Journal of Universal Computer Science

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1 Introduction

Almost all researchers in computer science have access to Internet by now: with some 2 million Internet nodes at the time of writing an estimated 30 million people can connect to Internet, many of them directly from their desk.

Internet has become an increasingly powerful information, communication and cooperation system. It is clear that the time has arrived to use Internet for the distribution of a prestigious journal in computer science that is universal in three ways: it can be used world-wide and at any time of the day or night, and it covers all aspects of computer science.

Observe that the first two aspects can be guaranteed by a judicious use of network facilities as described later; the third aspect - the coverage of a wide spectrum of areas - would make a printed journal too bulky and too cumbersome to use. Proper use of computers eliminates this problem.

This project describes the creation of such a journal, the problems involved and the solution adopted, and how this journal, the Journal of Universal Computer Science (J.UCS) will operate.

J. UCS will in 12 yearly issues, starting in January 95. Submissions are accepted as of now.To obtain more information send an email to our listserver in Graz jucs@iicm.tu-graz.ac.at with either subject [info] or the word info in the first line of your message (all the rest of your message will be ignored).

The rest of this paper is structured as follows. After introducing the basic premises in Section 2, a review of problems and solutions is presented in Section 3. In Section 4 the process of submitting, refereeing and publishing a paper is described in detail. Section 5 mentions some further general points and future extensions, and Section 6 contains a few references.

2 Basic Premises

J.UCS, the Journal of Universal Computer Science will be distributed mainly in electronic form. However, a CD-ROM version will be made available at the end of each year for archival purposes. Indeed, the CD-ROM version will include a print utility that will allow the printing of individual papers, or all papers, or

all papers in a coherent subject area, so that organisations can - if they wish -make printed versions of the journal or parts of the journal available to their clientele.Also,an official version will be availble in printed form around the same time the CD ROM is distributed.

J.UCS is supported by Springer Publishing Company: Springer has agreed to mention J.UCS in some of its publications and mailings; Springer will be the distributor of the CD-ROM version mentioned and will also publish and distribute an official printed version . Thus,every contribution accepted will not only appear in electronic form,but also as part of a refereed,printed high quality journal.

If sucessful as expected,Springer will operate J.UCS on a commercial basis from 1997 onward.The yearly subscription will be around US $100.– per year. One such subscription by any organisation will allow free access to the journal for all members of that organisation from their workstations or terminals,albeit only one user at a time.Suitable licensing procedures that are convenient for all users have been worked out.They will be desribed at a later stage.

J.UCS is a high quality publication. Each submission will be scrutinized by a minimum of three referees and accepted only if it measures up to the standards of prestigious printed journals in computer science. J.UCS is published in volumes (one per year) with 12 yearly issues. The material is structured into pages that are numbered consecutively. Thus, papers can be quoted exactly like in usual journals, with name(s) of author(s), title, name of journal, volume number, issue number, and page numbers. An editorial board consisting of over 160 eminent computer scientists covering all areas of computer science and coming from all corners of the world will ensure that a paper appearing in J.UCS will be as prestigious as a paper in any other reputable refereed journal. The original editorial board constitutes the board of "Foundation Editors". It will be extended in the future as seems necessary.

The process of submitting papers, of refereeing papers, all communications between authors and editors, and the access to the papers will be carried out mostly electronically via Internet. However,papers can always be printed out for refereeing,for reading, for archiving or even for distribution. The distribution of individual contributions in J.UCS for non-commercial use is expressly permitted free of charge unless explicitly stated otherwise. The distribution of whole issues of the J.UCS is handled exclusively by designated central servers (see section 3).

J.UCS is operated on a non-profit basis: editors and referees carry out their work on an honorary basis, as is the case with most professional journals. Nevertheless, J.UCS will only be available free of charge during a trial period of two years, i.e. during 1995 and 1996. After this initial period, charges to recover the costs of running the necessary central servers, potential network costs, and sundry items, will be collected as will be explained in section 3. Thus, J.UCS is not intended to be a free publication. However, despite its high quality it will certainly be less expensive than comparable printed journals, and much easier to peruse.

We believe that journals such as J.UCS will replace printed journals fairly rapidly. However, the J.UCS attempt is not seen as competing with current publishing companies but rather as a large scale experiment: if successful - and we firmly believe it will be - J.UCS might suggest how professional publishing houses should go about the distribution of journals and even books in the future. Note that most current computer journals do not pay fees or royalties to authors,

and neither will J.UCS . However,in the system used for transporting J.UCS a charging mechanism could well be employed in the future to collect royalties for contributions in electronic journals or for books published in a way similar to J.UCS.

Contributions in J.UCS can be located and read (on the screen or after being printed out) much like in any other journal. However, contributions can also be located by searching for keywords in the title, in the list of keywords supplied by the author, in the text, by author, by category, and by combinations thereof. All contributions are put in one or more categories based on a classification scheme used by ACM in their Computing Reviews (CRCS). Hence, e.g.searching for all papers between 95 and 97 with classification E.1 or "Data Structures" would produce a "subjournal" of all papers of J.UCS published in the three years 95 to 97 classified as contributions to "Data Structures". Note that contributions may well be classified under more than one category. Typically, a paper on "Hypertext" might be classified as H.5.1.3 ("Multimedia Information Systems") or/and I.7.2 ("Document Preparation").The classification scheme of ACM's Computing Reviews is quite detailed and fairly up-to-date (the last revision ocured less than two years ago).Please observe that the complete classification is always printed in the January issue of each year of the Computing Reviews:this also contains an "inverted list",i.e. looking up any title does give you immediately the correct classification.The CRCS editor-in-chief is Professor Neal S. Coulter from the Florida Atlantic University who we has also joined J.UCS as one of the Foundation Editors. Further, ACM has oficially endorsed the use of the CR Categories for J.UCS .Thus,if changes or extensions concerning the categories are necessary J.UCS will have immediate information.

"Subjournals" of J.UCS can also be created on the basis of other search criteria such as author, keywords, etc.

The main advantages of J.UCS over traditional journals are:

- fast turn-around time between submission of paper and publication;
- no limit on the size of an issue: all papers ready at a particular point in time appear in the next issue;
- easy access at all Internet access points with a range of search functions;
- less expensive than other journals;
- worldwide circulation;
- hyperlinks and annotation.

The last point merits some explanation. Authors of contributions can refer to other papers using the usual reference mechanism. However, if the paper quoted has appeard in J.UCS at a prior stage, clicking at the reference leads directly to the document at issue, and to a specific location within the document if such location ("destination anchor") has been specified. Conversely, contributions can be "annotated" later by the original author or other persons. All annotations go through an editorial process and are dealt with like "letters to the editor"; the main difference is that, when reading a document with annotations, the presence of annotations is pointed out: hence readers may be alerted to new results, corrections of errors, novel developments, etc. The process leading to such annotations is described in more detail in section 4.

3 What is the Big Deal?

Bulletin boards, collections of pictures and software modules, and electronic journals have been existing in Internet for a long time. So what is new about J.UCS, why is it such a great idea?As a matter of fact a careful look at electronic journals and a more radical point of view than ours on the speed of replacement of printed journals is taken in [Odlyzko 94].

Thus, the idea is neither great nor new. Literally thousands of researchers have had it before, and some have already acted, by issuing regular journals, newsletters or even whole user-written encyclopedias via Internet. However, all attempts to date that we are aware of are restricted to a narrow area, and/or are limited to the use of certain software/hardware platforms ,and/or do not support sophisticated searching techniques for locating papers and/or are lacking a serious refereeing structure (and hence the prestige of printed journals) and are somewhat hampered by the less than 100 % reliability of long-range network connections.For one example see [Steinberger 94].

J.UCS aims at covering computer science in general; its quality is assured by a large editorial board with eminent computer scientists and a thorough refereeing process; it is largely format and platform independent and deals with the problem of network (un)reliability by means of a distributed server approach. Both points are elaborated in what follows in more detail.

J.UCS is based on a networked multimedia system called Hyper-G (see.e.g. [Kappe, Maurer, Scherbakov 93] and [Kappe, Maurer 93]) and particularly [Kappe, Andrews, Faschingbauer, Gaisbauer, Maurer, Pichler, Schipflinger 94] contained in J.UCS 0,0 (1994). Hyper- G was developed by a team of specialists starting in 1989 . Developments of further Hyper-G features and maintenance of the system is guaranteed till at least 2000 due to contracts with a number of large organisations using Hyper-G, including e.g. a growing number of universities, museums, and the European Space Agency. Hyper-G is based on a client/server architecture with the server running on standard UNIX machines(e.g. from SUN,DEC,HP,SGI) . Clients are available for UNIX (both under X Windows and for simple terminals),Microsoft Windows,and Apple Macintosh.All Hyper-G clients are available free of charge (by anonymous FTP;look on host iicm.tu-graz.ac.at in directory pub/Hyper-G). The Hyper-G server is available free of charge for educational institutions.A version 1.0 has been released on June 30,94. For some "non-J.UCS" applications of Hyper-G see [Lennon, Maurer 94] .It is not necessary to install a server for casual use of J.UCS, however.

The server stores collections of document clusters, where a document can be a text file, a picture, an audio- or videoclip, or some other data-type. For J.UCS, only text files in English and pictures are permitted, initially. (See also section 5.) Information can be accessed using menus, various search-techniques and via hypertext links.

To use the material, a viewer for the type of terminal at issue is necessary. Viewers are supported for Windows, Macintosh and X-Window platforms (and an ASCII-text only viewer for VT100 displays). All viewers can be downloaded by anonymous FTP. Hyper-G is compatible with WWW [Berners-Lee 92] and Gopher [Alberti 92] to the extent that WWW and Gopher viewers can be used for Hyper-G with some loss of functionality. Since stable Hyper-G-specific viewers are available right now for Windows and X-Windows , and native Mac and

Power PC viewers are under development, the use of Hyper-G specific viewers is recommended for J.UCS.

Textual information is stored in Hyper-G in HTF format(a format based on SGML), and pictures are used where HTF is not general enough (e.g. for complex formulae). Both inline images and external images are supported in HTF.

The strength of Hyper-G is that a number of widely-used text formats can be converted automatically to Hyper-G internal form and can then be viewed on a variety of platforms such as PC (Windows), Mac or Unix-workstations (X-Windows).

The central J.UCS server will reside at the IICM (Institute for Information Processing and Computer Supported New Media) of the Graz University of Technology. However, to be less dependent on Internet connections to Austria a number of J.UCS servers scattered all over the world will be set up. Servers set up by the end of 94 are called the "Foundation Servers". Further servers are welcome and expected to join later. To set up a J.UCS server is easy: a Unix machine with at least a few hundred MByte free harddisk space and an Internet connection is all that is necessary. The J.UCS server software (Hyper-G) is available free of charge by anonymous FTP. Every J.UCS server registers as such with the IICM and then downloads each new issue of J.UCS automatically.This will be free of charge throughout 96. A nominal yearly fee to cover expenses for J.UCS will be charged thereafter. The server soft- ware remains free of charge independent of whether the subscription to J.UCS is continued into 1997 or not. J.UCS servers are encouraged to pass on their costs to users, in turn.

Users can read the J.UCS by accessing any of the available J.UCS servers. Clearly, major universitites and research organisations will be well advised to run their own J.UCS server: this way, access to the J.UCS is optimally fast, independent of network problems and the server (based on Hyper-G, a powerful hypermedia system) may well be used also for other purposes. Alternativley, a group of well-networked organisations may choose to run one joint server for reasons of economy, and still other institutions may decide to access the nearest public J.UCS via Internet.

4 The Submission Process

Papers are submitted as email or by FTP to the managing director(s) of J.UCS; initially this job will be carried out by H.Maurer, JUCS@iicm.tu-graz.ac.at. They can be submitted in a number of formats (typically as ASCII, LaTeX or RTF files as produced by most common word processing packages such as Winword or WordPerfect) according to the "instructions for authors".

They are automatically converted to Hyper-G format and sent to at least two editors who (or their designees) are refereeing the contribution. Refereeing can be done using a Hyper-G viewer that allows to insert comments at any spot but canand will be done also in a more traditional way.

Note that the referee may decide to have the contribution printed out (or may even request to have printed versions sent from the managing editor), make notes in the print-out and have someone else handle the (simple) editing with the Hyper-G viewer...or just use email to send all comments. Observe further that a Hyper-G viewer is available on most major platforms, hence referees (and readers!) of J.UCS need not change their usual "environment". Refereed papers

(or just comments and an evaluation form) are returned, including recommendations concerning publishability, via Internet to the managing editor.The managing editor notifies the author(s) accordingly. If the contribution is accepted, the author carries out whatever changes are necessary and sends the final version to the managing editor once more. The final version is, once more, converted into Hyper-G format. It is at this point only accessible to the author and the referees (if they have asked to check the final version). After the author has potentially added some "hypertext links" (links to specific places in contributions published in J.UCS earlier) and after author(s) and referees have given their OK the paper is "finished" and appears in the next issue.

The "instructions for authors" include information on permissible file formats, on the classification and keyword scheme, on how to insert links,etc. and can be obtained by sending an email to jucs@iicm.tu-graz.ac.at with subject [format] or the word 'format' in the first line of text of the message (the rest of the messaeg is ignored).

Note that J.UCS handles text in HTF format (and allows full-text searches in such textual segments) but stores complex formulae, drawings and pictures as raster images that cannot be searched.

Having contributions in electronic form in J.UCS certainly allows for "links" in a hypertext sense to other points in the database. Links to documents already existing in previous J.UCS issues can be handled as described earlier. "Forward" links (i.e. links from a document to another one that appeared later) can only be incorporated as "annotations" or by following links backwards. The latter situation is easy to explain: suppose document y refers to the (earlier) published document x. When reading x the user is informed that "there are documents referring to x " and all of those (clearly including the y in the example) can be located with a simple command. The situation with "annotations" is similar, except that "annotations" are not contributions in a research sense but just notes concerning previous contributions. Such "notes" ("letters to the editor") go through a refereeing process much like other contributions and are added only if deemed appropriate. Thus, an annotation by an author pointing out that the result in her/his earlier contribution x has now been improved is likely to be incorporated, an annotation claiming that all of contribution x is nonsense is going to be scrutinized carefully before being added to J.UCS as annotation. When annotations have been added to a document x their existence is pointed out to the reader of x similar to the case of documents referring to x mentioned earlier.

Observe that the philosphy of links and annotations explained above brings some of the benefits of hypertext to J.UCS, yet assures that no contribution that ever enters J.UCS can be changed at a later stage. We consider this essential to have the stability in J.UCS necessary to be able to quote contributions without fear that they may change (as is happening in many other electronic information systems)!

It is finally worth mentioning that J.UCS will have an ISSN Number and its contributions will be reviewed and abstracted like contributions in other journals.

5 Future Points and Future Extensions

As J.UCS develops it is clear that additional demands will be placed on it. People will wish for other file formats to be allowed as input, will wish for further search options, still better viewers, viewers for still more platforms, the possibility for private annotations, for customization, other language options and much, much more ... including interfaces with other applications, dynamically updated glossaries or bibliographies and the like.

Many of these wishes will be implemented, we expect, on the basis of the Hyper-G interface specification and will then be added to the J.UCS. On some, like the interface with an electronic library of books, some groups are already actively working.

As has been mentioned, J.UCS will also be distributed on CD-ROM for permanent archival purposes, and J.UCS contributions can be printed out. For an electronic journal this is a severe limitation: J.UCS authors - if we forget the printing feature - could well be allowed to also incorporate animation, movies, sound, 3D scenes with direct manipulation facilities, and much more.

The J.UCS will follow such developments closely. We expect that eventually J.UCS contributions may well include material that cannot be printed, and that "eventually" will come around earlier than most of us would think.

Acknowledgment by H. Maurer

The idea for this project as described originated in discussions with my friends Cris Calude and Arto Salomaa over the last years. I have also mentioned J.UCS to many other colleagues and have to state explicitly that the idea as such is not novel at all, yet many of the details (various formats, platforms, and editors) are reasonably scary once you look at them more closely. However, having developed a multimedia system capable of handling something like J.UCS in principle a number of the persons you find on the editorial board have encouraged me to go ahead and get started. I want to thank all of them, and all who have joined the "Foundation Board" and the "Foundation Network" for their encouragement and trust. As sure as I am that J.UCS will work based on Hyper-G I am equally sure that there will be glitches, and, according to Murphy, at the worst possible moments. Please bear with me when they arise and be tolerant with some (hopefully small) problems: this is a new and exciting frontier! The editorial board is explicitly responsible only for the ideas behind J.UCS. All problems with management and software are my sole responsibility and nobody else's.

The technical side of J.UCS is looked after by Dipl.Ing.Klaus Schmaranz at kschmar@iicm.tu-graz.ac.at : if you have technical questions please do not hesitate to contact him.

A more technical version of this paper on J.UCS is [Maurer, Schmaranz 94].

Eminent computer scientists interested in joining the editorial board or organisations interested in becoming members of the "Foundation Network" are encouraged to contact Hermann Maurer at hmaurer@iicm.tu-graz.ac.at.

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6 Appendix

ACM has endorsed our use of the ACM Review Category System beginning of June 94 and is going to run their own foundation server for J.UCS as ACM. Professor Hermann Maurer Department of Computer Science University of Auckland Auckland New Zealand fax: (09) 373 7453 email:hmaurer@cs.aukuni.ac.nz ph: 3737-599 ext. 5753 (bus) 5602 (Mags Woo,Secretary)