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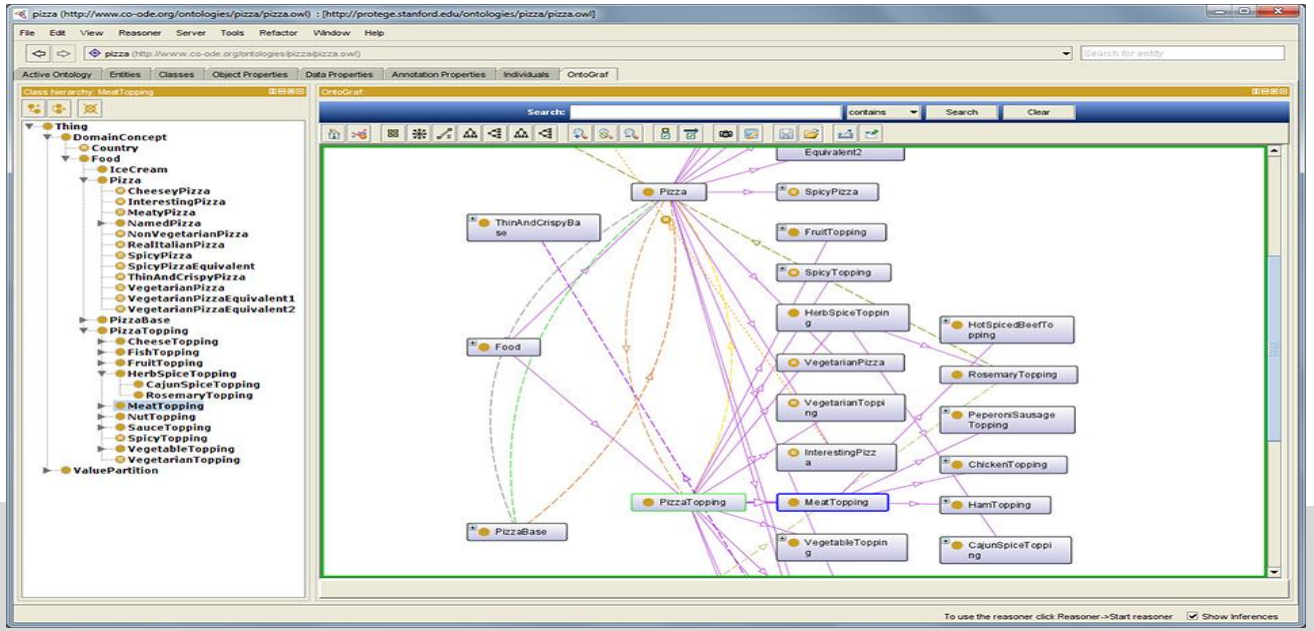
Lab 05: Ontologies in Protégé

What is Protégé?

- Protégé is a free, open-source platform that provides a growing user community with a suite of tools to construct domain models and knowledge-based applications with ontologies.
- Ontologies range from taxonomies, classifications, database schemas to fully axiomatized theories
- Ontologies are central to many applications such as scientific knowledge portals, information management and integration systems, electronic commerce and web services

Install Protégé

- Download and install Protégé Desktop at https://protege.stanford.edu/products.php#desktop-protege
- Java-based application (multi-platform)
- A GUI to help the editing of ontologies creation, modification, reasoning, debugging



Components of OWL ontologies

- **Individuals** (aka **instances**): represent objects in the domain that we are interested in
- **Properties**: binary relations on individuals, i.e. properties link two individuals together
- **Classes**: A concrete representation of concepts. OWL classes are interpreted as sets that contain individuals

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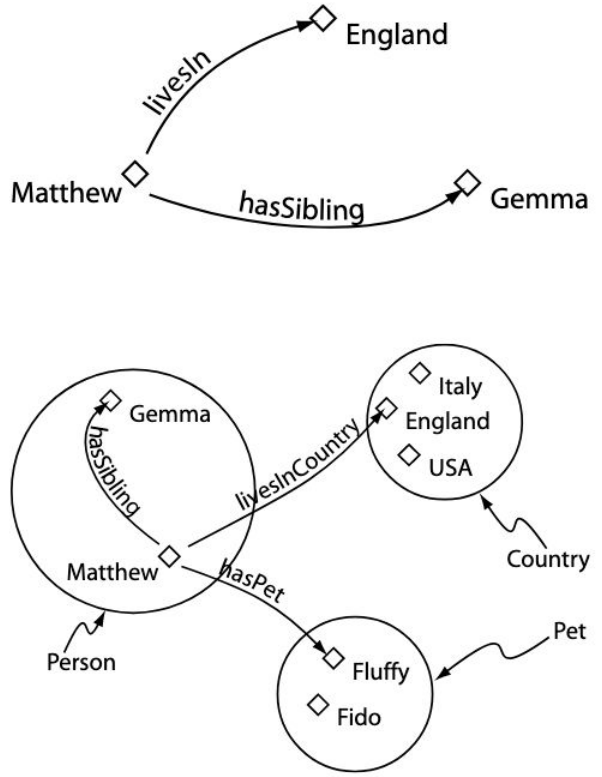
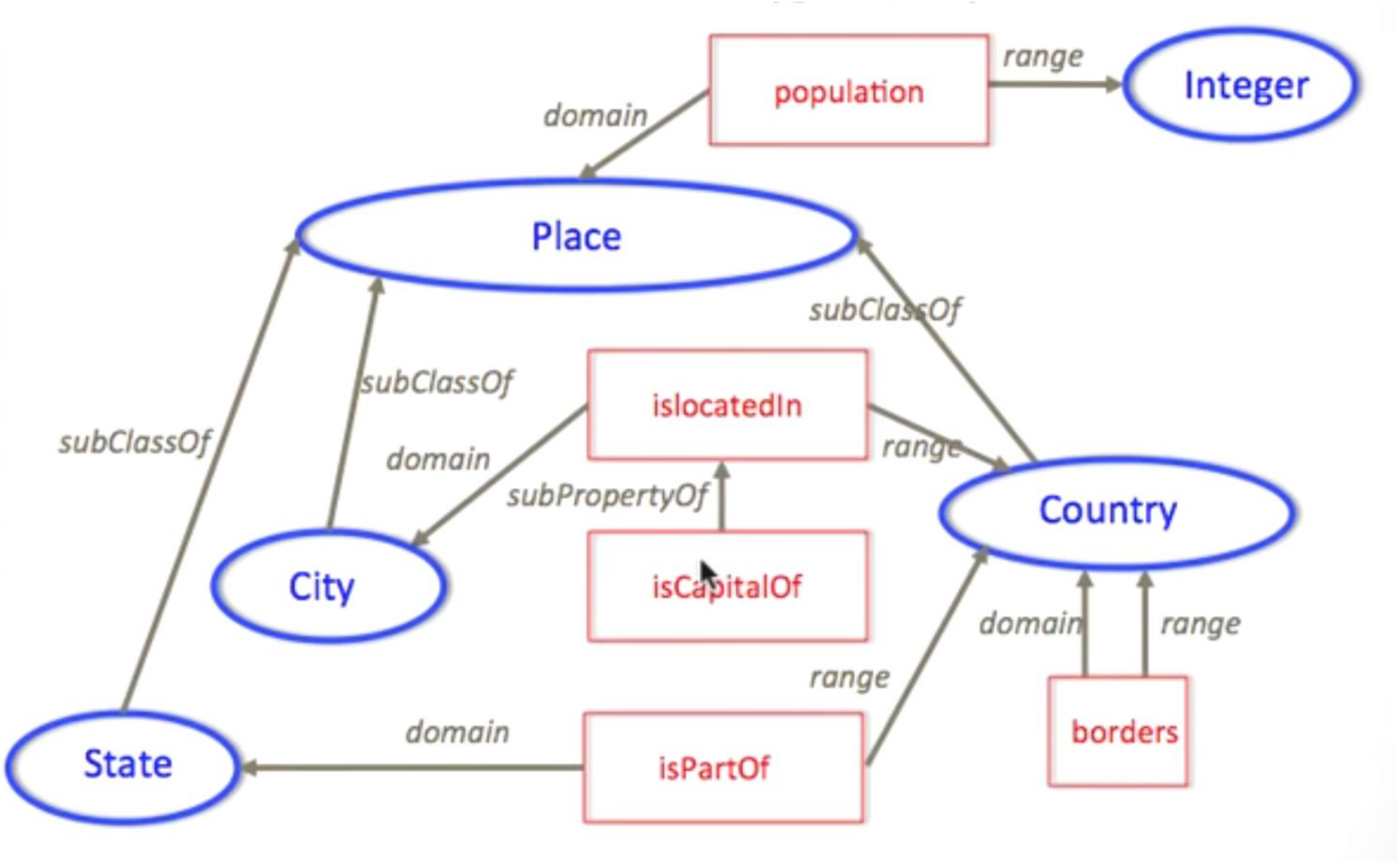


A Simple Knowledge-Engineering Methodology

1. Determine the domain and scope of the ontology
2. Consider reusing existing ontologies
3. Enumerate important terms in the ontology
4. Define the classes and the class hierarchy
5. Define the properties of classes
6. Create instances

Exercise 1


population
range
Integer
domain
Place
subClassOf
subClassOf
subClassOf
islocatedIn
range
domain
subPropertyOf
Country
City
isCapitalOf
domain
range
range
borders
State
domain
isPartOf

Exercise 1

1. **Create classes and properties**
2. Define property types and axioms
3. Define disjoint classes and class axioms
4. Define classes as property restrictions
5. Add individuals

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owl:SymmetricProperty
owl:ReflexiveObjectProperty
owl:transitiveProperty
owl:FunctionalProperty
owl:inverseOf
owl:propertyChainAxiom

Exercise 1

1. Create classes and properties
2. Define property types and axioms
3. **Define disjoint classes and class axioms**
    i. disjoint
    ii. complement
    iii. intersection
    iv. union
4. Define classes as property restrictions
5. Add individuals

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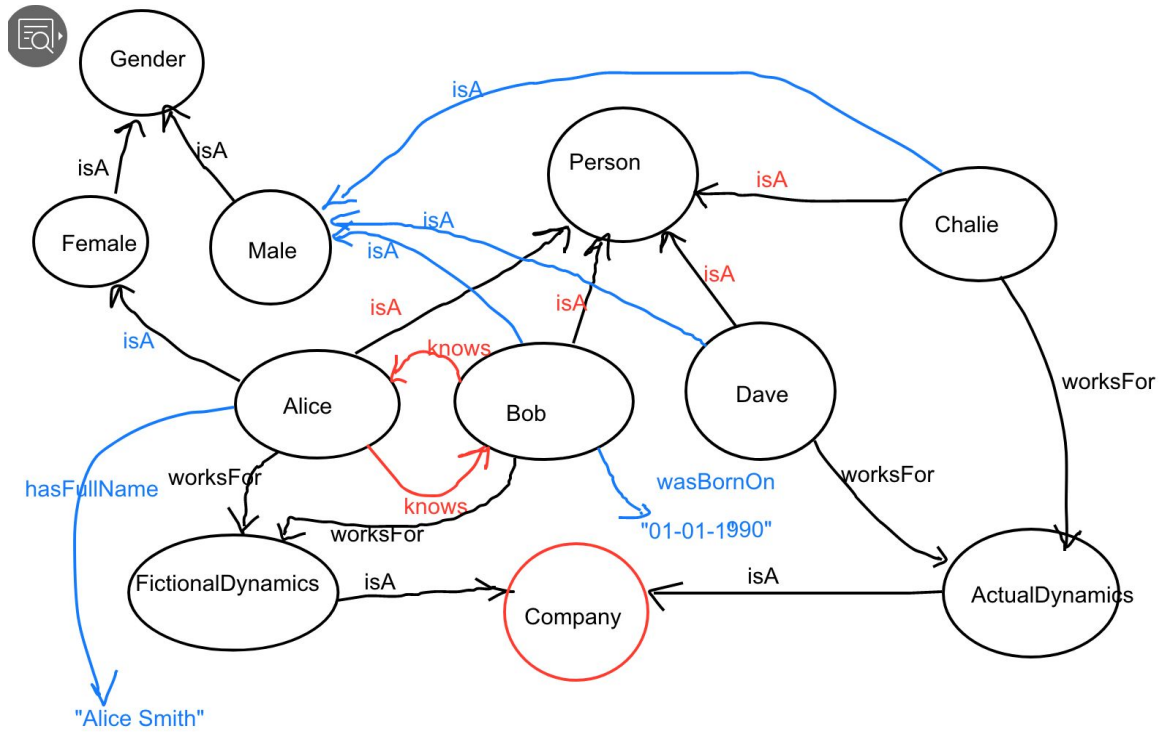
Exercise 2

In Lab 2, we extracted triples from and drew a graphical representation for the following text:

Alice and Bob know each other. They both work for a company named Fictional Dynamics. Bob also knows Charlie. Charlie works for a company named Actual Dynamics. Charlie knows his colleague Dave. Alice is a female. Bob, Charlie and Dave are men. Bob was born on 01-01-1990. Both Bob and Charlie have a monthly salary of 10,000. Alice's full name is "Alice Smith" and Bob's full name is "Bob Wilson". Homepages for all four persons (Alice, Bob, Charlie, and Dave) are accessible at http://www.fictionaldynamics.com/alice http://www.fictionaldynamics.com/bob http://www.actualdynamics.com/charlieand http://www.actualdynamics.com/daverespectively

- Implement this in Protégé
- Export the graphical representation
- Export your ontology in various RDF serializations (RDF/XML, Turtle, JSON-LD etc)

Exercise 2


Gender
isA
isA
isA
Female
Male
Person
isA
Chalie
isA
isA
isA
isA
isA
knows
Alice
Bob
Dave
worksFor
hasFullName
worksFor
knows
wasBornOn
"01-01-1990"
worksFor
worksFor
FictionalDynamics
isA
Company
isA
ActualDynamics
"Alice Smith"

Useful resources

- Getting Started with Protege Desktop Editor
- Ontology Development 101: A Guide to Creating Your First Ontology
- A Practical Guide To Building OWL Ontologies Using The Protégé-OWL Plugin and CO-ODE Tools
- Another Protégé Tutorial
- OWL Quick Reference Guide