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COMFy – A Conference Management Framework

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Abstract. Organizing the peer review process for a scientific conference can be a cumbersome task. Electronic conference management systems support chairs and reviewers in managing the huge amount of submissions. These system implement the complete work-flow of a scientific conference. We present a new approach to such systems. By providing an open API framework instead of a closed system it enables external programs to harvest and to utilize open information sources available on the internet today.

Keywords: Conference management system, linked open data, open Bibliographic Data

1. Introduction

In scientific publishing today most conferences and journals use an electronic conference managing system in order to organize their peer reviewing. Peer review is described as a process of self-regulation by a profession or a process of evaluation involving qualified individuals within the relevant field. Peer review methods are employed to maintain standards, improve performance and provide credibility. In academia peer review is often used to determine an academic paper's suitability for publication [14].

A typical peer review process for a conference or a journal works as follows: Authors submit their papers in a conference management system. After the submission deadline the reviewers are assigned to these papers. After the reviewing deadline the review results are communicated back to the authors. For all accepted papers the camera-ready version needs to be submitted from the authors. The reviewers are selected from a pool of known experts in the domain of the conference/journal. In case of a conference these experts are usually listed as the international program committee (IPC). For this reviewing process the two most applied types are single-blind and double-blind peer review. Single-blind means that the authors do not know who is reviewing their paper. The reviewer on the other hand knows the identity of the author. In the double-blind review process the reviewer does not know the identity of the authors.

Although there are many criticisms about peer review [11], the following quote from Mayur Amin from Elsevier[1] describes the current situation:

> Peer review is not perfect, but it's the best we have.

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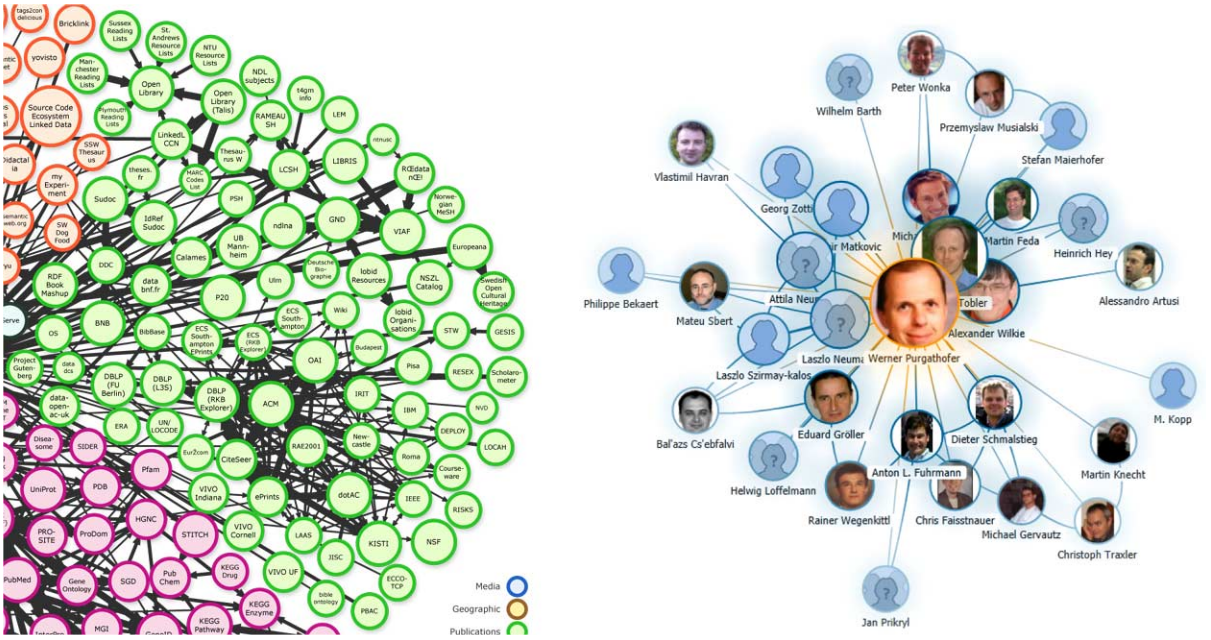
[1] Peer Review at the APE (Academic Publishing in Europe) Conference, Berlin, January 2011.



(a) (b)

Fig. 1. (a) Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch, http://lod-cloud.net/. (b) Co-author graph from Microsoft Academic Search. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-130697.)

One particular point of criticism is the poor referee selection [10]. Especially conferences with a large number of submitted papers experience an enormous time pressure for finding suitable reviewers.

So how can a conference managing system support the conference chair during the reviewer assignment phase? The idea is to utilize information available from different sources about the particular persons in order to find a suitable reviewer or identify conflicts of interest. Especially bibliographic data can be a valuable source of information for finding suitable reviewers. Figure 1(a) shows the image section of data sources related to publications within the Linking Open Data cloud. An example of such a data source is the DBLP [4], which provides bibliographic information on computer science.

Another bibliographic service is Microsoft Academic Search [7]. Figure 1(b) shows the visualization of a co-author graph from Microsoft Academic Search. A potential reviewer does most likely have an conflict of interest if he is a direct neighbor in the co-author graph of one of the authors.

In this paper we present the current development of the next version of the conference managing system used by the European Association for Computer Graphics (EG[2]). In order to be able to easily extend the system, it is based on exposing an API for managing conferences. This should encourage users to extend the system by developing their own tools and modules.

2. Conference example: Eurographics Annual Conference

In order to get an insight of the work of a conference chair we take a detailed look at the Eurographics Annual Conference, which is organized by the EG. Figure 2 shows the number of submitted/accepted

[2] www.eg.org.

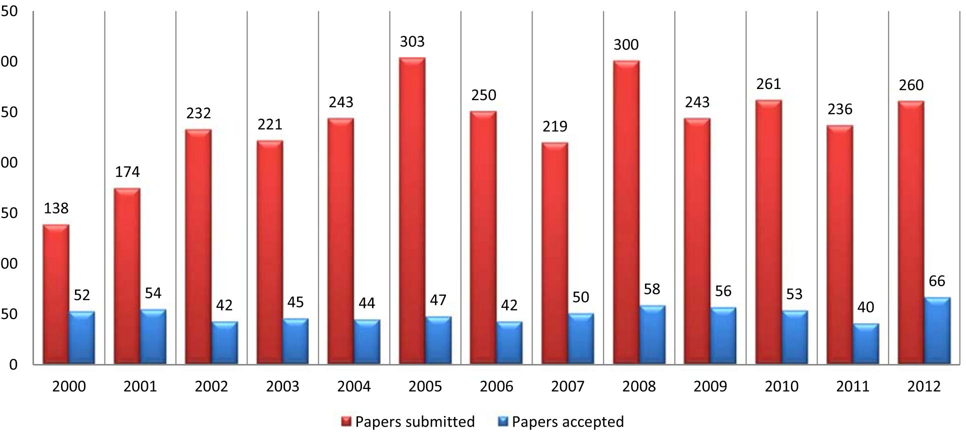


Fig. 2. Submitted/accepted papers of the Eurographics Annual Conference. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-130697.)

papers over the last twelve years. The requirement of at least 4 reviews for each paper leads to approximately more than 1000 review assignments. Assuming that the average workload of a reviewer should not exceed 5 reviews means that at least 200 suitable (and willing) persons have to be found. Since the year 2000 the EG uses the MCP system (Managing Conference Proceedings) [16] and the successor SRM (Submission and Review Management) as their conference management system. These system have been especially tailored to support the needs of the EG. In 2012 the system has been used by a total of 25 conferences.

How does the review process work in detail? The submitted papers are distributed to the members of the IPC. Each paper is assigned one “primary” and one “secondary” reviewer. These act as editors for that particular paper meaning they are responsible for finding at least three additional reviewers. Distributing the available submissions to the IPC members has turned out to be the most time-consuming task for the chairs in the last years. In order to support the distribution process the so-called “Bidding-Phase” was introduced with SRM. IPCs are presented a list of all submitted papers (title, abstract, keywords). For each of these papers the IPC member could specify one of the following: “want review”, “could review”, “not competent”, “conflict of interest”. Based on these entries the system creates an automatic suggestion how to distribute the IPC members as primary/secondary reviewers. Additionally the IPC members could specify the degree of expertise to the available categories for the papers (“expert”, “passing”, “not competent”). These values were matched with the author-selected categories for each paper. The weighted sum of both values would then indicate the appropriateness of an IPC member for that specific paper.

Although the process of peer reviewing is unquestioned within Eurographics, over the years valuable input from the chairs in order to improve the process have been made. One of the most discussed issues was the selection of suitable reviewers. Although this weighted sum works well for the distribution, the bidding values have to be entered by each IPC manually. Going through a list of more then 200 titles and abstracts is cumbersome.

Therefore the next version of SRM should use a new approach to use information available by Linked Open Data, especially bibliographic information. With the new system it should be easy to interact with 3rd party applications or data sources. It should be easy to harvest the data to create statistics and further usage of this data. Additionally this solution should handle in a similar fashion like the current system.

3. Related work

This section will give a small overview of some of other reviewed conference management systems:

- *Easy chair* is a free service for managing a conference. It provides the basic features like uploading a submission and a reviewing system. Further it has multiple conference models a chair can choose from to customize its conference. Beside the models it is not possible to further modify the conference [12]. The review assignment process in Easychair works manual or automatic. When using the automatic mode the Program Committee defines the conflicts of interests and then they specifies which papers they are interested to review. After this is done Easychair tries to create a good matching between the Committee and the papers [3].
- *COMS Conference Management System* has a one time set up fee for creating a website to satisfy the needs of the chair. This website will be the frontend for their conference management system. Once the homepage is created the chair may define 9 different review fields. The review assignment works is again either manual or automatic. The automatic mode takes the reviewers biddings like in Easychair and creates a matching between the reviewer and the submission [5].
- *OpenConf* is a php based conference management tool which has again the standard functionality for managing a conference. OpenConf provides the basic conference management tools. They further offer additional modules to add functionality to the program. One of these modules called the bidding module adds the functionality for Program Committee members to define which papers they want to review. After this bidding OpenConf provides some different algorithms to create a matching between the reviewer and the papers [15].
- *Confious* The Confious system has also the standard features for managing a conference. Confious has like the other systems a automated and a manual reviewer assignment system. But unlike the other systems Confious takes the paper topics into consideration. Authors define which topics their paper is in and the Committee members set their experience in these topics. Then it tries to create a good matching. Further Confious also tries to generate automated conflicts based on the Email and the institute of the IPC and the author [8].
- *Conftool* is a tool which provides many different languages to manage a conference. Like Confious its automated review assignment takes the IPCs bidding and the paper topics into consideration when creating a review assignment. It also tries to create conflicts like Confious according to the Email, the organization and the surname of the reviewer [13].

One major challenge in the Eurographics conference is the assignment of reviewers. There are currently two different approaches to accomplish this task. The automated and the manual assignment. With the manual approach the chairs assign reviewers to submissions from an user-pool. In the automatic approach the program tries to create a distribution between the reviewers and the submissions.

Current state of the art management systems use some form of bidding system where the IPC members can specify which papers they can review and for which they are not knowledgeable enough. Further they have to specify their conflict of interest. They also might declare their knowledge on the topics of the conference in order to create a better matching like Confious or Conftool does. Out of this bidding and declaration the program can compute a good matching between users and submissions.

This system however does not scale very well. Imagine an Eurographics conference with over 300 submissions (Fig. 2) where every submission needs at least 5 reviewers. This would take 1500 users to read 300 abstracts. Most of the time it is not even possible to obtain such a huge Program Committee. To tackle this problem EG currently divides this assignment into two steps. At first the IPC members read the abstracts and will then be assigned to a submission. Their task is then, to find further reviewers which are not part of the IPC. Since these "external" reviewers are not doing a bidding no information about their expertise or conflicts are known to the system.

Using open data sources it is possible to support the IPC members in finding the external reviewers, e.g. by identifying conflicts early. Email-based conflict analysis like in Confious or Conftool cannot detect conflicts between organisations in cross-institutional projects because of different subdomains. Co-authorship information, e.g. from the Digital Bibliography and Library Project (DBLP) provides a much stronger indication for possible conflicts. With the DBLP provided information it might even be possible to create a matching between the IPC members and the submissions by using their publication history making the bidding process superfluous.

4. Framework architecture

Based on the conference example the concept how the new system works is now presented. The new system provides an API for managing a conference. The new SRMv2 system communicates with the core layer through this well defined API. The core layer (COMFy) provides the application logic, while the SRMv2 purely consists of the user interface. Additionally external programs are also able to communicate with that API. COMFy itself maintains the conference data and uses the repository pattern in order to separate the business logic from the database layer. The states of a paper are represented by a state-machine. The core layer can be extended by additional modules if needed.

The new system is divided into 5 different layers. To lowest layer is the database and each of the upper layers uses the functionality of the lower layers and adds additional features to the system (see Fig. 3).

Database. The bottom layer is a relational database. In our case Microsoft SQL Server [2] is used. This database was chosen for its filestream feature. Normally files are stored in either the database or in a directory [9]. When stored in the database the performance to access the files are decreased drastically otherwise in the directory the transactional consistency is lost. The filestream feature of the Microsoft SQL Server combines these features by managing the files in database management system but stores it in a directory which is managed by the database itself. This way the transactional consistency is guaranteed and the file can be accessed fast via the directory.

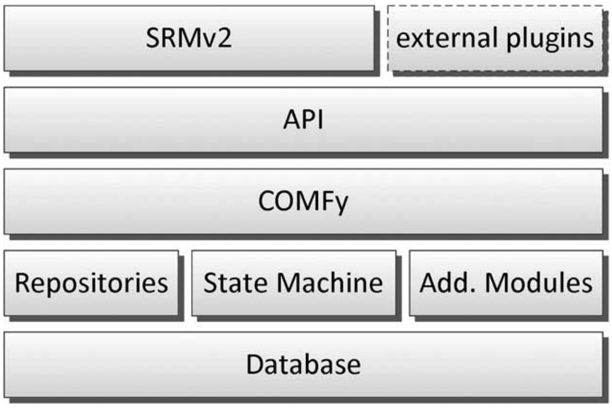


Fig. 3. Concept of COMFy.

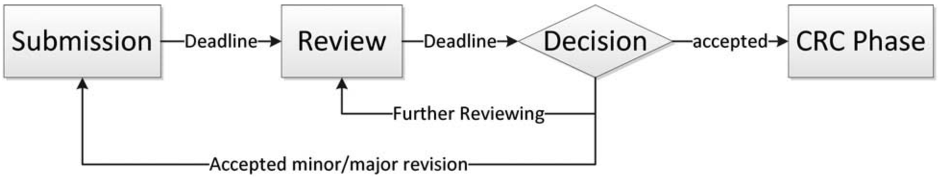


Fig. 4. Current states of COMFy.

Repositories. On the second layer there are repositories. The task of the repositories is to provide the upper layers an easy way to access the data in the database. When COMFy queries one of the repositories, this repository maps the request to an SQL statement. When the query is executed it returns the data to the upper layer. It also works in the other direction, so the upper layer can insert new data or update existing entries.

State-machine. The second part of the second layer is the state machine. This is the core of the framework. It manages the phases of every submission. When the submission changes its phase it also changes the access rights of different users. For example a author may not submit a new paper once the reviewing process starts. A further integral part of the design with the state-machine is that it should be easily extensible. For example another phase like a rebuttal phase where authors may object to the decision of the chair should be easy to add to the system. The current state-machine can be seen in Fig. 4.

COMFy. This layer contains the business logic of the conference managing system. It exposes these functionalities through a well defined API. It queries the repositories, parses the data and creates the response. It is also responsible for applying the different user roles, e.g. an author does not have access to the reviewer names, etc. It is designed as a model view controller pattern. So the controller takes care of the request, queries the repository, fills the model with the data from the repository and returns it to the view. Depending on the client the requested data can be delivered as XML, JSON or HTML. The next section will give an short overview of the available API functions.

5. COMFy API

The API on COMFy is based on the representational state transfer (REST) paradigm [1], which utilizes the well-known, well-defined methods of the HTTP protocol (GET, POST, PUT, DELETE). This paradigm is based on clean, human readable, hierarchical URLs for accessing the resources. COMFy uses clean, structured URLs to access the requested data. The API calls can be divided in 4 different categories: UserHome, Account, Conference, Submission.

The “UserHome” API calls are used for retrieving information of conferences and submissions which are tied to the user. This way the user can quickly access his own submissions or conferences. The “Account” API calls are used for managing user accounts, e.g. logging into the system, registering or changing the profile information.

The “Conference” API calls are for managing and viewing the conference. These calls are primarily by the chair when setting up the conference.

The “Submission” calls are used for managing and viewing a particular submission. They need the conference identifier because the paper identifier is only unique within one conference. This way it is easy to identify in the URL the conference a submission is in. The calls are mainly used by authors and reviewers. Some of the submission calls can be seen in Table 1.

Table 1

Submission API calls

API call	Call type	Description
Conference/EG2012/Submission/paper1000/Show	GET	Information of submission Paper1000
Conference/EG2012/Submission/paper1000/editSubmission	POST	Saves the new information
Conference/EG2012/Submission/paper1000/assignReviewer	POST	Assigns a reviewer
Conference/EG2012/Submission/paper1000/removeReviewer	POST	Deletes reviewer
Conference/EG2012/Submission/paper1000/reviewerDiscussion	GET	Access the discussion forum

```
<Conference xmlns:xsd=”http://www.w3.org/2001/XMLSchema”
  xmlns:xsi=”http://www.w3.org/2001/XMLSchema−instance”>
  <ConferenceId>24</ConferenceId>
  <ShortName>Test2013</ShortName>
  <Name>TestConference for SRMv2</Name>
  ...
</Conference>
```

Listing 1. XML example output. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-130697.)

```
{
    ”ConferenceId”: 24,
    ”ShortName”: ”Test2013”,
    ”Name”: ”TestConference for SRMv2”,
    ...
}
```

Listing 2. The associated JSON example.

COMFy supports currently three response formats: HTML, XML and JSON. By default the sample application SRMv2 (see Section 6) generates the HTML view. By adding a data flag to the request the data will be parsed according to the requested format. Such an example request which returns XML looks like: http://localhost/COMfy/Conference/EG2012?data=xml. Examples of the a XML and JSON output are shown in Listings 1 and 2.

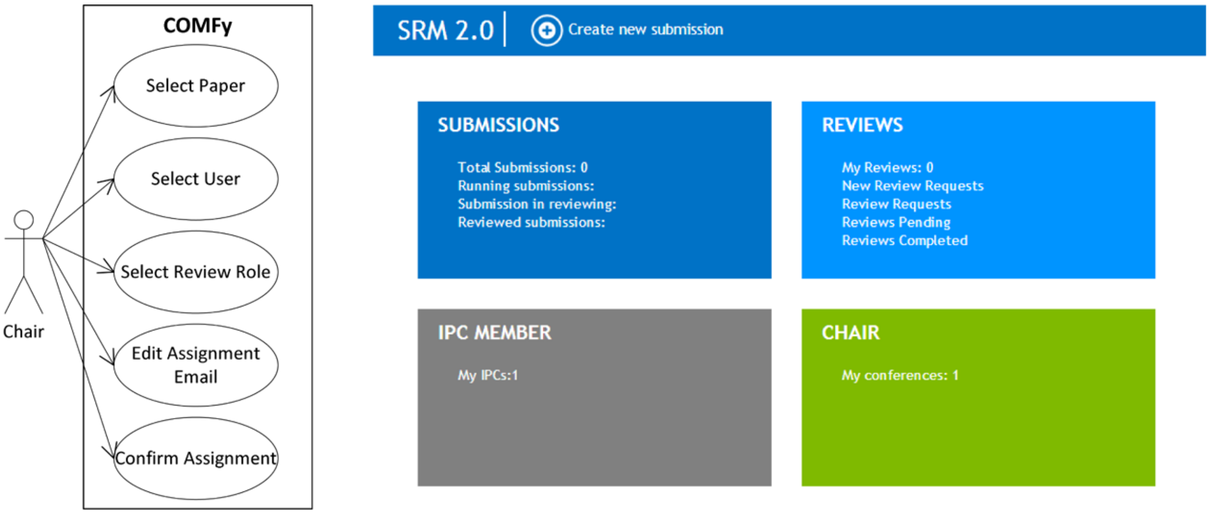
6. Sample application: SRMv2

The COMFy API encapsulates the core elements of a conference system. But it ca not provide a clear use-case model what steps a user needs to do for a certain task. Therefore SRMv2 is implemented on top of COMFy as one sample application. To illustrate the difference between the API and a particular use-case we take a look at the review assignment use-case. From the API perspective assigning a reviewer is just a call like:

```
AssignReviewer(ConferenceId, PaperId, ReviewerId, ReviewerRole).
```

The use case for the review assignment can be seen in Fig. 5(a). This displays the sequence how a reviewer is assigned to a paper from a user point of view. At first the paper has to be chosen. Then the chair has to select the user and set his reviewing role. Currently there are three different of these roles: primary, secondary and tertiaries. After this task it is possible to modify the standard email to create a more personalized email. At last the chair has to confirm the assignment, so the email will be sent and the person gets his assignment which he can accept or decline.

New in this version is that the chair can now access information from DBLP, e.g. it is flagged if the person might have an conflict of interest because of a co-author relationship. In the current prototype the bibliographic data from DBLP is used to help identifying these conflicts. The DBLP provides an API where users can query for authors. Every author in their system has an unique author identifier. After querying an author for the author identifier it can be further used to get the co-authors of that particular



Total Submissions: 0
Running submissions:
Submission in reviewing:
Reviewed submissions:

My Reviews: 0
New Review Requests
Review Requests
Reviews Pending
Reviews Completed

My IPCs:1

My conferences: 1

(a) (b)

Fig. 5. (a) Review assignment use-case. (b) User interface of SRMv2. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-130697.)

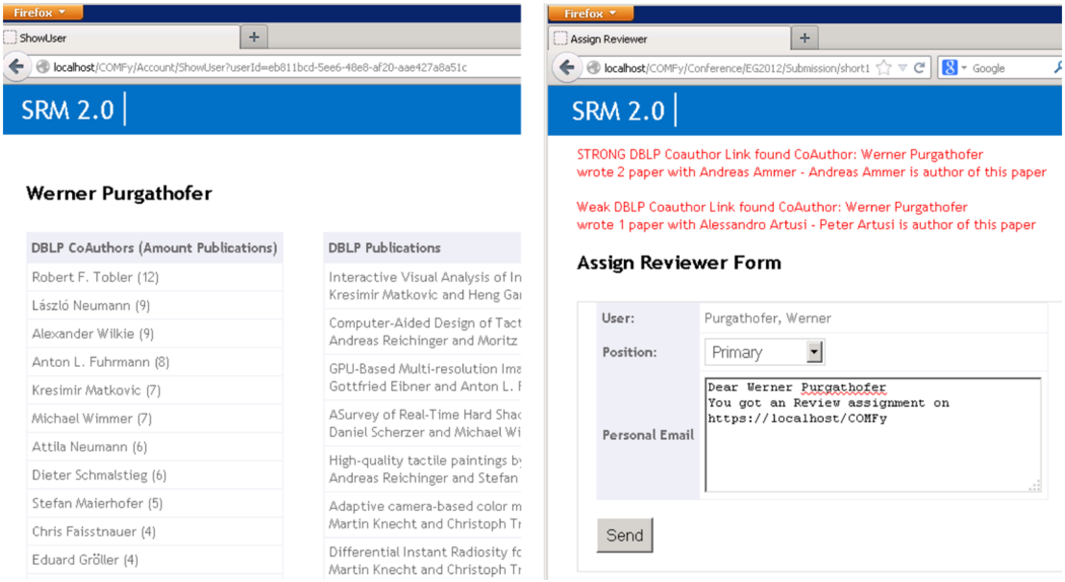
person. They also provide information about the amount of publications the two authors wrote together. It is also possible with the DBLP API to receive bibtex files of papers. These papers can also be found with the mentioned author pointer. Figure 6(a) shows the information within SRMv2 collected from the DBLP. Access to other sources like Mendeley [6] or Microsoft Academic Search are already under development.

7. Using linked open data

COMFy currently has two different ways to assign a reviewer to paper. The automatic and the manual assignment. The manual assignment can be seen in Fig. 6(b). After choosing the submission the person who will be assigned to review the paper, COMFy checks Linked Open Data sources like the DBLP if there are conflicts of interest between the reviewer and the authors. A strong link is found, when the full name appears in the coauthor list of for example DBLP. A weak link is found, when the domain name of the Email, the organization or the surname of the authors of DBLP matches.

For the automatic assignment it is necessary for IPC members to complete three steps. At first they are presented with a list of all authors where they can set their conflicts of interest with them. Then they set in which area they are experts in. In their last step they are presented with every paper. There they set which paper they would like to review and which they are in which paper they are not knowledgeable enough to review it. Once this is done for every IPC COMFy tries to create the best matching of reviewer to the submission.

Before such a matching is created COMFy currently cross checks the DBLP if there are some coauthor links which are not defined by an IPC. If some links are found the chair is notified in the suggested matching. Currently this system is redundant as IPC users are checking their conflicts by hand. In the future this automated assignment process will be improved and the cross checks against the DBLP should replace the manual conflict settings.


Firefox
ShowUser
localhost/COMFy/Account/ShowUser?userId=eb811bcd-5ee6-48e8-af20-aae427a8a51c
SRM 2.0
Firefox
Assign Reviewer
localhost/COMFy/Conference/EG2012/Submission/short1
Google
SRM 2.0
Send

Werner Purgathofer

DBLP CoAuthors (Amount Publications)
Robert F. Tobler (12)
László Neumann (9)
Alexander Wilkie (9)
Anton L. Fuhrmann (8)
Kresimir Matkovic (7)
Michael Wimmer (7)
Attila Neumann (6)
Dieter Schmalstieg (6)
Stefan Maierhofer (5)
Chris Faisstnauer (4)
Eduard Gröller (4)

DBLP Publications
Interactive Visual Analysis of In Kresimir Matkovic and Heng Ga
Computer-Aided Design of Tact Andreas Reichinger and Moritz
GPU-Based Multi-resolution Ima Gottfried Eibner and Anton L.
ASurvey of Real-Time Hard Sha Daniel Scherzer and Michael Wi
High-quality tactile paintings b Andreas Reichinger and Stefan
Adaptive camera-based color m Martin Knecht and Christoph T
Differential Instant Radiosity f Martin Knecht and Christoph T

(a)

STRONG DBLP Coauthor Link found CoAuthor: Werner Purgathofer
wrote 2 paper with Andreas Ammer - Andreas Ammer is author of this paper

Weak DBLP Coauthor Link found CoAuthor: Werner Purgathofer
wrote 1 paper with Alessandro Artusi - Peter Artusi is author of this paper

Assign Reviewer Form

User:	Purgathofer, Werner
Position:	Primary
Personal Email	Dear Werner Purgathofer You got an Review assignment on https://localhost/COMFy

(b)

Fig. 6. (a) DBLP entries of Werner Purgathofer – chairman of Eurographics. (b) Assigning Werner Purgathofer to a paper where there might be a conflict of interest. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-130697.)

8. Conclusion and future work

In this paper we described the new approach for a conference management system. Instead of creating a closed system the new system will allow to utilize the information of different data-sources. There is strict distinction between the core business logic of conference and the user interface defining the various use-cases. Currently the SRMv2 prototype is tested by a small conference (see Fig. 5(b)).

Future work will concentrate on improving the support for a semi-automatic review assignment process. For the current SRM system an experimental tool exists which calculated a so-called affinity score for the IPC members. Instead of performing a time-consuming bidding process, the IPC members upload up to 5 papers which are processed using natural language processing. These affinity scores were matched with the scores from the submitted papers in order to get an automatic distribution from IPC members to the submitted papers. Instead of the IPCs uploading their papers, the tool should harvest the papers itself from sources like the Eurographics or ACM digital library. By tweaking and improving this module the mapping should be that sufficient that the additional bidding and self entered level of expertise will be unnecessary. So the time the IPC members currently have to invest by bidding on the papers and setting the experience will be saved.

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