

Eulr: a novel resource tagging facility integrated with Flickr

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ABSTRACT

We have developed a novel information storage and display structure called EulerView, which can be used for the systematic management of tagged resources. The storage model is a non hierarchical classification structure, based on Euler diagrams, which can be especially useful if overlapping categories are commonplace. Keeping the constraints on the display structure relaxed enables its use as a categorisation structure which provides the user with flexibility and facilitates quick user tagging of multiple resources. As one instance of the application of this theory, in the case when the resources are photos, we have developed the Eulr tool which we have integrated with Flickr. User feedback indicates that the Eulr representation is intuitive and that users would be keen to use Eulr again.

Keywords

Euler Diagrams, Tagging, Classification, Categorisation, Flickr, Metadata, EulerView.

Categories and Subject Descriptors

H.5.2 [User Interfaces]: Graphical user interfaces (GUI); H.5.3 [Group and Organization Interfaces]: Web-based interaction

1. INTRODUCTION AND BACKGROUND

Metadata refers to data about data, and typical usage involves data about resources such as documents, books, articles or photos. Metadata are specific to the particular purpose they are designed for (e.g. metadata that can be associated to books). They are used to facilitate the retrieval of those specific resources. The importance of Metadata is increasing, especially in web-related activities, because many web sites allow users to add metadata to resources such as photo, URLs and blog entries. In this particular context the operation of adding metadata has been dubbed *tagging*.

Tags are an effective way for authors to categorize their resources: they facilitate future retrieval of information using tags as keywords. Similarly, tags are useful for readers who are browsing for

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resources. Although an author may be the best person to assign tags to his/her resources, his/her resources may mean something different to other people, or they may just perceive the tags used in a different manner. For this reason web sites like Del.icio.us allow users to tag other people’s resources. This *collaborative tagging* has been dubbed “Folksonomy” [6, 12], joining the term *folk* and the term *taxonomy*; “specifically it refers to subject indexing systems created within Internet communities”.

Flickr tagging system.

Flickr is a popular photo-sharing site that exploits tags as a core element to the sharing, retrieval, navigation, and discovery of user-contributed images. Every Flickr user can upload his/her photos to be stored online and they can choose to allow these photos to be publicly viewable and therefore easily discoverable. Making photos accessible to the public, together with strong emphasis on the tagging facility [11] has facilitated the expansion of the site; currently it boasts more than 700, 000 registered users. A functionality of Flickr which is greatly appreciated is the support of social interactions: in addition to uploading photos, users can create networks of friends, join groups, send messages to other users, comment on photos, tag photos, choose their favourite photos, and so on.

Flickr offers support for the development of applications which are aimed at manipulating photos, tags, contacts and the whole set of resources available. It offers a well documented set of libraries available for many programming languages. This library has enabled the flourishing of a wide range of applications that implement different kinds of elaboration of Flickr resources. We are interested here in those applications that have a strong focus on tag management. The standard Flickr application [2] and other similar, but independently developed applications [4] allow users to select photos and associate tags to them. Tag management is an important issue because many social interactions within the Flickr community rely on tags. This is emphasized by the existence of many applications which enable the user to browse through photo collections using tags as a guideline [1, 3, 5].

We wish to facilitate systematic tag-management, which raises the users awareness of the relationships between categories, and so we review and discuss categorisation and classification structures.

Categorisation and Classification.

We recall the following distinction between categorization and classification [10]: “Categorization divides the world of experience into groups or categories whose members share some perceptible similarity within a given context”, where category composition depends on the context and on the user of the organization; “classification involves the orderly and systematic assignment of each entity to one and only one class within a system of mutually ex-

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clusive and non-overlapping classes”, where classification usually refers to the assignment of a resource (e.g. a document, URL or photo) to a single class, among classes, often hierarchically organized making clear the complete relationships amongst classes (see [7] for a typical biological example).

We wish to delve a little deeper into the characterisations of categorisation and classification. The process of categorisation is generally perceived as being less precise than classification: the placement of an item within a classification structure indicates precise global information about that item, whereas placement of an item within a categorisation structure may represent partial information about the item, which is to be interpreted locally, or within a given context.

We also wish to also broaden the notion of classification structures: since hierarchical classification structures are often not sufficient for user-classification needs (and this is even felt to be the case in a real office setting [14]), one can consider non-hierarchical classification structures, such as polyarchies [13] or EulerView [8]. One could stretch the imagination slightly and think of non hierarchical classifications as fitting into the classification definition given above if one thought of two overlapping classes as three classes: two non-overlapping classes together with another class for the intersection. On the other hand it also fits quite well with the notion of categorisation: items in the intersection of categories share some property. So, non-hierarchical classifications could be thought as living somewhere in the middle of this Categorisation-Classification spectrum, allowing the overlap of categories but with a formal underlying model.

In general, strict classification system interfaces are especially useful for storage and retrieval of information, but are often thought to be too restrictive for users, for many reasons, such as: they may be time consuming to use, they may get very large and the visualisations unmanageable very quickly, and changes in the classification structure over time may require the update of all existing resources that are already classified – which may be a difficult chore. On the other hand, categorisation systems such as free-form tagging are much easier and quicker to use, but they have their own drawbacks such as: the necessity to use different visualisation techniques, such as tag clouds [9] in order to browse through existing resources.

We advocate a “best of both worlds approach”, by keeping an underlying (non-hierarchical) classification system, but presenting to the user interactive views of that data in the form of a simple categorisation structure which may be user-created and easily manipulated. This will bring the benefits of a classification structure, especially in terms of information retrieval, but with the flexibility associated to a categorisation structure.

In [8], EulerView was proposed as a means to enable the common user to easily capture the naturally non hierarchical organization of website bookmarking. User difficulties due to migration from the standard Treeview control were avoided by developing EulerView as an extension of Treeview. However, the hierarchy of a Treeview control is extended into a non hierarchical structure by using the power of the Euler diagram model; developing the EulerView component as such a $(1 + 1)$ -dimensional visualization of Euler diagrams also assists the user in overcoming potential navigation difficulties (i.e. scrolling and/or zooming in 2 or 3 dimensional interfaces).

2. EULR APPLICATION

We wish to enhance the user experience of tagging resources by providing them with the facility to create and easily manipulate their own categorisation structure to update tags (and in particular tags for photos on Flickr). So we wish to consider common

users’ tasks, and what facilities would be useful to assist them in performing those tasks, whilst not adding too much computational overhead to the system.

Tagging tasks can be described as the process of adding, or altering, tags to resources, where this might involve adding multiple tags to multiple resources. Whilst free-form user tagging allows quick single resource tagging it doesn’t allow multiple resource tagging, although there are applications that do facilitate this feature. However, they do not give an idea of the related categorisation structure, which would aid user awareness and facilitate quick tagging of multiple related resources.

We consider certain features that would be desirable with reference to some natural scenarios. Firstly, we note that the familiar use of a tree-structure where the parent-child vertex relationship represents category-subcategory relationship is a natural method for displaying a categorisation structure in a non-flat manner.

A feature desirable in categorisation structures is the facility of overlapping categories (called intersection categories). For example, a user may wish to place a photo in their “University Friends” Group but also in the overlapping category of “Work Colleagues”. This is useful within a single natural categorisation of groups of people, but if the user wants to tag a collection of photos which are “University Friends, Work Colleagues, In Italy and At Conference” then they may wish to create the intersection across naturally different categorisation structures. This motivates our desire to display a non-hierarchical categorisation structure (and to use an underlying non-hierarchical classification structure).

Enabling the use of multiple user categorisations provides flexibility. For example, suppose that a user wants to tag a collection of photos taken on holiday abroad with a certain group of friends. Suppose that the user had two categorisation (or classification) systems, one with groups of friends according to different social circles (so these groups may overlap) and another according to places in the world they have visited. Then, placement of the photos within these categorisation structures, enabling partial tagging (i.e. not requiring the explicit creation of intersection categories) would provide a quick method for utilising both categorisation structures together. This would also facilitate re-use of user-created categorisation structures. Therefore, a small investment in initial creation of categorisation structures will lead to continued benefits in the future. This motivates our desire to develop a user categorisation display structure which has a high degree of flexibility.

We have developed a visual component called EulerView which has an underlying model based on Euler diagrams. It has a novel, flexible interface to enable users to construct multiple integrated categorisation paths, which will facilitate tagging tasks as well as be useful in enhancing ease of future navigation (or classification) tasks. This methodology will extend to multiple different users using their own (multiple) categorisation (or classification) systems, but still enabling them to share their information effectively. To ground our ideas we have developed an application which is an instance of this EulerView theory. This integration of EulerView with Flickr has been dubbed *Eulr*; it facilitates user creation and management of tags attached to photos in Flickr.

The *Eulr* tool facilitates the development of a user categorisation structure, making it easier to assign sets of tags to collections of resources. The constraints we impose are very relaxed, allowing great flexibility, although the imposition of stronger constraints could be enforced, if desired. *Eulr* also allows the export, to Flickr, of the user-defined sets of tags for a collection of resources. Furthermore, we enable the import of multiple resources from Flickr into the *Eulr* display, thereby creating a categorisation structure which the user can use or manipulate. Thus we have addressed our major tagging

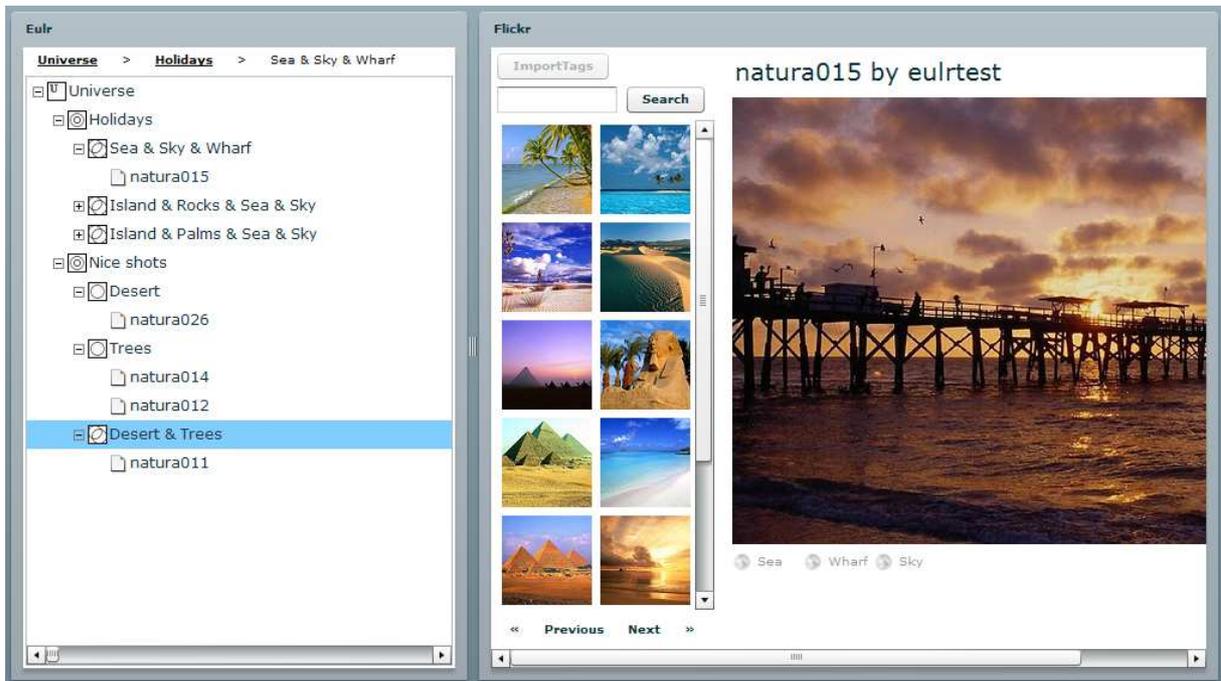


Figure 1: Eulr application user interface: on the left pane the EulerView control, on the right pane the Flickr photos.

requirements.

A major advance of Eulr over the existing Flickr applications is that Eulr enables the systematic management of tags. This brings many advantages such as enhancing the users' understanding of the categorisation structure (allowing user construction and manipulation of such a structure which displays relationships between resources); this can be a difficult comprehension task using "flat" tags. It has also been developed within a constraint-based framework, where the level of constraint could be varied, according to the application domain or user preferences, for instance. Tag management is an important issue because many social interactions within the Flickr community rely on tags.

2.1 Eulr user interface

Figure 1 shows the current user interface. The left pane shows the EulerView component used to categorize photos, while the right pane displays photos taken from a specified Flickr account. The Flickr pane presents the whole photo collection in thumbnails divided into pages in order to allow the user to browse through them rapidly. It also displays a larger photo of the currently selected photo, together with the associated tags for the photo that are stored on Flickr. Clicking on a thumbnail changes the currently selected photo and updates the display accordingly. A search facility is also available which enables the user to search for photos with a specified set of tags.

The EulerView control in the lefthand pane shows a user constructed categorisation structure. The basic idea is that we have a rooted tree for the categorisation structure, where the set of tags associated to a vertex are in fact the complete set of tags in the path back to the root node (called the Universe). Resources, which are in this case links to the photos, can be placed as shown thereby associating the corresponding set of tags to the resource. For example, the photo "natura012" has associated tags {Nice shots, Trees} within the EulerView control, whilst the photo "natura015" has associated tags {Holidays, Sea, Sky, Wharf}.

Notice that the tags associated to the photo in the Flickr pane for "natura015" are {Sea, Sky, Wharf}, which are not the same as those in the EulerView pane. This is because we chose not to enforce the automatic update of tags in Flickr whilst the user was manipulating the EulerView control, but instead to allow the user to decide when they wish to export the set of tags associated to each photo to Flickr. Once exported the updated set of tags become visible in the Flickr pane. For instance, upon exporting from the EulerView pane in Figure 1, the tag "Holidays" would also be added to the tags for the photo "natura015", and the other photos would have their tags updated. Automatic updates could instead be used if user-preference dictated it.

The icon associated to a category vertex consistently reflects the content of the branch from that vertex in the Eulr structure, as shown in Figure 2.

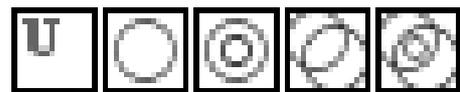


Figure 2: Icons for different categories (left to right): the Universe of Discourse category, a simple category, a category containing subcategories, an intersection category, an intersection category containing subcategories.

Now, the core functionality of the Eulr system is to be able to manage photos and the tags associated with them. Firstly, the user needs to create an EulerView categorisation structure, and then use that to help in photo tagging: drag a photo from the Flickr pane and drop it on the EulerView pane within a category is the basic means to associate the corresponding tags to that photo. Clicking on a resource in Eulr opens the link to that resource.

The Eulr categorization structure can be created and manipulated by a user, and we have very few constraints enforced in order to facilitate user flexibility. The universe, or root vertex, is always

present. A new category vertex can be added as child vertex of any existing category vertex. Any non-root category vertex v can be moved to become a subcategory of another vertex w ; note that the branch from v , moves with it. Two category nodes, with distinct label sets A and B , can be intersected to create a new category vertex with label $A \& B$. One can relabel any single-label category vertex. When an intersection is created, the label of the intersection vertex is linked to the single-label category vertices involved in its label and consistently reflects the renaming of those labels. Any non-root category vertex v can be deleted and the branch from v is also deleted (including all of the resource links). Resources (which are links to photos stored in Flickr here) can be added, deleted and moved at will (so one can place their own photos and change their labels). Adding new categories or resources, together with renaming, is achieved by right click followed by selection via a drop down menu. Category movement is achieved via drag and drop, and category intersection is achieved using drag and drop with a modifier of holding down the control key.

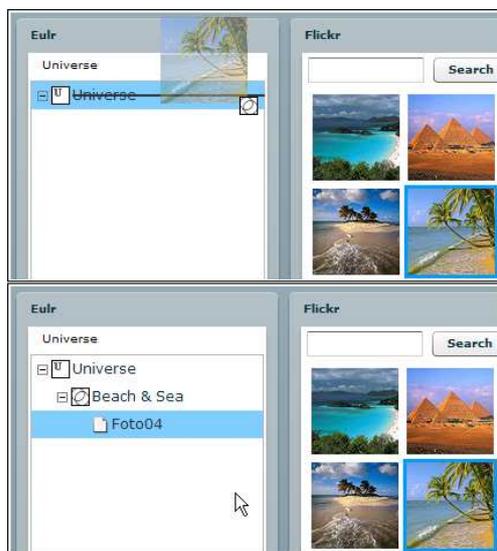


Figure 3: Drag and drop of a photo using the wizard.

In order to assist the user in creating their categorisation structure we developed a *wizard* function that allows a user to “migrate” the set of tags from photos to EulerView automatically generating their associated EulerView categorisation structure. Figure 3 shows the effect of category creation using the wizard. The top picture in Figure 3 shows the photo “Foto04” tagged with $\{Beach, Sea\}$ dragged, keeping the Control key pressed, onto the EulerView. During the drag operation a thumbnail of the photo tracks the mouse pointer and a black line helps the user to see where he/she is about to drop the photo. The bottom picture in Figure 3 shows the effect of dropping the photo: an intersection named *Beach&Sea* is created containing the photo. This wizard can be applied to a single photo, or a set of photos, and it also allows them to be imported into the Eulr display either just as resources or together with the automatic creation of the relevant categories. The selection of multiple photos from Flickr is achieved by holding down the control key. Releasing the control key allows drag and drop to a category vertex v to place the set of resources in v , whilst keeping the control key depressed enables the drag and drop to a category vertex v to place the automatically generated Eulr structure created as a subcategory of v (which could be the root node). This facilitates

easy categorisation of photos with similar tags.

Relationship of EulerView with Euler diagrams.

We give an example to give an idea of the relationship between EulerView and the Euler diagram model. The top part of Figure 4 shows a modified Euler diagram which is an alternative representation of the EulerView shown in Figure 1. This is a standard hierarchical view (without using the overlap facility), where the labelled curves represent a set of tags. For example, the category vertices “Desert, Trees and Desert & Trees” in Figure 1 are all subcategories of “Nice shots” and as such they are presented as 3 separate curves contained within the “Nice shots” curve. The bottom diagram is the more traditional Euler diagram view of this model, using overlap to represent intersection of categories.

3. USER PERCEPTION OF EULR

As a first step in exploring the usefulness of the Euler idea and the application, we wished to investigate user perception; if users had a particularly negative perception of the ideas and the application, then investing further resources in developmental time would have seemed inappropriate. There is much further user testing to be performed in the future, including comparisons of Eulr with the utility and perception of other tagging systems, and the effect of using Eulr on larger scale systems, but here we are primarily concerned with small scale everyday usage of Eulr.

User perception of the system was explored by guiding users through Eulr and its functionalities, having them follow a guided set of 11 tasks and then presenting them with a questionnaire. Finally, users were asked to give their own feedback on their perception of the Eulr concept and its integration into the system.

The test was undertaken by 16 users (14 male), who were computer science students (average age 25.8). The tasks were devised to help clarify the basic concepts involved (e.g. what is an intersection and how is one created) as well as to help the users get acquainted with these functionalities. The first 10 tasks involved the users managing 4 photos, creating an EulerView display, and placing photos in the relevant categories. The last task was much freer, asking the users to categorize about 20 photos by using or modifying the EulerView structure that they had developed earlier.

The questionnaire consisted of 15 questions, with responses measured on a Likert scale of -3 to 3 , and it involved questions such as: “Understanding the system at first glance is: hard/easy” and “The software does what you expect: never/always”. The overall consensus of the impression of the system was extremely positive (averaging 2.4) and they were keen to use the software again (average of 2.6). Learning to use the system was deemed easy (average 2.3), and it appears that a small initial effort helps the user understand the system (average score of 2.1 for ease at first look, raising to 2.6 for ease of use after some usage). Users believed that it does not require long to become acquainted with the application (average of 2.2), which may have been assisted since they perceived that the exploration of the functionalities of Eulr were quite straightforward (average of 2.0). Potential areas for improvement were the look of the graphical interface (average 1.6), the quality of the graphics (average 1.2) and the use of colour (average 1.8). The users perceived that Eulr speeds up their tagging work (average 2.2).

Users also provided feedback, in their own terms, on the concept of Eulr, and this indicated that the Eulr representation is intuitive and that the assimilation of concepts into a governing framework is excellent. Whilst these results are, by their nature, the subjective opinions of the participants they provide encouragement that the concept is worth further development.

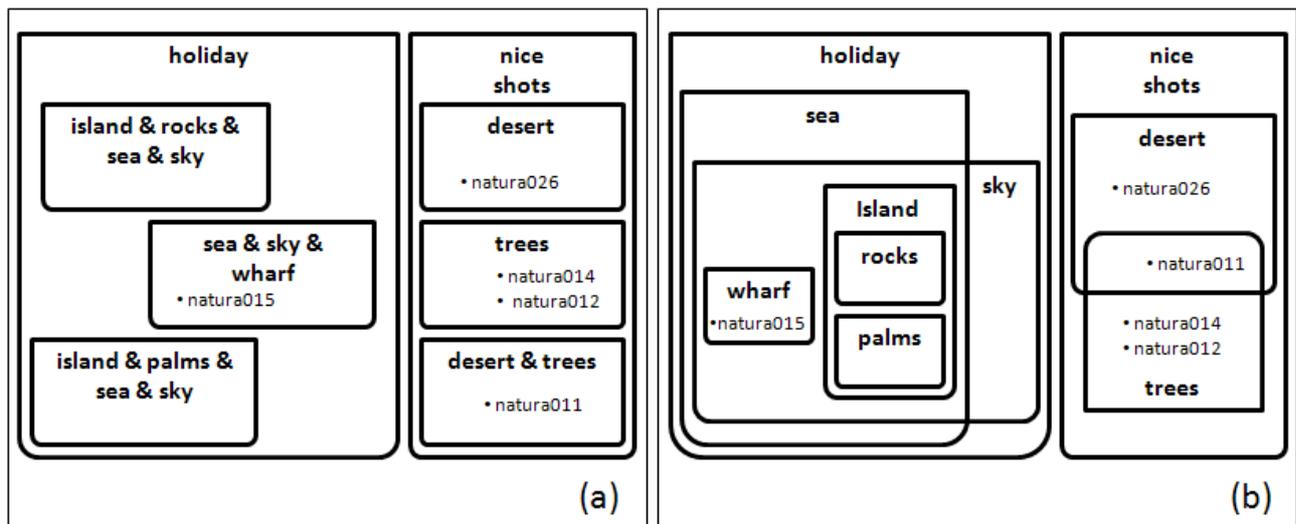


Figure 4: (a) A modified Euler diagram matching the EulerView in Figure 1 (b) a traditional Euler diagram of the same model

4. CONCLUSION

We have developed a novel information storage and display structure called EulerView, which can be used for the systematic management of tags. It has the flexibility of a relaxed categorisation structure (the EulerView display), but also provides an underlying non-hierarchical storage model which is based on Euler diagrams. To ground this theory in practice, we developed the Eulr tool, which is an instantiation of the EulerView model where the resources to be tagged are photos which are stored on Flickr. Functionality has been included to enable users to build multiple non-hierarchical categorisations within which to place links to photos from Flickr. The resource tagging information can be exported to update the tag set of the photos on Flickr. Furthermore, imports of multiple resources from Flickr, with or without an associated Eulr categorisation structure is enabled. User guided tests provided feedback which indicates that users would be keen to use Eulr again.

Our focus here was on user resource-tagging, but we envisage that EulerView will be of great benefit in the future as a single interface to be used for both user tagging and searching tasks; there are many avenues to investigate further related to alternative display options, the level of constraints imposed, and browsing and searching facilities. In the future, more sophisticated techniques to aid visual focussing, as in [15], may be incorporated within the EulerView. As with any tagging system, questions about the utility for large scale systems is an important avenue for future investigation, but the Eulr application here has been developed explicitly for simple small scale user usage.

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