The Social Semantic Web

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7 Multimedia sharing

As we have seen so far in this book, a key feature of the Social Web is the change in the role of a user from simply being a consumer of content. Furthermore, it is not just textual content that can be shared, annotated or discussed, but also any multimedia content such as pictures, videos, or even presentation slides. Moreover, this content can also benefit from Semantic Web technologies. In this chapter, we will describe various trends regarding multimedia sharing on the Social Web and we will focus on how Semantic Web technologies can help to provide better interlinking between multimedia content from different services.

7.1 Multimedia management

There is an ever-increasing amount of multimedia of various formats becoming available on the Social Web. Current techniques to retrieve, integrate and present these media items to users are deficient and would benefit from improvement. Semantic technologies make it possible to give rich descriptions to media, facilitating the process of locating and combining diverse media from various sources. Making use of online communities can give additional benefits. Two main areas in which social networks and semantic technologies can assist in multimedia management are annotation and recommendation. Some efforts such as DBTune[1] already provide musical content exported to the Semantic Web for music-based recommendations. We shall describe these efforts in more detail later on in this chapter.

Social tagging systems such as Last.fm allow users to assign shared free-form tags to resources, thus generating annotations for objects with a minimum amount of effort. The informal nature of tagging means that semantic information cannot be directly inferred from an annotation, as any user can tag any resource with whatever strings they wish. However, studying the collective tagging behaviour of a large number of users allows emergent semantics to be derived (Wu et al. 2006). Through a combination of such mass collaborative 'structural' semantics (via tags, geo-temporal information, ratings, etc.) and extracted multimedia 'content' semantics (which can be used for clustering purposes, e.g. image similarities or musical patterns), relevant annotations can be suggested to users when they contrib-

[1] http://dbtune.org/ (URL last accessed 2009-06-09)

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ute multimedia content to a community site by comparing new items with related semantic items in one's implicit and explicit networks.

Another way in which the wisdom of crowds can be harnessed in semantic multimedia management is in providing personalised social network-based recommender systems. (Liu et al. 2006) presents an approach for semantic mining of personal tastes and a model for taste-based recommendation. (Ghita et al. 2005) explores how a group of people with similar interests can share documents and metadata, and can provide each other with semantically-rich recommendations. The same principles can be applied to multimedia recommendation, and these recommendations can be augmented with the semantics derived from the multimedia content itself (e.g. the information on those people depicted or carrying out actions in multimedia objects[2]).

7.2 Photo-sharing services

As soon as people began to use digital cameras for taking pictures, they tended to publish them on the Web. However, installing dedicated applications such as Gallery[3] or having one's own storage space on the Web requires some technical expertise, thereby limiting the picture-sharing experience to only a few users. Similar to blogging platforms that provide simple mechanisms for people who want to publish their thoughts online without technical requirements, Social Web applications that let people easily publish, tag and share pictures began to appear, with Flickr being one of the most popular. Flickr, now owned by Yahoo!, allows you to upload pictures by selecting some images from your hard drive, to add text descriptions and tags, and to mark regions of interest on a photo by annotating them ('add note').

As well as offering tagging and commenting mechanisms, Flickr allows users to organise their pictures into browsable sets. Pictures can be searched by date (i.e. by upload date or by the real 'taken on' date using EXIF metadata), tag, description, etc. Flickr offers control mechanisms for deciding who can access photos, and one can define each picture's visibility (private, public, only friends, only family). As well as the web interface, pictures can be uploaded to Flickr by e-mail or using desktop utilities, and users can display thumbnails of pictures on their blog or website using 'badges'.

Millions of pictures are now available on Flickr, and upload statistics on the Flickr homepage show thousands of pictures being uploaded each minute. Thanks to camera phones and custom uploading applications, many of these incorporate automatic geolocation metadata, such that people can publish pictures as soon as

[2] http://acronym.deri.org/ (URL last accessed 2009-06-09)

[3] http://gallery.menalto.com/ (URL last accessed 2009-06-09)

they take them on the street, underground or anywhere and these are then automatically linked to a particular place on a map.

Apart from the uploading and storage facilities that Flickr offers, an important feature of the service is its social aspect. Flickr offers social networking functionality in the form of adding friends and exchanging messages with them. Pictures can not only be seen by anyone but they can also be subject to conversation. Groups can even be created, to foster a community around a particular topic, following the idea of object-centred communities that we mentioned earlier on in this book. For example, the 'Squared Circle' group, dedicated to pictures of circular things, has nearly 6,500 members and 83,000 pictures, with related discussion threads[4].

There are some limitations with Flickr. You cannot export your data easily, and you cannot modify or edit your pictures (apart from rotation). You have to pay if you want: to allow higher resolution viewing of your images; to create more than three photo sets; to be able to post to more than 10 groups; or to upload many (large) pictures, since the free version is limited to 100 MB of data transfer per month. As a result, some other feature-rich services have become quite popular including Zooomr[5].

7.2.1 Modelling RDF data from Flickr

While Flickr does not natively expose any data in RDF, various exporters have been written to provide semantically-enhanced data from this popular photo sharing service. As with many other social websites, Flickr provides an API for developers, and RDFizers (tools for converting from various data formats to RDF) can be written based on this API.

For example, the FlickRDF exporter[6] (Passant 2008a) provides a representation of Flickr social networks and related user-generated content in RDF, mainly using the FOAF and SIOC ontologies. Therefore, it allows one to export their Flickr connections in FOAF so that they can be related to connections from their personal FOAF profile or from other social websites providing data in RDF (such as Twitter and its related FOAF exporter), enabling the construction of a distributed social graph as detailed in Chapter 10. The exporter relies on FOAF and SIOC as follows:

- It uses FOAF to model people as instances of foaf:Person, as well as the various relationships between people using the foaf:knows relationship. Depending

[4] http://flickr.com/groups/circle/ (URL last accessed 2009-06-09)

[5] http://www.zooomr.com/ (URL last accessed 2009-06-09)

[6] http://tinyurl.com/flickrdf (URL last accessed 2009-07-09)

on how much information is publicly available, it can provide more information, such as the person's name using the foaf:name property.

- It uses SIOC to model the related user account (sioc:User) as well as the various user galleries that belong to it, using sioc:owner_of and sioc_t:ImageGallery. SIOC is also used to model the various groups a user belongs to, using the sioc:member_of property and the sioc:Usergroup class.

Some sample metadata from the FlickRDF exporter is given below:

```
<http://apassant.net/home/2007/11/flickrdf/people/33669349@N00> a
foaf:Person ;
  foaf:name "Alexandre Passant" ;
  foaf:mbox_sha1sum "80248cbb1109104d97aae884138a6afcda688bd2" ;
  foaf:holdsAccount
  <http://apassant.net/home/2007/11/flickrdf/user/33669349@N00> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/86846122@N00> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/32233977@N00> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/43184127@N00> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/24266175@N00> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/14027651@N04> ;
  foaf:knows
  <http://apassant.net/home/2007/11/flickrdf/people/7787294@N06> ;
  sioc:member_of
  <http://apassant.net/home/2007/11/flickrdf/groups/49656594@N00> ;
  sioc:member_of
  <http://apassant.net/home/2007/11/flickrdf/groups/23989049@N00> ;
  sioc:member_of
  <http://apassant.net/home/2007/11/flickrdf/groups/572123@N25> .
```

Moreover, in order to provide global interlinking with other RDF data, the exporter also relies on other ontologies and data sources such as GeoNames[7] to model the geolocation of a user (based on the Flickr information from the user profile). By providing such a complete export, one can for example identify all Flickr galleries owned by a friend-of-a-friend who lives in France.

Other ways to provide semantically-enhanced data from Flickr have been provided. The Flickr Wrappr[8] provides information regarding pictures related to any

[7] http://www.geonames.org/ (URL last accessed 2009-07-07)

[8] http://www4.wiwiss.fu-berlin.de/flickrwrappr/ (URL last accessed 2009-06-09)

DBpedia URI. In this way, one can identify all pictures related to a particular monument, city, person, etc. This exporter combines the multilingual capacities of DBpedia and its geolocation features with the Flickr API so that it can identify all pictures related to a particular concept. The export is available both in HTML and RDF (thanks to content negotiation), so that human readers as well as software agents can benefit from it.

Another service called Flickr2RDF also provides a method for extracting RDF information from any Flickr picture[9]. This API mainly uses FOAF and Dublin Core to represent such information in RDF, and also provides a way to export Flickr notes so that notes applied to particular image regions can also be represented in RDF (using the Image Region vocabulary[10]). We shall describe more ways to annotate image regions in the next section.

(Maala et al. 2007) have presented a conversion process with linguistic rules for producing RDF descriptions of Flickr tags that helps users to understand picture tags and to find various relationships between them. Finally, as we will mention in Chapter 8, machine tags from Flickr can be translated into RDF using the Flickcurl API. This API also allows other information about Flickr pictures to be translated into RDF using Dublin Core (and the WGS84 Geo vocabulary[11] if the picture has been geotagged).

7.2.3 Annotating images using Semantic Web technologies

While annotating Flickr pictures and extracting some RDF information from them requires the use of a service like Flickr2RDF, there are generic ways to add semantic information to images that can be applied to any picture. The 'Image Annotation on the Semantic Web' document[12] from the W3C Multimedia Semantics Incubator Group references various vocabularies, applications and use cases that can be used for such tasks. A simple way to do this is to represent metadata related to a particular picture (such as the title, author, image data, etc.) using common Semantic Web vocabularies such as FOAF or Dublin Core (as performed by Flickr2RDF). This then provides a means to query for metadata about pictures in a unified way.

Going further, the MPEG-7 (Moving Picture Experts Group) standard and its associated RDF(S)/OWL mappings can also be used to represent image regions and add particular annotations about them[13]. These annotations can be combined with other metadata, for example, modelling that a region depicts a person (identi-

[9] http://www.kanzaki.com/works/2005/imgdsc/flickr2rdf (URL last accessed 2009-06-09)

[10] http://www.bnowack.de/w3photo/pages/image_vocabs (URL last accessed 2009-06-09)

[11] http://www.w3.org/2003/01/geo/wgs84_pos (URL last accessed 2009-06-09)

[12] http://www.w3.org/TR/swbp-image-annotation/ (URL last accessed 2009-06-09)

[13] http://www.w3.org/2005/Incubator/mmsem/XGR-mpeg7/ (URL last accessed 2009-07-16)

fied using the FOAF vocabulary), a place (referring to DBpedia or GeoNames information), etc. Vocabularies such as Digital Media[14] or the Image Region vocabulary can be used for a similar task. Applications such as M-OntoMat-Annotizer[15] or PhotoStuff[16] can be used to provide such annotations and to create the corresponding RDF files that can then be exchanged or shared on the Web.

While many of these techniques usually require a separate RDF file for storing metadata information, annotations can sometimes be directly embedded into the image itself, for example, in SVG (Scalable Vector Graphics) images as described by the SVG Tiny specification[17].

At the moment, there is little agreement on what media vocabularies should be used across the board. One useful task would be to define a set of mappings between these various models, allowing us to efficiently combine the best parts of different ontologies for annotating multimedia content. This is one of the current tasks of the W3C Media Annotation Working Group[18]. As defined by the charter of the group, its goal 'is to provide an ontology designed to facilitate cross-community data integration of information related to media objects in the Web, such as video, audio and images'. A first draft of this ontology was published in June 2009[19].

7.3 Podcasts

Podcasts are to radio what blogs are to newspapers or magazines - people can create and distribute audio content using podcasts for public consumption and playback on personal / portable media players, computers or other MP3-enabled devices. Video podcasts, also known as 'vlogs' from video blogs or 'vodcasts' from video podcasts, are a variation on audio podcasts where people can produce and publish video content on the Web for consumption on media playing-devices, and this content can range from individuals publishing home movies or their own news 'interviews', to studios releasing TV episodes or movies for a fee. We shall now describe these two areas in more detail, along with some ideas on how semantic metadata can be leveraged for this application area.

[14] http://www.mindswap.org/2005/owl/digital-media (URL last accessed 2009-06-09)

[15] http://tinyurl.com/kyyjl (URL last accessed 2009-06-09)

[16] http://www.mindswap.org/2003/PhotoStuff/ (URL last accessed 2009-06-05)

[17] http://tinyurl.com/svgtiny (URL last accessed 2009-06-05)

[18] http://www.w3.org/2008/WebVideo/Annotations/ (URL last accessed 2009-06-05)

[19] http://www.w3.org/TR/2009/WD-mediaont-10-20090618/ (URL last accessed 2009-07-07)

7.3.1 Audio podcasts

Audio podcasting has become quite popular in the past few years, with podcast recordings ranging from interviews and music shows to comedies and radio broadcasts. One of most popular podcasts is by comedian Ricky Gervais for the Guardian Unlimited website.

Although the concept of podcasting was suggested in 2000, the technical roots started to evolve in 2001, with the influence of blogs being a key aspect. The word 'podcast' itself is a portmanteau of 'pod' from iPod and 'broadcast', and the term came into popular use around 2004 with one of the first-known podcasts being produced by Adam Curry. Several technologies had to be in place for podcasting to take off: high-speed access to the Internet, MP3 technology, RSS, podcatching software, and digital media players. In 2005, the word 'podcast' already yielded over 100 million Google hits, and in 2006, the number of podcasts surpassed the number of radio stations worldwide.

From simple origins, podcasting has become a major force for multimedia syndication and distribution. Much of the strength of podcasting lies in its relative simplicity, whereby casual users can create and publish what is effectively an online radio show and can distribute these shows to a wide audience via the Web. All a user needs to create a podcast is some recording equipment (e.g. a PC and microphone), an understanding of subscription mechanisms like RSS, and some hosting space.

It is also easy for a consumer to listen to podcasts, either by using traditional feed-catching methods to subscribe to a podcast feed and thereby receive automatic intermittent updates, or by subscribing to a podcast discovered through the categorised podcast directories of Odeo or the iTunes[20] music store on a desktop computer, iPod Touch or iPhone.

However, it is not only individuals who are publishing podcasts, since larger organisations have leveraged the positive aspects of such technologies. Many companies now have regular podcasts, ranging from Oracle and NASA to General Motors and Disney. Also, many radio stations have begun making podcasts of their programmes available online (e.g. NPR's Science Friday), although these usually are devoid of music or other copyright content.

Many sites have offered downloads of audio files or streaming audio content (in MP3 or other format) for some time. Podcasts differ in that they can be downloaded automatically via 'push' technologies using syndication processes such as RSS described earlier. When a new audio file is added to a podcast channel, the associated syndication feed (usually RSS or Atom) is updated. The consumer's podcasting application (e.g. iTunes) will periodically check for new audio files in the channels that a consumer is subscribed to, and will automatically

[20] http://www.apple.com/itunes/ (URL last accessed 2009-06-05)

download them. Podcasts can also be accompanied by show notes, usually in PDF format.

After recording a podcast using a computer with a line-in or USB microphone, editing can be performed using open-source utilities like Audacity[21]. The podcast can then be self-hosted using services like LoudBlog[22] or WordPress.org[23] with the PodPress[24] extension, or hosted on other third-party services such as WordPress.com[25], Blast[26] or Blogger (e.g. by uploading a file to the Internet Archive and linking to a post on Blogger using their 'Show Link Field' option). As well as the iTunes application from Apple, a popular open-source tool for downloading podcasts is Juice[27].

There is also a legal aspect to podcasting. Copyright, the branch of law that protects creative expression, covers texts displayed or read aloud, music played during podcasts (even show intros or outros), audio content performed or displayed (e.g. in video podcasts, more later), and even the interviews of others may be protected under copyright. The solution is to try and use what is termed 'podsafe' content, i.e. Creative Commons-licensed works[28], works in the public domain (e.g. from the Internet Archive[29]), or at the very least, material that adheres to fair use principles[30].

Universities are also publishing lectures or other educational content through podcasts[31], allowing students to listen to or view their lectures on demand. Teachers can publish podcasts of their lectures and assignments for an entire class or for the public, e.g. to supplement physical lectures or to fully serve the needs of distance-learning students. Conversely, students can create and publish content and deliver it to their teachers or other students. Some popular educational podcasts are provided by Stanford[32] and MIT[33].

Some more podcasting technologies and derivatives include: 'autocasting', the automatic generation of podcasts from text-only sources (e.g. from free books at Project Gutenberg); multimedia messaging service-based podcasts and 'mobilecasting', i.e. mobile podcasting and listening or viewing through mobile phones;

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[21] http://audacity.sourceforge.net/ (URL last accessed 2009-06-05)

[22] http://www.loudblog.com/ (URL last accessed 2009-06-05)

[23] http://wordpress.org/ (URL last accessed 2009-06-05)

[24] http://www.podpress.org/ (URL last accessed 2009-06-05)

[25] http://wordpress.com/ (URL last accessed 2009-06-05)

[26] http://www.blastpodcast.com/ (URL last accessed 2009-06-05)

[27] http://juicereceiver.sourceforge.net/ (URL last accessed 2009-06-05)

[28] http://wiki.creativecommons.org/Podcasting_Legal_Guide (URL last accessed 2009-06-05)

[29] http://www.archive.org/details/opensource_audio (URL last accessed 2009-06-05)

[30] http://tinyurl.com/bkxtcs (URL last accessed 2009-06-05)

[31] http://tinyurl.com/ln2v7t (URL last accessed 2009-06-05)

[32] http://itunes.stanford.edu/ (URL last accessed 2009-06-05)

[33] http://web.mit.edu/itunesu/ (URL last accessed 2009-06-08)

'voicecasting', or podcast delivery through a telephone call; and 'Skypecasting[34]' or phonecasting where podcasts are created by recording a Skype conference call or regular phone call.

At the SDForum / SoftTECH Event on Architecting Community Solutions in 2005, Zack Rosen of CivicSpace Labs posed the idea for an evolutionary step in web-based discussions, whereby phone conversations could be recorded (via Asterisk, an open source Linux-based PBX application) and then streamed or downloaded as audio discussions that would augment the traditional text discussions on message board sites. We may also see mailing lists being linked to PBX phone numbers that you could ring up to leave audio comments for members of the list. Podcasting is moving in this direction: you can not only have text comments as replies to podcast postings but you can also add audio comments (this is a feature of the LoudBlog podcasting platform).

7.3.2 Video podcasts

Video podcasts (Felix and Stolarz 2006) are similar to audio podcasts, and can be downloaded to PCs or personal media players using many of the same tools and mechanisms. Known by a variety of terms (video blogging, vidblogging, vlogging, vodcasting from 'video on demand', video casting or vidcasting), video podcasting ranges from interviews and news to tutorials and behind-the-scenes documentaries. Some television stations are also making episodes of their series downloadable for free (e.g. via Channel 4's 4OD[35] player in the UK) or for a fee. With video podcasts, anyone can have their 'own' internet TV station: all they need is a camera and some effort.

Some of the most popular video podcasts (from the Podcast Alley[36] directory) include one offering woodworking advice, a gadget news show, digital video camera tutorials, discussions on real-life issues, and a Big Brother-type series. Video podcasters can make money from their podcasts through various means: by using Google Adsense for display ads or by having a PayPal 'tip jar' at the podcast download site, by manually inserting video advertisements or by using Revver[37] 'RevTags' (a clickable advert at the end of each video).

According to a story from the Guardian[38], despite the relatively modest number of users who are watching online video, research indicates that video downloads are responsible for more than 50% of all internet traffic, and this may in the future cause gridlock on the Internet. Premium Internet video services will reach $2.6

[34] http://www.voip-sol.com/15-apps-for-recording-skype-conversations/ (accessed 2009-06-05)

[35] http://www.channel4.com/programmes/4od (URL last accessed 2009-07-07)

[36] http://www.podcastalley.com/ (URL last accessed 2009-07-07)

[37] http://www.revver.com/ (URL last accessed 2009-06-05)

[38] http://www.guardian.co.uk/technology/2007/feb/10/news.newmedia (accessed 2008-05-01)

billion in 2009[39], and according to Forrester Research, with more than half of adults (53% of consumers 18 and older) stating that they view online video[40], mainstream adoption of Internet video has arrived.

Similar to the differences between audio downloads and podcasting, there are some distinctions that can be made between video downloads and podcasts. Both involve a content creation process, use codecs (coder-decoders) for media compression, may be transferred via multiple file formats, and can possibly leverage some streaming services. Like audio podcasting, video podcasting differs in that it includes some method for automated download of video files, e.g. using an RSS subscription mechanism or possibly some blogging or CMS (content management system) software. DRM (digital rights management) or restrictive transfer protocols are not usually a feature of video podcasts, otherwise nobody would bother downloading them.

Video podcasts are normally created through a digital camera or camcorder, webcam, mobile phone, etc. Video files are then transferred from the recording device, or may be captured live via USB, TV card, etc. After conversion, editing and compression using processing tools like VirtualDub or Adobe Premiere, the videos are uploaded to the Web, including popular video sharing services like YouTube, blip.tv, etc. Video podcasts need to be fairly short: less than 5 minutes is good, 15 minutes is okay, but 30 minutes is too long. Since a lot of video podcasts are similar to 'talk radio', there can be a bit of a learning curve. As with audio podcasting, you should use 'podsafe' audio[41] from sources like GarageBand or Magnatune in your videos.

Seesmic[42] is a 'microvlogging' application in the style of services like Twitter (such that it is being referred to as 'the video Twitter'). However, if a picture is worth a thousand words (and a video contains many thousands of pictures), then Seesmic is quite different to Twitter in terms of expressivity and what can be conveyed through even a short video message (when compared to 140 characters). Seesmic has a simple but intuitive interface for creating content and viewing videos (from the public or from friends). The emphasis in Seesmic is mainly towards using one's webcam for creating microvlogs, but it also encourages the uploading of short video files (e.g. in Flash video format).

Another recent trend is that of 'lifecasting' or live video streaming, as exemplified by services such as Ustream[43] (allowing video to be broadcast live from computers and mobiles) and Qik[44] (for sharing live video from mobiles only).

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[39] http://www.instat.com/newmk.asp?ID=1478 (URL last accessed 2009-06-05)

[40] http://tinyurl.com/dmff8l (URL last accessed 2009-06-09)

[41] http://tinyurl.com/2jjtpu (URL last accessed 2009-06-05)

[42] http://seesmic.tv/ (URL last accessed 2009-07-16)

[43] http://www.ustream.tv/ (URL last accessed 2009-07-07)

[44] http://qik.com/ (URL last accessed 2009-07-07)

7.3.3 Adding semantics to podcasts

Semantic metadata can be associated with both the overall structure and audio content of podcasts. Such metadata for podcasts can be attached to the channel and item descriptions in RSS 1.0 format, and may simply involve a reorganisation of pre-existing structured data (see Figure 7.1).

For example, Apple has written a specification document[45] describing their iTunes namespace[46] (an extension for RSS 2.0) that details podcast metadata for use in iTunes listings and iPod displays. Yahoo! has also created a namespace for syndicating media items[47], intended as a replacement for the RSS enclosure element.

In fact, it may also be possible to explicitly define metadata in an RSS 1.0 extension for multimedia data where such metadata does not already exist (Hogan et al. 2005). Podcast content can also be annotated, more so through automatic speech recognition, but people could also add annotations (e.g. URL references) or tags to parts of a recording as they listen to it. This could also be combined with the Music Ontology[48] (more later).

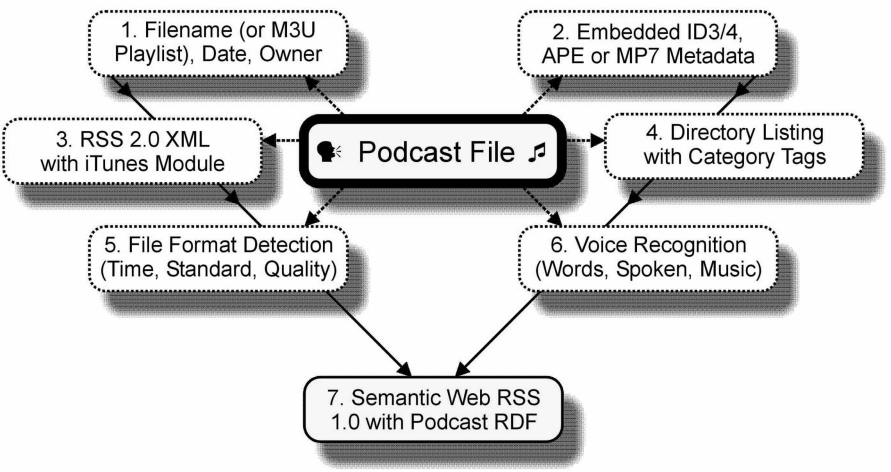

Fig. 7.1. Some sources of metadata for a semantic representation of a podcast file

One possibility would be to extract and convert the metadata that is often embedded in multimedia files, and this could be extracted when songs are played during the recording of a podcast. An example of such embedded metadata would be the ID3 / ID4 / APE tags often found in MP3 files and annotated via tools like the

[45] http://www.apple.com/itunes/whatson/podcasts/specs.html (URL last accessed 2009-06-05)

[46] http://www.itunes.com/DTDs/Podcast-1.0.dtd (URL last accessed 2009-06-05)

[47] http://video.search.yahoo.com/mrss (URL last accessed 2009-06-08)

[48] http://musicontology.com/ (URL last accessed 2009-06-05)

ID3 Tag Editor[49]. Such tags provide information relating to the file name, song or piece name, creator or artist, album, genre and year. Other multimedia metadata standards include the MPEG series of standards (e.g. MPEG-7, a means of expressing audio-visual metadata in XML). Upon parsing of such information, a pretemplated RSS 1.0 file can be filled in with the available supplemental information for further interpretation by podcasting tools. This metadata can then be used by tools such as the Podcast Pinpointer described by (Hogan et al. 2005), a prototype application for the intelligent location and retrieval of podcasts.

Many sites have begun using word recognition technologies in the indexing of multimedia files, with one such popular site being the video site blinkx. Word recognition software has seen many advances in recent years, and is becoming more and more accurate. Services can use these technologies to create a transcript of spoken words contained in the audio of podcast files. This would be quite useful in keyword searches.

Others are employing human transcription services to convert the content of audio podcasts to text files, especially since 'content is king' on the Web and podcasts can be a valuable source of new text content that may not be available elsewhere. As well as these transcripts, HLT (Human Language Technology) could be implemented to derive a structure from the prose. These structures could also be attached to RSS 1.0 documents thereby complementing existing metadata.

An example of a semantically-enhanced podcast service is the ZemPod application described by (Celma and Raimond 2008). It uses both speech and music recognition algorithms in order to automatically split a podcast into different parts and then adds RDF metadata to each part of it in order to ease the way in which podcast files can be consumed and browsed. Metadata can be related to extracted keywords as well as to the recognised songs. Regarding the latter, additional information can be retrieved or interlinked from existing sources for a better user experience. For example, one could identify all podcasts containing a song that lasts less than two minutes and was written by an American band that played at least twice in the CBGB music club.

We shall now describe in detail other initiatives related to adding semantics to music-related content on the Web, many of which can be used to semantically describe the content in both audio and video podcasts.

[49] http://www.id3-tagit.de/ (URL last accessed 2009-06-05)

7.4 Music-related content

7.4.1 DBTune and the Music Ontology

A wide range of music-related data sources have been interlinked within the Linking Open Data initiative (Raimond et al. 2008). Some efforts such as DBTune[50] already provide musical content exported to the Semantic Web, and recent work has been performed in order to reuse that interlinked musical content for music-based recommendations (Passant and Raimond 2008).

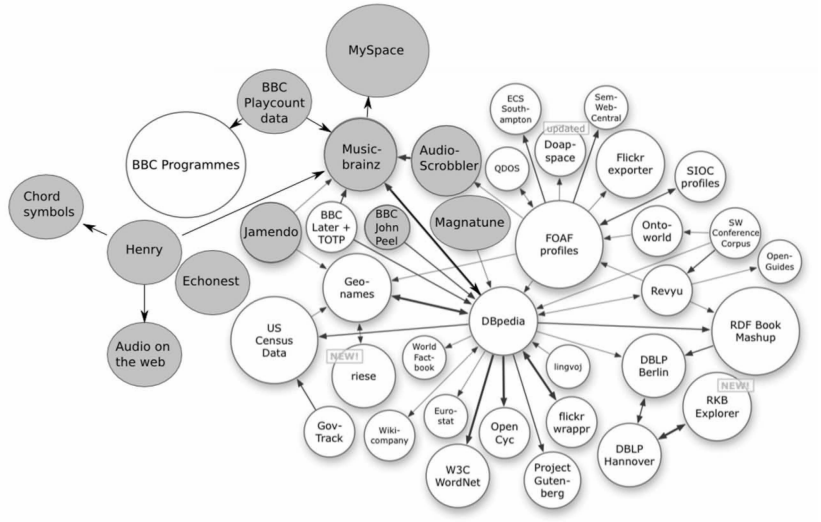

Fig. 7.2. Sources of music-related data interlinked with the Linked Open Data cloud

For example, the DBTune project exports the data sets depicted in Figure 7.2 in RDF, interlinked with other data. These data sets encompass detailed editorial information, geolocations of artists, social networking information amongst artists and listeners, listening habits, Creative Commons content, public broadcasting information, and content-based data (e.g. features extracted from the audio signal characterising structure, harmony, melody, rhythm or timbre, and content-based similarity measures derived from these). These data sets are linked to other ones. For example, Jamendo (a music platform and community for free downloadable music) is linked to GeoNames, therefore providing an easy-to-build geolocation-

[50] http://dbtune.org/ (URL last accessed 2009-06-05)

based mashup for music data. Artists within MusicBrainz are linked to DBpedia artists, MySpace artists, and artists within the BBC's playcount data.

In order to represent assorted types of information from these music data sets, such as differentiating between bands or solo artists, as well as various kinds of artists, the Music Ontology (MO) provides a complete vocabulary for music-related information modelling which ties in with well-known vocabularies such as FOAF. For example, the 'Artist' class in MO is a subclass of the 'Agent' class from FOAF.

7.4.2 Combining social music and the Semantic Web

Information from DBpedia, music-related services and data sets described in the previous section can be efficiently combined with social information such as social networks, tagged blog posts, etc. to provide advanced services for end users to browse and find music-related information.

Hence, (Passant and Raimond 2008) have detailed various ways for using Semantic Web technologies to enable the navigation of music-related data. For example, by modelling social network information from various platforms (Last.fm, MySpace, etc.) using FOAF (as we will describe later), information can be suggested to a user not just from his or her friends on a particular network but from friends-of-friends on any network. This is shown in Figure 7.3 and goes further than some generic collaborative filtering algorithms provided in most social music applications. A related project is 'Foafing the Music' (Celma et al. 2005) which uses FOAF-based distributed social networks as well as content-based data available in RDF to suggest related information in recommender systems.

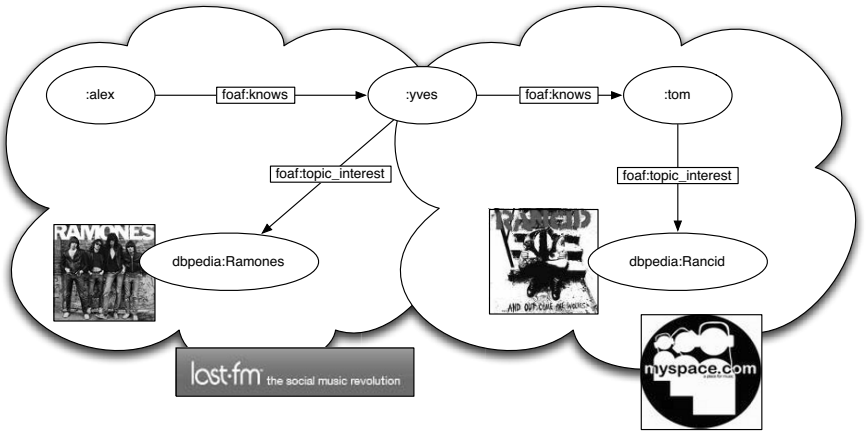

Fig. 7.3. Combining social networks and musical interests across social websites

Another way to benefit from user-generated tagged audio content is to leverage advanced semantic tagging capabilities such as MOAT (described in Chapter 8). For example, pictures of Joe Strummer or other former band members from the Clash could be displayed when browsing blog posts about the band, as depicted in Figure 7.4 (e.g. by leveraging relationships existing between both in the DBpedia).

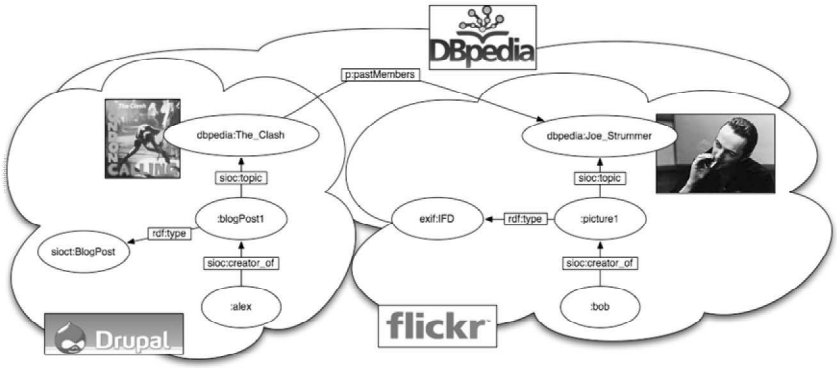

Fig. 7.4. Interlinking related music information from a content management system and photo-sharing service

The Beastie Boys are an American hip hop group from New York City consisting of Michael "Mike D" Diamond, Adam "MCA" Yauch, and Adam "Ad-Rock" Horovitz. Since around the time of the Hello Nasty album, the DJ for the group has been Michael "Mix Master Mike" Schwartz, who was featured in the song "Three MC's and One DJ". They started out as a hardcore punk group in 1979, and appeared in the compilation cassette New York Thrash with Riot Fight and Beastie. They switched to hip hop with the release of their debut solo album Licensed to Ill (1986), which enjoyed international critical acclaim and commercial success. The group is well-known for their eclecticism, jocular and flippant attitude toward interviews and interviewers, obscure cultural references and kitschy lyrics, and performing in outlandish matching suits. They are one of the longest-lived hip hop acts and continue to enjoy commercial and critical success in 2008, more than 20 years after the release of their debut album. On September 27, 2007 they were nominated for induction into the Rock and Roll Hall of Fame.

- Browse 'Beastie Boys' on last.fm

Interested in artists :

having a similar topic ?

- Capitol Records artists (97 bands/artists including Aslyn,Bob Seger,Bonepony, ...)
- Beastie Boys (12 bands/artists including Alfredo Ortiz,Amery Smith,Awesome; I Fuckin' Shot That!, ...)
- Grammy Award winners (1873 bands/artists including "Weird Al" Yankovic,112 (band),A Flock of Seagulls, ...)
- New York musical groups (381 bands/artists including +/- (band),10,000 Maniacs,1313 Mockingbird Lane, ...)
- White hip-hop artists (76 bands/artists including 2 Live Jews,3rd Bass,7L & Esoteric, ...)
- Def Jam Recordings artists (53 bands/artists including 112 (band),Ashanti (singer),Beanie Sigel, ...)
- Rapcore groups (37 bands/artists including Aztlan Underground,Back-On,Black Market Hero, ...)
- Songwriting teams (37 bands/artists including Absolute (production team),Ashford & Simpson,Atelje trag, ...)
- Jewish hip hop groups (6 bands/artists including 2 Live Jews,Blood of Abraham,Hadag Nahash, ...)
- American hip hop groups (442 bands/artists including 10,000 Cadillacs,116 Clique,13 & God, ...)
- New York hardcore punk groups (43 bands/artists including 108 (band),Agnostic Front,Alove for Enemies, ...)
- Musical groups established in 1979 (76 bands/artists including 45 Grave,A II Z,Amsterdam Baroque Orchestra & Choir, ...)

playing a similar genre ?

- Funk (1161 bands/artists including (Not Just) Knee Deep,100 Days, 100 Nights,12" Collection and More, ...)
- Rock music (12606 bands/artists including "Weird Al" Yankovic,'05 EP,(Reach Up for The) Sunrise, ...)
- Hip hop music (4102 bands/artists including "Weird Al" Yankovic,$100 Bill Y'all,(Always Be My) Sunshine, ...)
- Jazz (3331 bands/artists including '58 Miles Featuring Stella by Starlight,'Nuff Said!,'Round About Midnight, ...)

from the same label ?

- Def Jam Recordings (233 bands/artists including (You Gotta) Fight for Your Right (To Party!),10 (LL Cool J album),4, 3, 2, 1, ...)
- Grand Royal (44 bands/artists including 456132015,Adam Horovitz,Adam Yauch, ...)

Fig. 7.5. Browsing similar artists using information from the DBpedia

As we explained earlier, an aspect of Semantic Web data modelling is the presence of typed links between concepts rather than simple hypertext links between documents. These links can then be used when browsing content, so that one can decide to visit an artist page from another one because they are in the same musical genre or are signed to the same label. A first experiment based on artist information available in DBpedia is depicted in Figure 7.5.

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[21] http://www.w3.org/History/1989/proposal.html (URL last accessed 2009-06-09)

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Dedication from John

I would like to dedicate this book to my mother, Mary Breslin, who died during the writing of this book. Mary was a loving and caring wife and mother, and had a huge network of friends that she helped through both actions and words. She was an extremely intelligent and organised woman, and showed throughout her life how she was able to adapt herself to new situations and take on a variety of challenges. She was also very modern and took to technology very easily, from chatting to me via VMS Phone in 1996, to posting comments on my blog in 2006. She loved many things, including: her family, her two grandchildren, her home and village, and being beside the sea. I loved her too, and always will.

14th September 2009

Biographies

John Breslin[22] is currently a lecturer in Electrical and Electronic Engineering at the National University of Ireland, Galway (NUI Galway). He is also an associate researcher and leader of the Social Software Unit at the Digital Enterprise Research Institute at NUI Galway, researching semantically-enabled social networks and community portals. He is the founder of the SIOC initiative, which aims to semantically-interlink online communities. He has received a number of awards for website design, including two Net Visionary awards from the Irish Internet Association for the Irish community website boards.ie, which he co-founded in 2000. He is a member of the IEI, IET and IEEE.

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