

Keyimage Ontologization & Folksonomy in Web 2.0 Social Space

Web 2.0 Sosyal Uzayında Anahtar Resim Niteleme ve Etiketleme*

Micheál Mac an Airchinnigh

School of Computer Science and Statistics, University of Dublin, Trinity College Dublin 2, Ireland.
mmaa@cs.tcd.ie

Kalina Sotirova

Department of Telecommunications, Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia, Bulgaria. kalina@cc.bas.bg

Abstract: The Age of Image predates and is currently contemporaneous with the Information Age. In our times the explosive expansion of Web 2.0 Social Space, typified by the phenomena of De.licio.us, Flickr, MySpace, YouTube. . . , and the concomitant emergence of folksonomy, present interesting challenges in the management of this information. One key process by which to accomplish this in Social Space, is the wedding of folksonomy (of the people) with ontology (of the machine). Such a wedding must necessarily be conducted in the shared physicality of the word, of language. In this respect, WordNet together with OWL (Semantic Web Ontology Language), play the role of matchmaker. But the same Social Space also provides an opportunity for natural folksonomical tagging by digiFoto (key)image. The research harness for experimental keyimage tagging consists of Flickr as the main (digiFoto image) Social Space testbed and De.licio.us as the auxiliary outreach secondary Social Space. Protégé Editor with OWL-DL (OWL Description Logic) provides the support for the bridge from keyimage to the formal ontology. The primary end user application domain is the keyimage tagging of paintings in an online art gallery.

Keywords: Access, art, folksonomy, keyimage, ontology

Öz: Görüntü Çağı Bilgi Çağından önce gelir ve günümüzde Bilgi Çağıyla çağdaştır. De.licio.us, Flickr, MySpace, YouTube. . . gibi olgularla örneklenen Web 2.0 Sosyal Uzayının tahminleri

ötesinde büyümesi ve bununla birlikte ortaya çıkan etiketleme bilgi yönetiminde ilginç gelişmelere sahne olmaktadır. Sosyal Uzayda bilgi yönetimini başarmak (insanlar tarafından gerçekleştirilen) etiketleme ve (makinelere tarafından gerçekleştirilen) ontolojinin birleştirilmesini gerektirmektedir. Böyle bir birleştirme mutlaka sözün ve dilin ortak fizikseliğiyle gerçekleştirilmelidir. Bu hususta Web Ontoloji Dili (OWL) ile WordNet çöpçatan rolü oynarlar. Öte yandan aynı Sosyal Uzay digiFoto (anahtar) resimle doğal folksonomik işaretleme yapmak için de bir fırsat sağlar. Deneysel anahtar resim işaretlemesi yapmak için kullanılan araştırma araçları ana (digiFoto görüntü) Sosyal Uzay sinama ortamı olan Flickr ile yardımcı ikincil Sosyal Uzay sinama ortamı olan De.licio.us'dan oluşmaktadır. OWL-DL (OWL Betimleme Mantığı) ile Protégé Editor anahtar resimden biçimsel (formal) ontolojiye köprü kurmak için destek sağlar. Başlıca son kullanıcı uygulama alanı bir çevrimiçi sanat galerisindeki tabloların anahtar resim işaretlemesidir.

Anahtar sözcükler: Erişim, sanat, etiketleme, anahtar resim, ontoloji

BackStory

The research work reported on here is firmly situated within the emerging field of the Digital re-Discovery of Culture (DrDC) (Sotirova, 2005). Taking image (painting, photograph, publicity image (Berger, 1972, p. 129), television, film. . .) as typical focal point for (post)modern culture, we explore to what extent one can be led to an

* Ontoloji: Varlıkbilim; varlıkların en temel niteliklerini inceleyen felsefe dalı. Folksonomi: Etiketleme; kullanıcıların fotoğraflarını, web sitelerini, video'larını kendi sözcükleriyle tanımlamaları. Tagging: İşaretleme.

experience of personal «physicality of soul» (FoS) in a playful way, an entertaining way, perhaps through a purposeful designed game (DrDCg) on the Internet, to that self-awakening of one's own (people's) cultural spirit. Note our use of “«” and “»” to denote a key concept. In the Semantic Web Ontology Language (OWL) we would write PhysicalityOfSoul. For acronym construction we follow a convention of choosing phonetic F in place of lexical Ph to give FoS.

Let us look at the case of a painting: to see it in digital form, even of the highest resolution, can never match the face to face encounter between the actual painting, wherever it may be, and the spectator. Such face to face encounter is one class of FoS. A part of that FoS is to see the detail of the brushwork of the painter, to see the colors exactly as they are in the light setting of the exhibit, gallery, museum, church, mosque. . . . On the other hand, for most people, paintings can only ever be seen in their print form and in their digital form. The former is exclusive and/or expensive. The latter is inclusive and essentially free. In each case there is a different FoS. The print form is intended to match that of the original. But if the original is a mural like *Guernica* (Fig. 1), then physical experience of scale (350.5 x 782.3cm) is not possible in the printed form. For comparison, the scale of the print in (Thompson, 2006, pp. 198-199) is about 11.7 x 26.1 cm. A certain degree of physical experience of scale is possible in the digital world. One may be presented with a % size indicator of the image and the possibility of panning and zooming such as used in the National Gallery, London (Mantegna, 1505-6). The physical location of paintings such as *Guernica*, Museo Nacional Centro de Arte Reina Sofia, in Madrid is also out of (physicality) bounds for most people.

Images and paintings in their print form (and by that we now mean printed in a book) are usually accompanied by a

great deal of textual information, frequently of technical, historical and social nature. Online Museums of Art (Art Galleries) present the images in similar (textual) contexts. Information attached to the image and the associated text is already very well managed. Here we take information management to be “the handling of information acquired by one or many disparate sources in a way that optimizes access by all who have a share in that information or a right to that information.” It may be “characterized by the phrase ‘Getting the right information to the right person at the right place at the right time’” (Information, 2007). As part of that information, we take for granted formal markup languages based on XML and even include the Semantic Web Ontology Language (OWL) “texts” based on Resource Description Framework (RDF). In Web 2.0 Social Space, Web 2.0 being a “human friendly and socially inclusive” name for Semantic Web, such management is played out against the backdrop of folksonomy, “an Internet-based information retrieval methodology consisting of collaboratively generated, open-ended labels that categorize content such as Web pages, online photographs, and Web links” (Folksonomy, 2007). This curious neologism may be likened to astronomy. Just as one studies the myriad stars and their satellites in World Space, one studies the people, in their interactions in the Social Space of the Internet.

Let us illustrate this by use of a very practical domain, that of the tagging of paintings and photographs of an Art Gallery Collection online by enthusiasts. The *Steve Project* (2006; Chun, Cherry, Hiwiler, Trant, & Wyman, 2006) is prototypical. Whereas the professional, the curator, the art critic, will describe a painting in a certain way, using culturally apt and learned text, the new/naïve spectator will inevitably resort to the language of the pop(ular) culture. One is not certain of the existence of such naïve



Figure 1. *Guernica*, 1937.

ultimate goal of a project such as Steve seems to be that the Museum will learn how to see, understand, and communicate with their putative visitors, fundamentally at a distance, and for the few in practical visitation.

To mimic the tagging task and to explore a theory of folksonomy with respect to “Art Galleries” we have set up our own experimental framework in Flickr (2006). In place of real paintings in a real gallery, we use real digiFotos in a real Web~2.0 Network (Орела). At the time of writing (21 May 2007) there were approximately just over 5500 such digiFotos.

Let us begin with a simple example. The color digiFoto, entitled *Mother and Child* (Майка и Дете) 2006 (Fig. 1) shows two (blue) bottles, one large, one small; «bottle» is a good tag; for the tagging of colours one must look at the original image: “отвлечено понятие: майка и дете” (Орела, 2006c). The title of the black-and-white image shown here *Mother and child* 2006 suggests 3 tags: «mother», «child», «mother and child». Finally, one might add «2006» as tag.



Figure 2. *Mother and Child* (Майка и Дете), 2006

Ontologically, the use of the word «child», rather than daughter or son, is significant. Specifically, in the Western Tradition, largely dominated by Christian influence for two millennia, we originally hypothesized that the choice of Child rather than the specific word Son universalizes the Christian narrative to everyone everywhere at all times. One wonders at what point in time did the «Mother and Child» concept become dominant? Subsequent thoughtful reflection suggested a much better explanation: the gender of a child was not known before actual birth; hence a gender-neutral concept word was necessary in language to refer to that which was yet to be born—the child.

In this paper we adhere to the ontological commitment articulated by Quine (1939), that “To be is to be the value of a variable” (Mautner, 1997, p. 400). In particular, we

formally encode the concepts of our art world within the Sowa 12 upper ontology (Sowa, 2000) and deliberately restrict expressive power to the Description Logic (Baader, Calvanese, McGuinness, Nardi, & Patel-Schneider, 2003) variant of the Semantic Web Ontology Language (OWL) (W3C, 2004). In our research work we focus on the use of images to tag images. The digiFoto in Fig. 2 is used to tag the painting *The Madonna with the Long Neck* by *Parmigianino* (1532-40) (de Rynck, 2004, p. 172). The key concept is «(long neck)-ness». This concept forms part of our ontology. Such a tagging image is called a keyimage. The very act of making such an image tagging by an image calls to mind the possibility of other “long-neck” women in paintings, photographs, and so on. In other words, surely the Parmigianino painting is not unique? It turns out that indeed it is not. Gombrich remarks that very few people notice that Botticelli’s *Venus* has a long neck (Gombrich, 1995). When we come to formalize this concept in OWL-DL we choose a simple enumeration for the length of neck property: [short-neck, normal-neck, long-neck]. The judgment will then depend on what one considers to be a normal-neck. We suspect that such judgments will be culturally based and we are reminded of the danger of falling into the “heresy of eugenics”.

Many of the digiFotos which we use as keyimages in our research are generated within the social computer game SIMS 2 (2006). Although the gameplay is in English, we have chosen to tag the emerging digiFotos in Bulgarian (Slavic language) and Gaelige (Irish Celtic language), both of which are official languages of the European Union (EU) since January 1st 2007. In this paper tagging *form* is emphasized rather than tagging *content*. In practice concepts are explored in two non-hegemonic languages of very different cultural backgrounds. To highlight this *formal* approach we deliberately use Bulgarian, Gaelic, and even some Turkish words.

Let us look at two of these digiFotos, taken from the SIMS 2 game, which have been used to tag the paintings *Nevermore* (Gauguin, 1897) tagged by (Орела, 2006a), and *Olympia* (Manet, 1865) tagged by (Орела, 2006d). It is important to note that the latter keyimage is ambiguous, being also used to tag the painting *Venus of Urbino* (Titian, 1538) (de Rynck, 2004, p. 178). The key concept in this case is «female nude gazing at spectator», difficult to ontologize formally. The concept of Gaze (Harris, 2006, p. 126) is foundational.

What are tags? You can give your photos a “tag”, which is like a keyword or category label. Tags help you find photos which have something in common. You can assign as many tags as you wish to each photo. (Flickr (2007).

Of course, it is natural to try to extract an ontology automatically from such tags (Schmitz, 2006). But in true folksonomical fashion the taggers tag as they will. A tag

may be a single word or a phrase in quotes, such as “long neck”. One interesting use has been to assign a line of poetry as a single tag. Let us imagine that some poem contains 42 lines? Then one uses 42 tags. It is a very creative way in which to illustrate such a poem by a digiFoto. For example, Wordsworth’s poem “I wandered lonely as a cloud” may be used to tag a digiFoto of a single (white) cloud in a blue sky. In this way the tagging is the thing, the picture is incidental. The poem itself is now the image which is being tagged by the digiFoto. This inversion is one of the striking features to emerge in the Social Web. It is unexpected. It is very like emergent behavior in a complex system. Now that it has happened, it seems quite a natural phenomenon. We personally had been using the Description feature of Flickr to carry the poem and to use a digiFoto as image tag. Clearly both approaches can be used (redundantly) for the same poem. Perhaps, the tagging is best used in the conventional way of “naming” a poem by its first line.

Another noteworthy tagger is currently being prototyped: the Image Labeler (Google, 2007), which appears to be based on the ESP game (von Ahn & Dabbish, 2004). This seems to be a direct competitor of the Steve Project. That Google is taking an interest, suggests that folksonomical image tagging has arrived. The next big leap forward will be the use of images and not just words to do the tagging.

In the course of our research into the formal characterization of keyimage, especially with regard to its use in an ontology, and upon being challenged to produce an algorithm for the assignment of such, to images and paintings in general, we chanced upon the happy use of keyimage as tag or key in cubist painting:

By abandoning illusionistic form, Picasso had removed the traditional framework upon which likeness in portraiture had always been hung. In his painting of Kahnweiler, he invented a whole new way of signalling a particular identity by turning characteristic features — the dealer’s quiff, his long nose and his clasped hands, for example — into the signs that we now refer to as “tags” or “keys”. (Thompson, 2006, p. 110)

Clearly, a recognizable detail in an otherwise unrecognizable image is one basis by which keyimage may be classified, albeit relatively.

How to Ontologize an Image

Instead of “how to ontologize” an image we might be more modest and begin with “how to read” it, or “how to talk about” it or even “how to look at” it. And for simplicity we might consider that definite sub-category of image, called painting. Let us work with “how to read” it?

How to Read a Painting (de Rynck, 2004) and *How to Read a Modern Painting* (Thompson, 2006) are two texts with which one might begin. Although similarly named, one being a “natural sequel” of the other, their “ontological

structure” differs considerably. The former provides the “sizeable index... to help readers explore... by name... or alternatively by theme, motif or concept...” these “pre-Modern” paintings (circa 1300–1800). The latter contains an index of names only. To ontologize the “modern painting” from the latter requires patient, painting by painting, study. Something more is needed to assist in the ontologizing of the latter. For very basic professional work we make use of “Art History, the Key Concepts” (Harris, 2006) and Hall’s *Illustrated Dictionary of Symbols in Eastern and Western Art* (Hall & Puleston, 1994). The latter text is especially noteworthy for our research technique in that the concepts, given in descriptive form, are indexed by keyimage in the margin.

A Pre-Modern Painting

Consider, for example, the painting *The Introduction of the Cult of Cybele at Rome* (Mantegna, 1505-6) which is discussed in “Learning to look at paintings” (Acton, 1997, p. 55). We are drawn to the text “She was worshipped in the form of a sacred round stone. . .” (p. 55). In the ontologization we will use the binary relation form ‘Cybele hasRepresentation RoundStone’ which fits nicely into OWL-DL (W3C, 2004). But this ontologization is relative to the painting itself. In another (textual) image of Cybele she is represented by a pointed black stone (Ball Platner, 1929). How Cybele is represented by a stone is ambiguous, the resolution of which must be sought in the image in question. That Cybele is represented by a round stone is true relative to at least the Mantegna painting. The keyimage for Cybele is shown in Fig. 3 and is publicly accessible on Flickr (Орела, 2006b).

A Modern Painting

In order to be expressive and still adhere to the requirements of black and white images for publication, what could be better than Picasso’s *Guernica* (Picasso, 1937) (Fig. 1)?

The bull is not Fascism, but it is brutality and darkness. . . . The horse represents the people, in this the *Guernica* mural is symbolic, allegoric. That is why I used the horse, the bull and so on. The mural is for the definite expression and resolution of a political problem and that is why I used symbolism.

This quotation of Pablo Picasso (Thompson, 2006, pp. 198-199) provides us with exact concepts with which to tag the painting: «bull», «horse». . . . We are also able to connect it with the «майка и дете» image in Fig. 2. Here, in *Guernica*, the «Mother» is screaming for her dead «Child». Might one not use the image of two (blue) bottles, the smaller being broken, to tag *Guernica*?

On the other hand, with respect to description, an artist may do the exact opposite to Picasso. René Magritte’s “Ceci n’est pas une pipe” is typical. “Ah, the famous pipe.

. . . I've been criticised enough for it! And yet. . . can it be stuffed with tobacco, my pipe? No it can't, can it, it's just a representation. So if I had written "This is a pipe" below the picture, I would have been lying!" — René Magritte in an interview with Claude Vial, 1966 (Magritte, 1979, p. 643).



Figure 3. Cybele (Кибела)

The Gallery

In the Web 2.0 Social Space one expects the Art Galleries and Museums to be online and accessible by anyone from anywhere, free of charge. In the first instance, both the "local" language, say Bulgarian, and the hegemonic Anglo-American English will mediate the access. Of particular interest to us, is digital access to the "National" collections in Sofia (National Art Gallery Bulgaria, 2006) and Dublin (National Gallery of Ireland, 2006). Since there is not yet, at the time of writing, adequate online access to the National Art Gallery in Bulgaria, we are obliged to rely on published works such as the catalogue of "Bulgarian Painting (1900-1950)" (Маринска & Цилиянов, 1999) and online sites such as the "Domino Art Galleries" ("Български художествени галерии,"). With regard to the former we are very pleased to note that each artist's work is introduced, not only by a very brief biography, but for us, more importantly, by an image of the painter in question, whether a self-portrait or portrait by another. In some sense this use of the portrait is in fact a keyimage for the painter. Such a typical keyimage of the painter Ivan Milev (Иван Милев) can be seen at (Орела, 2007).

For historical reasons, Ireland might look to her closest "neighbor", the UK in comparison. There are comparable institutions in London, such as (The National Gallery, London, 2007) and, the Victoria and Albert Museum (V&A, 2007) which has one of the largest collections of photographs in the world.

In order to provide a sound ontological foundation for the exploration of folksonomy of paintings, it seems reasonable first to choose key concepts from WordNet

("WordNet,") that correspond to the curatorial language and that of the art critic. Let us look at the pictorial elements which one might consider to be important with respect to the visual qualities of a painting: composition, space, form, tone and color (Acton, 1997, p. 225). From WordNet we choose «composition»: "noun: The spatial property resulting from the arrangement of parts in relation to each other and to the whole; 'harmonious composition is essential in a serious work of art.'" From Mary Acton's point of view «composition» is "the artist's method of organizing a subject, of deciding what to put in and what to leave out in order to make an effective picture" (Acton, 1997, p. 1). The average folksonomer may be "educated" in this concept by a suitable access interface? A second example is «form»: "noun: The visual appearance of something or someone; 'the delicate cast of his features'" ("WordNet,") and "Form is the term artists use to describe the feeling of volume in a painting" (Acton, 1997, p. 51). This latter definition suggests that there is an artist-focused ontology that suitably complements the curatorial ontology.

Method of ontologization is suggested by these two simple examples. For each professionally recognized concept in the domain, match its definition and use with a corresponding one from WordNet. If no such correspondence is found in WordNet, then there is an obvious gap to be filled.

Access by the Book

Orhan Pamuk was a painter at the age of 15 (Pamuk, 2005, pp. 239-250). In his memoir, he introduces his first love, whom he calls Black Rose (Siyah gül) and describes how their intimate relationship developed in the artistic context of painter and model:

One day, without telling her, I did a sketch of her lying there. I saw this pleased her, so the next time she came I did another. (Pamuk, 2005, p. 295)

Why did Orhan Pamuk call her "Black Rose?" The name conjures up the image. Googling provides many "black roses." A folksonomer may (be prompted to) choose one to her/his taste. Are there other keyimages which are appropriate for the ontology? To say that "BlackRose *isa* Rose and *hasColor* Black", does not seem to cover the concept adequately at all. In other words to assign the color Black to the Black Rose of Orhan Pamuk is to make a categorical error. Now let us imagine that we choose the sketch of Fig. 4 to be the keyimage for Orhan Pamuk's Black Rose? This is a typical folksonomical choice, illustrating how one might naturally choose an image by a current Bulgarian artist, Gredi Assa (Греди Асса) to tag the image of the Black Rose (Черна Роза) of Orhan Pamuk, a Turk. Such "typical folksonomy" is, of course, probably localized to the Bulgarian culture and is unlikely to extend beyond it.



Figure 4. *Model and Painter*

Painting and color become the subject of Pamuk's most famous book *My Name is Red* (Pamuk, 2002).

One day Shirin . . . sees a picture of Hüsrev . . . Beholding this picture of the handsome Hüsrev in that beautiful garden, Shirin is stricken by love. (Pamuk, 2002, p. 47)

The book (indirectly) suggests to the reader that in order to re-live the story, they ought to seek out the pictures spoken of. In the paper "The practical sense of philosophizing: Why preserve anything at all, even digitally?" (Mac an Airchinnigh, 2004, pp. 128-130) there is a brief discussion on the use of the «picture portrait» as keyimage for "falling in love" and that the keyimage is just right. The picture *Shirin examines Hüsrev's portrait* (Fig. 5) may now be used as keyimage in its own right to depict any image or painting the subject of which is falling in love. In particular, it may be used to key any painting where Cupid is active, such as in Botticelli's *Primavera* (Spring).

Color

After all these years, everyone has their own mauve. . . they wrote their theses on blueberry iMacs, photographed their friends on one-use Kodaks. . . wore blue, green, even yellow. . . walked around as if these colours were the most natural thing in the world. (Garfield, 2000, pp. 197, 200)

Color is one of the five pictorial elements connected with the visual qualities of a painting, described in detail by Mary Acton. Color may be used for many different purposes. She particularly insists that the work of Chevreul (Michel, 2007) was a key influence in the development of the use of color in (painting in the West

in) the nineteenth century. We are personally familiar with the prior work of Goethe (Goethe & Eastlake, 1975), his remarkable experiments and the discovery of new colors.



Figure 5. Shirin examines Hüsrev's portrait

From the point of view of ontology and folksonomy, colors and color names and color associations, all provide a very rich world for a digital re-discovery of culture (one's own and that of the Other). They also provide a major challenge for folksonomy.

Let us take the simple case of the color red (Kırmızı in Turkish); (алено or червено in Bulgarian) (dearg in Gaelic). How can we tell whether or not these words describe the "same" color red? Perhaps, a keyimage will be of some use?

One set of keyimages for color might be presented by color tiles. But because the perception of color is contextual, we must initially present the tiles against some sort of neutral background (grey).

Hypotheses and Directions

The concept of Genre in painting is ambiguous (Harris, 2006, p. 131). As a classificatory concept it denotes landscape, portrait, nude, still life, history painting. . . . For this meaning we use the concept GenreOfPainting. In a narrower sense it is also used to denote ordinary, everyday life painting. We denote this by GenrePainting.

In general, one is recommended to use singular nouns: Person, not Persons; indefinite forms: Person, not the Person; use processes: gazing, not to gaze; and so on. For keyimages we are beginning to form hypotheses.

1. A keyimage ought to be free, just like a keyword. No one is bigger than the language (a modification of the Bulgarian proverb “Никой не е по-голям от хляба”: no-one is bigger than the bread). The language is free for all. Such keyimages may be posted to a site such as Flickr with a creative commons license (“Creative Commons, 2006”) that allows one to use keyimages freely.
2. Every image must point to some digital image in a meaningful way. By this we mean that the keyimage itself must be formally ontologized such that a property of the keyimage *pointsTo* the property in the image. For example, the property that a big bottle has a small bottle beside it and is of the same kind may be used for “Mother” and “Child”. To formalize such notions as “beside” and so on is already well-known to be difficult and challenging.
3. How many keyimages ought one to associate with any given image (painting, ...)? Let us posit the number 5. Why? One has five digits on a hand. This paper is permitted up to five keywords. We hypothesize that even 5 independent and formal keyimages will be difficult to find for each image.

For *Guernica*, we propose keyimages associated directly with the keywords (tags): 1) «майка и дете» (Mother and Child), 2) «бик» (Bull), 3) «кон» (Horse), 4) «окото» (the Eye), 5) «цвете» (Flower).

For *Cupid and Psyche in the Nuptial Bower* (Figure 6), we propose keyimages 1) «пеперуда» (Butterfly), 2) «ябълка» (Apple), 3) «лък и стрели» (Bow and Arrows), 4) «пъпеш» (Melon), 5) «какавида»(Chrysalis).

4. The structure of keyimages ought to mirror that of keywords and be grounded in OWL-DL.

For example, «майка и дете» is keyimage of Gredi Assa's *Model and Painter* which in turn is keyimage of *Black Rose* in Orhan Pamuk's *Istanbul*. The «butterfly on apple» in *Cupid and Psyche in the Nuptial Bower* reflects «Psyche with wings» and is, therefore, a reflexive keyimage.

5. A keyimage will in principle key many different kinds of images according to the property picked out. In this sense, a keyimage on its own is inherently ambiguous. Nevertheless, the property that a keyimage *pointsTo* or depicts some property of another image suggests that there is a well-defined means of ambiguity resolution. We expect there to be a comprehensive classification of the types of ambiguity of keyimages just as there is a classification for the types of ambiguity in play (Sutton-Smith, 1997).

The Keyimage Algorithm(s)

The personal, folksonomical approach to “reading an image” is typified very well by the Google Image Labeller.

To be able to comment on, to describe, to tag an image one must first be able to recognize the familiar.

There are two basic algorithms or procedures by which one might construct and/or assign keyimages: the Kahnweiler algorithm and the Portrait algorithm. The former is so-named (by us) after the cubist portrait painting of the same name (Fig. 7) by Pablo Picasso. The algorithm is based analogously on a simple universal mathematical principle: the construction of a pullback, or inverse-image, or pre-image of some mapping. In other words, the given image, in this case a painting, is considered to be the range of some mapping or function of the “observer”.

We have chosen the name Kahnweiler precisely because it is non-intuitive for the “average observer” to identify features that might be tagged in a simple folksonomical fashion.

Kahnweiler Algorithm

1. Begin with the image, say a painting or a photograph. For definiteness, look at the Kahnweiler painting (Picasso, 1910b).
2. Identify and name the key characteristics which strike you. In Kahnweiler, we see the «quiff», the «long nose», the «clasped hands» (Thompson, 2006).
3. Attach a keyimage for each of the characteristics, viz. the «quiff», tagged by Teddy Boy image from (Quiff, 2007) the «long nose» by the sea horse image from (Seahorse, 2007) and the «clasped hands» from the image of the painting by (Tiziano, 1550).
4. Tag the image with both the keyword and keyimage.
5. Tag the keyimage with pointer to the image.
6. Record the tagging in Protégé OWL-DL.

It might be the case that for such a cubist painting one needs to find another (intermediate) painting of the very same subject in order to be able to obtain details for which keyimages can be assigned. For example, Picasso did a cubist painting of Ambroise Vollard (Picasso, 1910a). If one is not familiar with special features or characteristics of Ambroise Vollard then it is natural to look for another portrait (painting or photograph) of Ambroise Vollard that will act as a direct keyimage to the Picasso painting. That of Cézanne (1899), done 11 years earlier, might not be appropriate. That of Pierre Bonnard (ca. 1924) 14 years later seems to be a better fit.

Portrait Algorithm

1. Begin with the artist, the creator or maker of the image: the painter, photographer, author... For definiteness, let us choose Turkish Nobel Prize winner: Orhan Pamuk.
2. Find a portrait/self-portrait and use that as keyimage to any work of her/him. Googling Orhan Pamuk provides abundant opportunities for a portrait.



Figure 6. *Cupid and Psyche in the Nuptial Bower*



Figure 7. *Kahnweiler*

3. If no such portrait exists, consider the possibility of using a textual description that conjures up a picture of the artist. Such a description is deemed to be a (pseudo) keyimage.
4. Tag the images which are to be associated with this keyimage portrait. For Orhan Pamuk, we choose the texts (in English) *My Name is Red*, *Istanbul*, *Snow*, *The White Castle*, *The Black Book*, *The New Life*, all of which

have been read by the first author. Each text in turn may be considered to give rise to specific keyimages with which to tag modern Turkey, not-so-modern Turkey, the Ottoman Empire, and so on.

5. Now apply the rules of the Kahnweiler algorithm wherever possible and/or appropriate.

Epilogue

One referee remarked that this text “is like modern music: it is difficult to hear its melody. There are pieces but it is somewhat difficult to distinguish the connections among these pieces.” We have to agree. Reading back over all that has been written, it seems to us that there is a theme which needs to be brought to the fore: the theme of access, both ordinary physical access and world-wide web access. It is to facilitate, encourage, enhance such access that drives us. On a complete re-write we might begin with Section 4 on Orhan Pamuk’s “Access by the Book” and most certainly emphasize Rifkin’s “Age of Access” (Rifkin, 2000). We hope that, in spite of the many remaining obvious imperfections in the text, the reader will find at least one melodic thread to follow or unravel in accessing Art wherever it may be found in the digital world.

Acknowledgements

Khurshid Ahmad, Thérèse Mac an Airchinnigh, Daniel Isemann and Michael Emmanuel O’Rahilly all helped in the development of key concepts through their critical reading and subsequent discussion of early versions of this paper. Catherine Sheridan, of the National Gallery of Ireland directed us to the Steve Museum Project. Declan O’Sullivan’s proof reading of the penultimate version was particularly insightful.

A very special note of thanks is due to the anonymous referees’ comments whose feedback contributed significantly to this final form of the paper. One referee insisted upon the “overall algorithm or procedure for finding the keyimage among many images.” This seemed at first to be an impossible task, so early in the stage of development of the research idea. In particular, we were aware of our use of many different algorithms, each particularized by the inputs (points of view) we were using in the construction of the system.

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