

# Re-Use? Is this Re-Use?

Paul Libbrecht

*Competence Center for E-Learning, DFKI gGmbH*

<http://www.activemath.org/~paul/>

In this paper, we investigate the notions of re-use: at least as it has been understood by many computer-scientists, as was probably used by the Intergeo project description, and what it can mean in a more realistic setting.

The paper first defines the technical re-use: the one that expects a real data operation of "copy and deploy" as and its implementation in the i2geo platform.

A simple experience in Intergeo has proven that this is a far too restricted view: when an teacher is gathering resources, he gathers them because they are interesting; for some of them, he can easily "copy and deploy" but, for many, there's a little itch that prevents the copy and deploy to be useful... "Not bad! Redoing it in my favorite geometry system will be easy!"

This paper investigates the re-use methods and proposes that users should be allowed to explicitly mark the links of being a copy of, a relationship that applies to the copy operation as well as to many other re-use methods (copy-and-paste, imitation, transclusion...).

## Introduction

Many circles have been advocating the notion of re-use as a way to lower the price of designing and producing high-quality digital learning resources. In this spirit, several projects have appeared with the clear objective of facilitating re-use by cataloguing them appropriately so that they are easily found. This objective of an easy re-use has often stumbled against the great diversity of usages of a learning resource, the context of teaching being different each time.

One of the simple answers to this objective is to allow the evolution of resources in each of the recipients' hands so that they can do the necessary adjustments and, maybe later, republish. Most learning objects sharing platform enable this by the documentation of licenses with a default that allows such modification. Although that default is often rejected by contributors.

The answer of the quality work-package of the Inter2geo project has been different: to stimulate the report of quality evaluations so that a commented validation of the usage allows the long-term development of the resource,

duplicated if necessary, based on the usage of the resource in different learning contexts.

The answers of [Meyer<sup>+</sup>06] is to allow a refactoring framework, to enable easy but limited modifications by recipients for content produced by a professional publishing team. Answers of [Wiley 01] and many others include the definition of a standardized metadata schema. Answers by communities have been studied in [Gueudet-Trouche 09].

We see above that methods to enable re-use already depend on the delivery workflows (a publisher will rarely be revising his content while an contributing teacher will be happy to integrate a tiny technical enhancement). In this paper we point to alternate methods that are not re-use in the strictest sense but still constitute an important flow of actions in the delivery methods. It contends that alternate methods to describe the re-use should be introduced and reported about by the users so as to create a community of practice.

No paper on re-use can be written without mentioning the licenses that are applicable to allow re-use, in particular the ones that allow re-distribution in modified form. However, the need for a license is clear and can be considered as solved by the current platforms, including the i2geo platform. The contributors are then sole responsible of applying the right licenses to what they upload to the platform

This paper originates in the difficult mission of measuring re-use that has been charted in the Inter2geo project and for which implementations have shown very little significant numbers in comparison to the proactive re-use attempts that the author could observe in users of the i2geo platform.

We start with a short description of the Inter2geo ways to perform re-use and broaden the discussion to the widespread alternate methods of re-use. We then describe other usage practices which are, in the head of many practioneers, also methods of re-use or maybe methods of appropriation. We conclude by the proposition of a humanly declared relationship of appropriation, together with a measure of the usage, which could have been a much more convincing indicator than the computation of re-use.

## **1 Re-use on the I2Geo Platform**

The i2geo platform is a web-based centralized repository of learning resources using dynamic geometry. It allows contributors to submit resources in the form of

arbitrary files and tag them with useful information for its display. It allows readers to view the contributions, play them right away if a dynamic geometry file, and view the information about it. A search function allows the metadata to be searched, some through multiple languages and curriculum regions. More info on the platform is in [Libbrecht<sup>+</sup>09].

The most explicit way to trigger a re-use in the platform is using the copy function: this function is activated by a link that is displayed for each logged-in user when a resource is displayed as can be seen in figure 1.



Figure 1: two occurrences of the *copy* link offered by the i2geo platform.

This function is followed by forms to input a revised metadata. Once filled, one obtains a resource that belongs to the current user and which he or she is invited to further modify. The resource starts a new life, in the hands of a new owner.

However, no trace of this process is left, except for the statistics and this is certainly an issue. We shall address it later when pondering the value of the re-use action. The statistics show a disappointing amount of use of this function (less than 20 from Nov 2009 till June 2010).

To use someone else's content is also a form of re-use since the usage is done for a pedagogical context that can only be different than its originator's content. This would be any person using the resources, for example:

- reading (hence downloading) the uploaded documents (25'586 times since last November)
- receiving the document, maybe modified, from another place where it was published such as a virtual learning environment (uncountable)

Considering usage-by-others as a form of re-use may be a more important concern than actually expecting the re-use-by-copy. The importance of a resource being used is what the work-package on quality of the Inter2geo project has considered; as witness of the usages, they are proposing in [Trgalová<sup>+</sup>09] and [Mercat<sup>+</sup>09] that reviews be written about the resource's usage. The reviews are expected to formulate a *judgement* on the *quality of the resource*; but what is clearly aimed at is the quality of the usage of the resource, in particular in other learning contexts.

A particularly effective impact of the reviews is the change of visibility that the platform provides following a submission of review. If a resource is judged of low quality, it will be displayed with small stars and will be pulled-down in the search results.

An impact that the i2geo platform has not yet been providing is that of awareness. Users have to return to their resources' list to actually see that a review was commented upon or reviewed. This early decision was done in the spirit that RSS feeds could replace efficiently mails but neither were they sufficiently flexible nor were they a replacement to mail notifications.

## 2 Typical Workflows of i2geo Users

Both of these re-use methods are tightly related to the workflow of usage of the platform: one typical such workflow, let us call it the *resourcing workflow*, is run by teacher users of the platforms and are as follows, it can be seen in the many log-books created by such teams as the IREM-Lyon [Bourgeat<sup>+</sup>10]:

- pedagogical objectives set in advance (curriculum, class progress, ...)
- the search tool is used to identify relevant resources, per notion or using the curriculum texts to point to the relevant notions.
- each of the potentially relevant resources are skimmed through with varying criteria of extra filters (e.g. does it please me? can my students play it? is it detailed enough?); generally starting from top of the results

- in this skimming process, each of the usefulness criteria are evaluated in counterweight to the extra work that will be needed to enhance the resource
- some resources are chosen upon, adapted to the right target, and prepared for use by the learners
- for some resources an *a priori* evaluation is formulated
- for one or two that are used in classroom, an *a posteriori* review is formulated
- only if the user deems it useful to have a new resource different than the original, he contributes it as a new resource, probably starting with the copy function

One important aspect of this workflow is that no criteria is a definitive criteria; the usefulness of a resource is to be measured with an eye on the further actions of the teacher user: that person will be *using* this resource, as a tool to help him/her to help the learners learn.

Users that the author has met are generally users that know well several dynamic geometry systems so that, among others, transferring from one tool to another was one the least expensive operation. Planning a sequence and implementing innovative pedagogical approaches was more expensive.

However, killer criteria remained in case the resource was not copiable, not imitable, and not modifiable: for these, only the perfection was acceptable, no less if use or re-use is to happen. This is due to the fact that such resources as in figure 2 are not adaptable.

The *easy versioning* offered by the resources of the i2geo platform that are made of documents is probably an important technical characteristic for a learning object repository. While the majority of the resources are made of a simple link, the resources made of concrete files offer a bigger potential to re-use, at least if the *source files* are included; fortunately, for most of the dynamic geometry softwares that the i2geo platform has served, the source files are always shipped with any export.

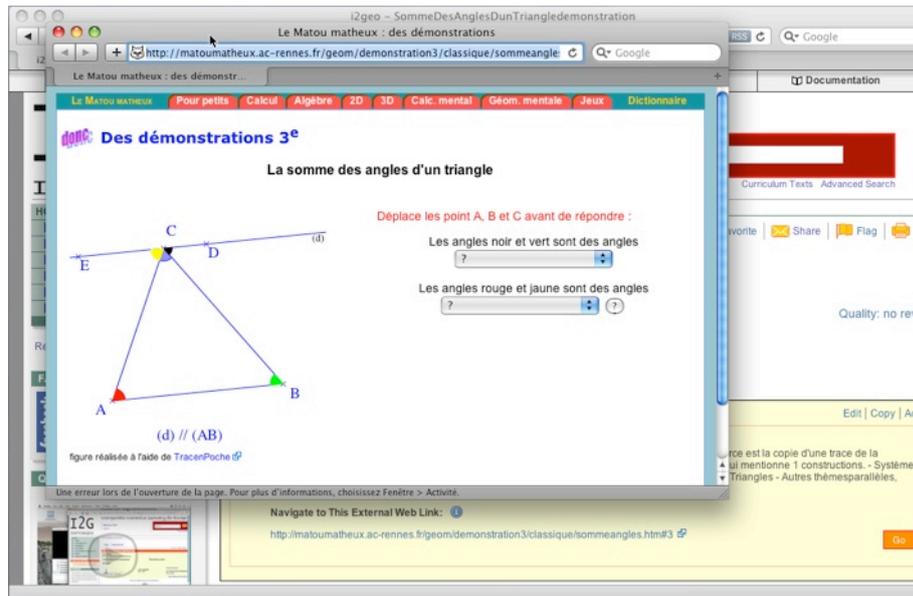


Figure 2: A screenshot of the resource *Somme des angles d'un triangle (démonstration)* available at [http://i2geo.net/xwiki/bin/view/Coll\\_cdording/SommeDesAnglesDunTriangle demonstration](http://i2geo.net/xwiki/bin/view/Coll_cdording/SommeDesAnglesDunTriangle demonstration). This is an example of non-adaptable resource.

The lessons learned for the consideration of re-use on the i2geo platform is that, clearly, the notion of re-use as one would first define it, using the copy function, is not sufficiently applicable to users while such paradigms as a review might be a much better indication of true re-use. Moreover, re-use is to be counterweighted by the effort of re-creating which can be, in some cases where the inter2geo intended to deliver a fully-automatic solution, be quite low.

A possible cause for the lack of re-use-by-copy and the possibly limited amount of reviews (350 as of this writing compared to the 2500 resources) is the lack of notifications which prevented users of being easily aware of the life of resources they liked, reviewed, contributed, ...

### 3 Classical Re-use Practices

In this section we review the classical re-use practices in wide use on the web. This broader perspective will allow us to compare the value of practices.

**Copy-and-paste** is probably the most widespread means to re-use. Within the edition of a document, copy-and-paste is used to transport a fragment of content from one *place* to another. Copy and paste is quite wild: no trace is left of the

transfer, and further adaptations are almost always possible. This is probably why it is most used.

Considering copy-and-paste as one of the best-practice re-use means for a sharing platform would be wrong: copy-and-paste leads to the proliferation of duplicates, some of which are mildly adapted, some not, without any possibility of control or awareness of it. Except for the technical impediments that prevent web-browsers to copy a broad spectrum of content flavours, it would have been unwise for the i2geo platform to have taken copy-and-paste as a means of re-use because the controlled duplication is really wished as otherwise search results would return large bodies of copies with too little differentiation.

**Copy-and-branch** is the other widespread practice, and the one implemented in the i2geo platform. It involves starting with a document, bringing it in one's workspace (copy), and further editing it (branch as in versioning systems).

Copy-and-branch is widely used in desktop systems where copying a document to serve as basis for *the next document* is one of the most widespread practice to start work on a document. It is also the most widespread re-use at the Connexions' authoring commons as noted at [Petrides<sup>+</sup>08].

**Hyperlink** or **Transclusion** are two web-based methods to bring the reader of a document to read a document from somewhere else. Hyperlink implies that the user follows the link and reads the other document in its original context while transclusion, a termed coined by T. Nelson [Nelson<sup>+</sup>99], involves embedding the content of the other document into the document in question.

Both of these methods are perfect in terms of respecting the origin and avoiding the duplication but they are much less used because of their inherent fragility and their impossibility to change the content for the purposes of the readers of the document being edited.

All these methods share the same objective: enriching the document being created by the contribution of someone else, be it a fragment or a modification of it. The distinctive feature here is to bring the resource of someone else within a different perspective, living in another context.

### 3 Broadening Re-use and It's Utility

The definition formulated above applies to many artefacts, much broader than just computer documents or web resources; in particular, it applies to the relationship of *being inspired* or even to *apply a theory*. We argue, in this section that such a generalization is probably necessary and that a relationship with a name beyond re-use should be investigated, input, and displayed.

We have seen above situations of re-use which are beyond those of the real computers exchange. For normal users, if the physical-document-based re-use is more expensive than to create again, they will prefer to create again. The fact that the resource is easily playable with is important so as to observe an interactive resource under all of its behaviour possibilities. For such an action as imitation, who can make the statement that a re-use has been done? At this point, certainly only the author himself, indicating, for example by a citation, that he is inspired by someone else's resource.

Similarly, for the copy-and-paste and copy-and-branch methods, there is no method, to date, to trace automatically the fragments' origin.

The relationship of *being inspired* or of *imitation* is weak but it can have the utility than the relationship of physical copy of a document. And indeed, the utilities are multiple:

- The receiving author has an advantage of keeping such a link for him to come back to it for further observation, evolution, ...
- An author may appreciate to know that another is using some of his resources in another setting: for the pride, for the interest, for the possibility of seeing enhancements
- External authors may be much interested by the links that someone else has been re-using (a part of) a given resource (in any of the senses above): this gives credibility to the piece of content, raises its applicability spectrum for example, and also allows that external author to look at different *transformations* of the first resource, for the better or for the worse.
- When a source of inspiration is changed, this may interest the receiving author, and, conversely, when a re-used resource is further changed, this may interest the source author.

## 4 Conclusion

Finding a concept of a relationship between resources broader than the relationship of being technically copied is the research problem opened by this paper. It should allow users that are creating resources in a totally different world to still declare their inspiration and/or copy.

Such a relationship, at this point, can only be requested to be input manually by the authors which is probably feasible and useful. More important than the actual implementation of such a feature within a web-based service such as i2geo, the possible types of such relationships remain to be investigated. Here are a few that are worth mentioning, between two resources A and B:

- A is a copy of B
- A is a copy and modification of B
- A is used inside B (transclusion or copy-and-paste)
- A is inspired by B (imitation)
- A has a part that is a part of B (copy-and-paste)
- A had a part that was a part of B
- A resembles to B
- A is (was) a translation of B

while other relationships such as *A quotes B* is probably not of relevance for the notions of re-use.

Such relationships appear to be quite applicable for the resources that have been catalogued within the inter2geo project but further experiments are needed to validate it.

Automated implementations of such linking mechanisms are partially doable. The first and foremost automation is to obtain *the reverse of the relationship*. A protocol called TrackBack [SixApart 04] has been created and implemented several times to notify a content-management-system that another content-management-system has a link to a given page; basic implementations simply display the link to the source while it is rare to see mature implementations because of the possibility of spamming such a channel. Other methods such as the usage of search engines to find links going a page exist. An ideal system could be able, using various techniques in the direction of plagiarism detection to capture

similarities between documents. This could to automatically create suggestions of links that a user could filter but will remain incomplete as long as the plethora of file-formats remains.

The relationships of re-use have the potential of stimulating the fuzzy creation of Communities of Practices which appear as fundamental to allow the design process to evolve in sense by the shared meaning of the design reifications built by the community as explained in [Fischer-Ostwald 03].

Within a sharing platform similar to the i2geo platform, or even within the broad web, such links could be made visible and be exploited, in particular, for witnesses of evolutions: for example to be show the evolution of resources *around* a given resource and notify the interested parties of the change. A model of such a community and its technical implementations remain to be described, in particular one that allows an inexpensive enrolment within a community which may become very tight by progressive intensification of the collaboration.

The desirability of the relationship of re-use, as we have listed above, is an hypothesis of the author. There may be objections such as the fact that it shows the receiving authors' methods of work, or such as the fact that one doesn't wish to know or show that others have re-used because we wish not to hear from them.

Last but not least, the spread of a practice of establishing an explicit of re-use could help authors publish learning resources on the web with more confidence. Each time we have asked digital learning resources' authors to consider a license with the right to redistribute modified versions (the right to *derive*), we have met this same question: *But what are people going to do with it?* This may start to bring the first answers.

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