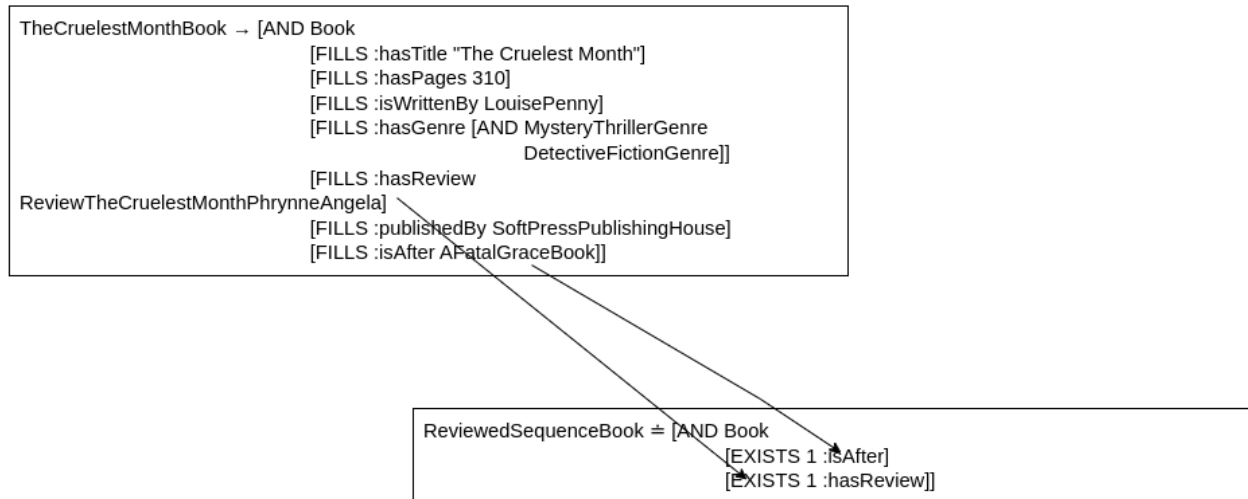
- Примери за това дали даден индивид удовлетворява дадено описание ($KB \models (c \rightarrow e)$)

$KB \models (ARuleAgainstMurderBook \rightarrow SequenceBook)$

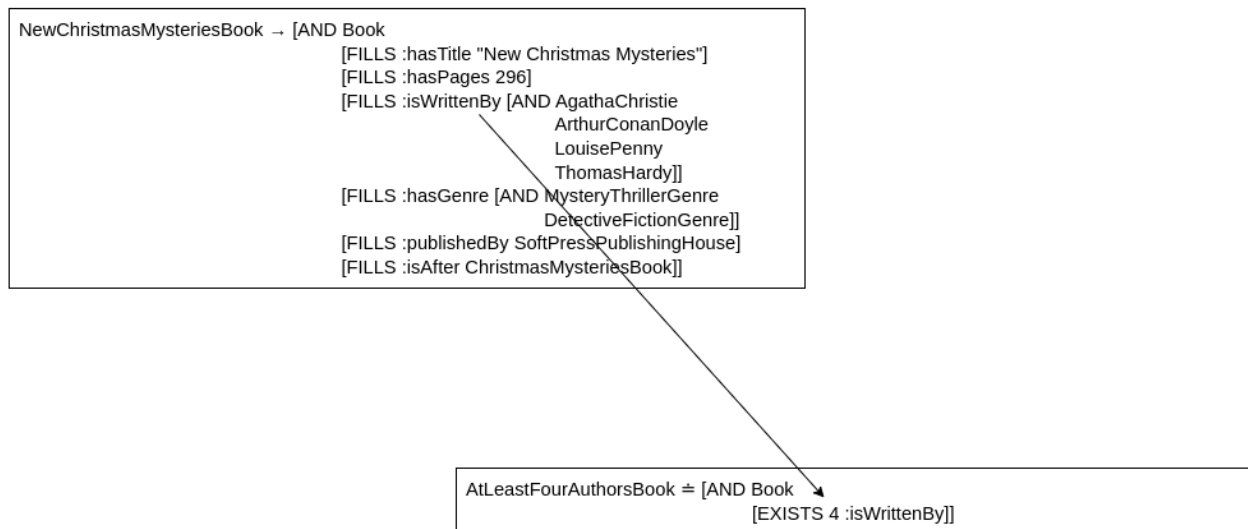
ARuleAgainstMurderBook \rightarrow [AND Book
[FILLS :hasTitle "A Rule Against Murder"]
[FILLS :hasPages 322]
[FILLS :isWrittenBy LouisePenny]
[FILLS :hasGenre Crime]
[FILLS :publishedBy SoftPressPublishingHouse]
[FILLS :isAfter TheCruellestMonthBook]]

SequenceBook \doteq [AND Book
[EXISTS 1 :isAfter]]

$KB \models (TheCruellestMonthBook \rightarrow ReviewedSequenceBook)$



KB |= (NewChristmasMysteriesBook → AtLeastFourAuthorsBook)



- Примери дали дадено описание се включва в друго (KB |= (d ⊆ e))

KB |= (AtLeastFourAuthorsBook ⊆ CoAuthorBook)

AtLeastFourAuthorsBook \doteq [AND Book
[EXISTS 4 :isWrittenBy]]

CoAuthorBook \doteq [AND Book
[EXISTS 2 :isWrittenBy]]

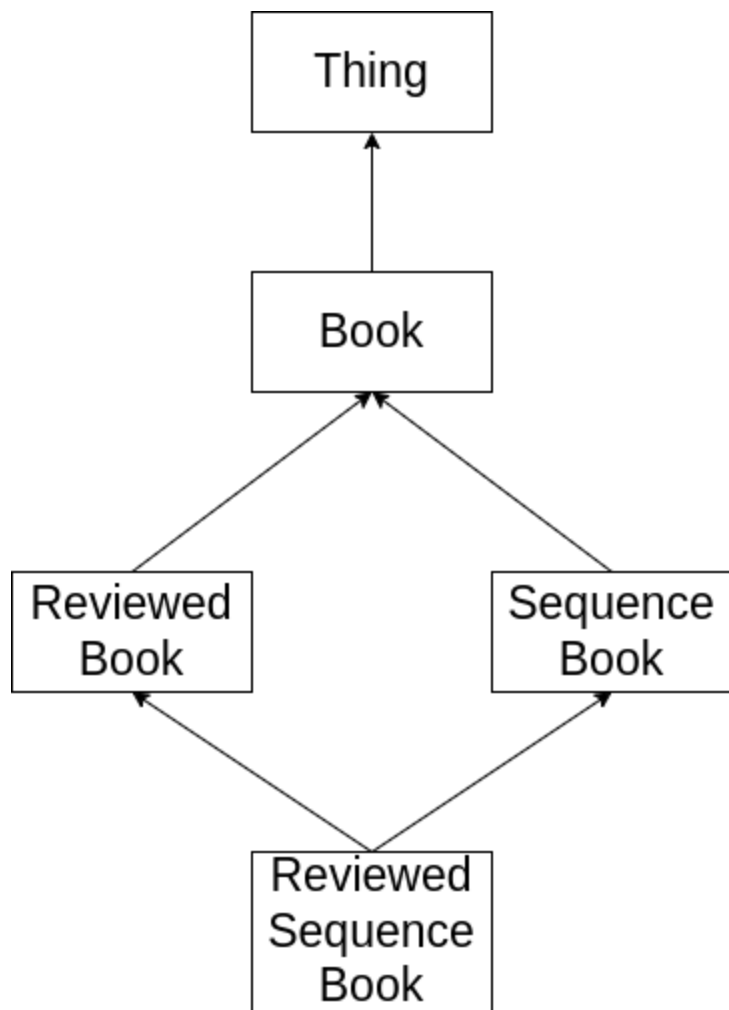
KB \models (PopularBook \sqsubseteq ReviewedBook)

PopularBook \doteq [AND Book
[EXISTS 2 :hasReview]]

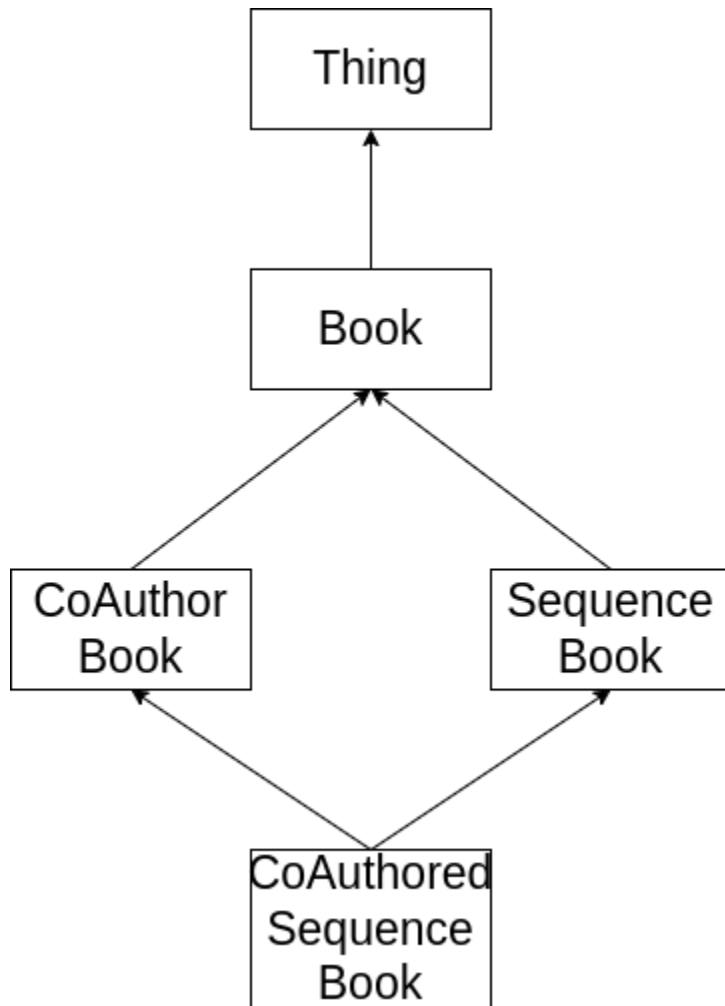
ReviewedBook \doteq [AND Book
[EXISTS 1 :hasReview]]

- Примери за класификация

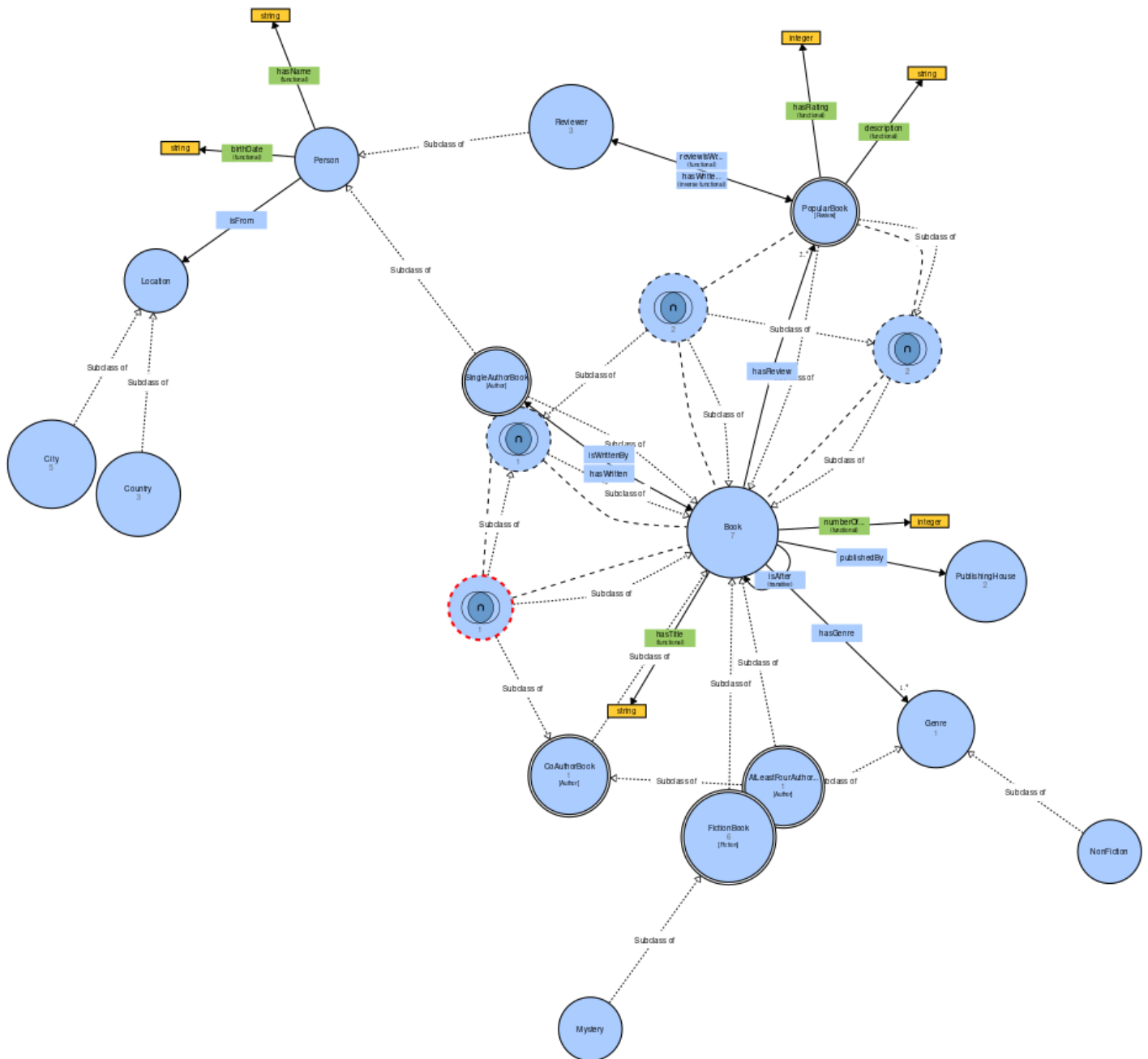
ReviewedSequenceBook \doteq [AND Book
[EXISTS 1 :isAfter]
[EXISTS 1 :hasReview]]



CoAuthoredSequenceBook \doteq [AND Book
[EXISTS 1 :isAfter]
[EXISTS 2 :isWrittenBy]]



4.Схема на онтологията



5. Заявки към базата от знания, даващи като резултат част от основните цели на проекта

След зареждане на файла “book_ontology.owl” в GraphDB [4] чрез използване на SPARQL ще можем да реализираме различни заявки, чиито резултати са част от основните цели на проекта:

- Извличане на ревьюта за книга (например “The Cruellest Month Book”)

```
PREFIX : <http://test.org/onto.owl#>
select ?description where {
    ?book :hasTitle "The Cruellest Month" .
    ?book :hasReview ?review .
    ?review :description ?description .
}
```

Резултат:

	description	
1	"Louise Penny is a Supernova in the Canadian literary firmament. And her warmth and human compassion is especially endearing, as is her supercharged inspiration in concocting such an endlessly labyrinthine structure for her book. Her writing is excellent. And enchanting. I loved it."	

- Намиране на поредица от книги (например тези, които са преди “A Rule Against Murder”)

```
PREFIX : <http://test.org/onto.owl#>
select ?prequelTitle where {
    ?book :hasTitle "A Rule Against Murder" .
    ?book :isAfter ?prequel .
    ?prequel :hasTitle ?prequelTitle .
}
```

Резултат:

1	"Still Life"
2	"A Fatal Grace"
3	"The Cruellest Month"

- Извличане на книги по автор (напр. Louise Penny):

```
PREFIX : <http://test.org/onto.owl#>
select ?bookTitle where {
    ?author :hasName "Louise Penny" .
    ?author :hasWritten ?book .
    ?book :hasTitle ?bookTitle .
}
```

Резултат:

1	"Still Life"
2	"A Fatal Grace"
3	"The Cruellest Month"
4	"A Rule Against Murder"
5	"New Christmas Mysteries"

6. Бъдещо развитие

- Добавяне на повече индивиди с цел разширяване на знанията на онтологията
- Разширяване на онтологията с още свойства, които да описват по-добре света на книгите и нещата, свързани с тях
- Обединяване на текущата онтология с друга подобна, свързана с книги

7. Използвани технологии

- Проектът е реализиран чрез Python и Owlready2 [1]
- За заявките в т.5 са използвани GraphDB и SPARQL
- За набавяне на информация относно индивидите в онтологията е използван сайтът GoodReads [3]
- За визуализация на схемата на онтологията е използван WebVOWL [2]

8. Библиография

- [1] <https://owlready2.readthedocs.io/en/v0.37/>
- [2] <http://vowl.visualdataweb.org/webvowl.html>
- [3] <https://www.goodreads.com/>
- [4] <https://graphdb.ontotext.com/documentation/10.1/>
- [5] <https://blog.reedsy.com/book-genres/>