FOAF: Friend of a Friend

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- Real-world examples
- How the Semantic Web looks like, especially in the area of social networking
- A chance to practice what we have learned about RDF, RDFS and OWL

Simple social networking

- Tons of millions of personal Web pages on the Web
- The author often provides some personal information
- The author may also include some links to his/her friends
- With this network, we can answer questions such as “who has the same interest as I do?”,

Motivation

- To make these personal web documents understandable to an application, two major steps have to be accomplished:
  - a machine-readable ontology about person has to be created
  - each personal home page has to be marked up, i.e., it has to be connected to some RDF statement document written by using this ontology.

Birth

- Founded by Dan Brickley and Libby Miller in the mid 2000
- FOAF is an open community-lead initiative with the goal of creating a machine-readable Web of data in the area of personal home pages and social networking.

Machine-readable Web of data

- Just like the HTML version of your home page,
- FOAF documents can be linked together to form a Web of data.
- The difference is that this web of data is formed with well-defined semantics, expressed in the person ontology.

FOAF = Vocabulary

- (or, ontology) which includes the basic terms to describe personal information, such as
  - who you are?
  - what you do?
  - and who your friends are?

- It serves as a standard for everyone who wants to mark up their home pages and turn them into the documents that can be processed by machines.

- Official Web site can be found at
  - http://www.foaf-project.org/

- An official definition of FOAF:
  - *The* Friend of a Friend *(FOAF) project is creating a Web of machine-readable pages describing people, the links between them and the things they create and do.*

- FOAF ontology is not a standard fromW3C; it is managed by following the style of an Open Source or Free Software project standards and maintained by a community of developers.

- However, FOAF does depend on W3C standards, such as RDF and OWL
  - FOAF ontology is written in OWL.
  - FOAF documents must be well-formed RDF documents.

Specifications

- FOAF ontology's official specification can be found at the location
  - http://xmlns.com/foaf/spec/
- the FOAF ontology itself can be found (and downloaded) from the following URL:
  - http://xmlns.com/foaf/spec/index.rdf
- A wiki site for FOAF project
  - http://wiki.foaf-project.org/w/Main_Page

- FOAF ontology is a collection of terms and all these terms are identified by pre-defined URIs, which all share the following leading string:
  - http://xmlns.com/foaf/0.1/

- and by convention, this URI prefix string is associated with namespace prefix `foaf:` and is typically used in RDF/XML format with the prefix foaf.

Core FOAF Vocabulary

- FOAF terms are grouped in categories.

Category	Terms
Basic FOAF classes and properties	`foaf:Agent`, `foaf:Person`, `foaf:name`, `foaf:nick`, `foaf:title`, `foaf:homepage`, `foaf:mbox`, `foaf:mbox_sha1sum`, `foaf:img`, `foaf:depiction`, `foaf:depict`, `foaf:surname`, `foaf:familyName`, `foaf:givenName`, `foaf:firstName`, `foaf:lastName`.
Properties about personal information	`foaf:weblog`, `foaf:knows`, `foaf:interest`, `foaf:currentProject`, `foaf:pastProject`, `foaf:plan`, `foaf:based_near`, `foaf:age`, `foaf:workplaceHomepage`, `foaf:workInfoHomepage`, `foaf:schoolHomepage`, `foaf:topic_interest`, `foaf:publications`, `foaf:geekcode`, `foaf:myersBriggs`, `foaf:dnaChecksum`

Classes and properties about online accounts and instance messaging	foaf:OnlineAccount, foaf:OnlineChatAccount, foaf:OnlineEcommerceAccount, foaf:OnlineGamingAccount, foaf:account, foaf:accountServiceHomepage, foaf:accountName, foaf:icqChatID, foaf:msnChatID, foaf:jabberID, foaf:yahooChatID, foaf:skypeID
Classes and properties about projects and groups	foaf:Project, foaf:Organization, foaf:Group, foaf:member, foaf:membershipClass
Classes and properties about documents and images	foaf:Document, foaf:Image, foaf:PersonalProfileDocument, foaf:topic, foaf:page, foaf:primaryTopic, foaf:primaryTopicOf, foaf:tipjar, foaf:sha1, foaf:made, foaf:maker, foaf:thumbnail, foaf:logo

Person class

- foaf:Person is defined as a sub-class of Person class defined in WordNet. WordNet is a semantic lexicon for the English language.
- It groups English words into sets of synonyms called synsets and provides short and general definitions, including various semantic relations between these synonym sets.

```
<rdfs:Class rdf:about="http://xmlns.com/foaf/0.1/Person"
            rdfs:label="Person"
            rdfs:comment="A person."
            vs:term_status="stable">
  <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Class"/>
  <rdfs:subClassOf>
     <owl:Class rdf:about="http://xmlns.com/wordnet/1.6/Person"/>
  </rdfs:subClassOf>
  <rdfs:subClassOf>
     <owl:Class rdf:about="http://xmlns.com/foaf/0.1/Agent"/>
  </rdfs:subClassOf>
  <rdfs:subClassOf>
     <owl:Class rdf:about="http://xmlns.com/wordnet/1.6/Agent"/>
  </rdfs:subClassOf>
  <rdfs:subClassOf>
     <owl:Class rdf:about=
          "http://www.w3.org/2000/10/swap/pim/contact#Person"/>
  </rdfs:subClassOf>
  <rdfs:subClassOf>
     <owl:Class rdf:about=
          "http://www.w3.org/2003/01/geo/wgs84_pos#SpatialThing"/>
  </rdfs:subClassOf>
  <rdfs:isDefinedBy rdf:resource="http://xmlns.com/foaf/0.1/"/>
  <owl:disjointWith
          rdf:resource="http://xmlns.com/foaf/0.1/Document"/>
  <owl:disjointWith
          rdf:resource="http://xmlns.com/foaf/0.1/Organization"/>
  <owl:disjointWith
          rdf:resource="http://xmlns.com/foaf/0.1/Project"/>
</rdfs:Class>
```

- foaf:Person is a sub-class of foaf:Agent, which can represent a person, a group, a software, or some physical artifacts, and similar agent concept is also defined in WordNet.
- Moreover, foaf:Person cannot be anything such as a foaf:Document, a foaf:Organization, or a foaf:Project.

Properties

- Properties defined by FOAF can be used to describe a person
- foaf:firstName is a property that describes the first name of a person.
  - This property has foaf:Person as its domain, and http://www.w3.org/2000/01/rdf-schema#Literal as its value range.
- foaf:givenname is the property describing the given name of a person, and it has the same domain and value range.
- A simpler version of these two properties is the foaf:name property.

Properties

- foaf:homepage property relates a given resource to its home page. Its domain is http://www.w3.org/2002/07/owl#Thing, and range is foaf:Document
  - This property is an inverse functional property.

- Therefore, a given `Things` can have multiple home pages
- However, if two `Things` have the same home page, then these two `Things` are in fact the same `Thing`.

Properties

- foaf:mbox property describes a relationship between the owner of a mailbox and a mailbox
  - This is also an inverse functional property;
  - if two foaf:Person resources have the same foaf:mbox value, these two foaf:Person instances have to be exactly the same person.
- On the other hand, a foaf:Person can indeed ownmultiple foaf:mbox instances.

Example of using foaf:Person

```
1: <rdf:RDF
1a: xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-
   ns#"
2: xmlns:foaf="http://xmlns.com/foaf/0.1/">
3:
4: <foaf:Person>
5: <foaf:name>Rajendra Akerkar</foaf:name>
6: <foaf:mbox
   rdf:resource="mailto:akerkar8@gmail.com"/>
7: </foaf:Person>
8:
9:</rdf:RDF>
```

- There is a person, this person's name is Rajendra Akerkar, and
- e-mail address is akerkar8@gmail.com.

Broken one of the most important SW rules

- Whenever you decide to publish some RDF document to talk about some resource on the Web (in this case, Rajendra Akerkar as a foaf:Person instance), you need to use a URI to represent this resource, and you should always use the existing URI for this resource if it already has one.

- Missing Pattern where rdf:about attribute is used on foaf:Person resource:
  - `<foaf:Person rdf:about="some_URI"/>`

foaf:mbox property

```
<rdf:Property
  rdf:about="http://xmlns.com/foaf/0.1/mbox"
vs:term status="stable"
rdfs:label="personal mailbox"
rdfs:comment="...">
<rdf:type rdf:resource=
"http://www.w3.org/2002/07/owl#InverseFunctionalProp
  erty"/>
<rdf:type rdf:resource=
"http://www.w3.org/2002/07/owl#ObjectProperty"/>
<rdfs:domain
  rdf:resource="http://xmlns.com/foaf/0.1/Agent"/>
<rdfs:range
rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
<rdfs:isDefinedBy
  rdf:resource="http://xmlns.com/foaf/0.1/"/>
</rdf:Property>
```

My friend's FAOF document

```
<foaf:Person>
<foaf:nick>Raj Akerkar</foaf:nick>
<foaf:title>Professor</foaf:title>
<foaf:mbox
  rdf:resource="mailto:akerkar8@gmail.com"/>
</foaf:Person>
```

- An application that understands FOAF ontology will be able to recognize foaf:mbox property and conclude that this is exactly the same person as described in foaf:person (*slide 21*)

foaf:knows property

```
1: <foaf:Person>
2: <foaf:name>Rajendra Akerkar</foaf:name>
3: <foaf:mbox rdf:resource="mailto:akerkar8@gmail.com"/>
4: <foaf:knows>
5: <foaf:Person>
6: <foaf:mbox
   rdf:resource="mailto:john.park@yahoo.com"/>
7: </foaf:Person>
8: </foaf:knows>
9: </foaf:Person>
```

This shows that I know a person who has an e-mail address given by

- Since property foaf:mbox is used, a given application will be able to understand that the person I know has a name called `John Park` (No URI is used to identify the person)

rdfs:seeAlso property

```
1: <rdf:RDF
1a: xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
2: xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
3: xmlns:foaf="http://xmlns.com/foaf/0.1/">
4:
5: <foaf:Person>
6: <foaf:name>Rajendra Akerkar</foaf:name>
7: <foaf:mbox rdf:resource="mailto:akerkar8@gmail.com"/>
8: <rdfs:seeAlso
8a: rdf:resource="http://www.tmrfindia.org/raa.rdf"/>
9: </foaf:Person>
10:
11: </rdf:RDF>
```

Line 8 says, if you want to know more about this Person instance, you can find it in the resource pointed by `http://www.tmrfindia.org/raa.rdf`

`foaf:knows` and `rdfs:seeAlso` to link RDF documents together

```
1: <rdf:RDF
1a: xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
2: xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
3: xmlns:foaf="http://xmlns.com/foaf/0.1/">
4:
5: <foaf:Person>
6: <foaf:name>Rajendra Akerkar</foaf:name>
7: <foaf:mbox rdf:resource="mailto:akerkar8@gmail.com"/>
8: <rdfs:seeAlso
8a: rdf:resource="http://www.tmrfindia.org/raa.rdf"/>
9: <foaf:knows>
10: <foaf:Person>
11: <foaf:mbox rdf:resource="mailto:john.park@yahoo.com"/>
12: <rdfs:seeAlso
12a: rdf:resource="http://www.infsys.com/john.rdf"/>
13: </foaf:Person>
14: </foaf:knows>
15: </foaf:Person>
16:
17:</rdf:RDF>
```

- In previous example, an application sees the document will move on to access the document identified by the following URI:
  -
- By doing so, FOAF aggregators can be built without the need for a centrally managed directory of FOAF files.
- Thus, property `rdfs:seeAlso` is treated by the FOAF community as the hyperlink of the FOAF documents.

How Does the Friend Circle Work?

- A user creates the FOAF document.
- Link your home page to your FOAF document.
- FOAF uses its crawler to visit the Web and collect all the FOAF documents.
- FOAF maintains a central repository and is also responsible for keeping the information up to date.
- FOAF provides a user interface so that we can find our friends and conduct other interesting activities.

Scutter

- A crawler
  - it visits the Web and tries to find RDF files. In this case, it has to find a special kind of RDF file: a FOAF document.
  - Once it finds one, the least it will do is to parse the document and store the triples into its data system for later use.
  - it has to know how to handle `rdfs:seeAlso` property.

A user interface

- FOAF offers some tools one can use to view the friends in the circle, which further defines the look and feel of the FOAF project. Among these tools, FOAF explorer is quite popular, and you can find this tool as the following location:
  - http://xml.mfd-consult.dk/foaf/explorer/

Create Your FOAF Document

- Use a simple text editor
- Or use tools to create FOAF document
  - FOAF-a-matic (http://www.ldodds.com/foaf/foaf-a-matic.html)

Publish Your FOAF Document

- There are three different ways to get into the circle
  - Add a link from you home page to your FOAF document

```
<!-- this is your homepage -->
<html>
<head>
... ...
<link rel="meta" type="application/rdf+xml"
   title="FOAF"
href="http://www.tmrfindia.org/raa/foaf.rdf"/>
... ...
</head>
<body>
... ...
</body>
</html>
```

- Ask your friend to add a `rdfs:seeAlso` link that points to your document

- To implement this, your friend needs to remember that he/she has to use `foaf:knows` and `rdfs:seeAlso` together by inserting the following lines into his/her FOAF document:

```
<foaf:knows>
<foaf:Person>
<foaf:mbox rdf:resource="mailto:you@yourEmail.com"/>
<rdfs:seeAlso rdf:resource="http://
path_to_your_foaf.rdf"/>
</foaf:Person>
</foaf:knows>
```

- Use the “FOAF Bulletin Board”
- Instead of waiting for FOAF network to find you, you can report to it voluntarily.
- You can also use the following URL to directly access the page:
  - http://wiki.foaf-project.org/w/FOAFBulletinBoard

Home pages for human eyes vs. home pages for machines