

# Open Access Lecture Notes

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## 1. Introduction

The expansion in online information over the last ten years has been spectacular, but has been accompanied by increasing difficulty in searching and classifying the material that has been created. There are several current methods of cataloguing and archiving online material in mathematics. Preprints are now put into a number of recognized archives, while systematic lists of online and offline journals exist. There are several open access encyclopaedias of mathematics, but these have had to face two difficulties: persuading people to write articles for them and providing an appropriate level of editorial control; see [3, 8]. Both involve committing considerable amounts of time to the projects, and time is what most senior people do not have. There are also many lists of open access material, for example [5], but the current proposal envisages more sophisticated search facilities. Jim Pitman has a very ambitious plan for linking up a wide range of mathematics on the web, but this also requires very substantial editorial control; see [7].

We are concerned in this article with another large source of material, that has escaped attention: open access lecture notes kept on the authors' own web sites. In this section we explain why this resource should not be neglected, and the difficulties involved in trying to catalogue it. In the next section we describe a new portal called "Mathematics Online", which catalogues open access postgraduate lecture notes, mostly in analysis and related subjects. In Section 3 we discuss the vital question of scaling this project to cover mathematics as a whole. We also discuss how to cope with broken links.

There is clear evidence that mathematicians are much more enthusiastic about writing notes on their own favourite subject, than in submitting articles commissioned by an external editor. This enthusiasm should be exploited rather than ignored. Lecture notes may overlap to an extent than would not be appropriate in an encyclopaedia, but it is a great advantage to have access to a substantial, self-contained account of a topic that can be printed without

too great a cost. These lecture notes are almost always well under a hundred pages in length, and commercial publication would not be a viable proposition.

The enthusiasm of authors has a negative side. They need to be persuaded that putting their notes on the web does not involve a loss of ownership, and that it is a painless way of giving back to the community some part of what they have gained from the free use of systems such as  $\text{T}_{\text{E}}\text{X}$ . The process of submission also needs to involve the absolute minimum amount of trouble on their part. Both of these issues are addressed in the next sections.

Our experience is that many authors of lecture notes are not willing to put their lecture notes into permanent archives. Although they are usually written to a high standard, authors do not regard them as finished products, and often have the idea that one day they will expand them into monographs. Also they want the freedom to expand the contents of the notes as and when they wish without interference from an outside body.

The market for such lecture notes is varied, but includes many mathematicians in developing countries as well as mathematicians teaching material with which they are not very familiar. Experience shows that some lecture notes cover topics of great current interest, so they may well be valuable without reference to any lecture courses. I am convinced that this project is ready to take off, and will prove increasingly popular. As a living and slowly changing record of current interests it may well prove to be as useful as more permanent electronic records. Such a portal can co-exist with more permanent archives, with users referring to one or the other as is appropriate.

It is worth noting that in 2002 MIT launched an ambitious website called MIT Open CourseWare, which provides a wide range of undergraduate and postgraduate lecture notes based on their own courses; see [4]. This project has the support of the President of the World Bank, James D. Wolfensohn; see [6]. He commented on the relevance of this material to the African Virtual University, which at present has little mathematical material; see [1].

There are several reasons why lecture notes are now starting to appear on the web in considerable numbers. The expansion of the web is not the only cause. Most mathematics is produced using  $\text{T}_{\text{E}}\text{X}$  or  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$ , which is now accepted by most book and journal publishers. Over the last five years it has acquired several features of importance. These include: the easy incorporation of PostScript files and hence of computer graphics (this is actually more than five years old); a simple procedure for producing pdf files from  $\text{T}_{\text{E}}\text{X}$  or  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  source files, so that readers do not need special software to access the texts; a one-line command for creating internal hyperlinks (as in this document) and a less simple procedure for including external hyperlinks; the possibility of producing coloured text; and no doubt other possibilities. These have caused a change of attitude among mathematicians towards electronic publication, and the task is to impose some type of order on it.

## 2. “Mathematics Online”

The portal described has been in existence as a pilot scheme for two years under the title “Modern Analysis Online”, which has recently been changed to “Mathematics Online” (MAO); see [2]. It currently only contains material in analysis and related areas, but the same principles could apply to the whole of mathematics. The contents are sorted by MSC subject classification and within each field alphabetically by author. Most of them were found by

manual searching of well-known universities around the world. If one included all subjects we estimate that there are more than thousand volumes of postgraduate lecture notes, with lengths of between 25 and 100 pages, that could be included.

The front page of the site describes the scheme and gives access to six other pages. These are

- (1) **Contents Page:** This contains the actual links to the external web sites.
- (2) **Submissions:** This uses an electronic form. This has been made very simple so as to reduce the barriers due to inertia as much as possible.
- (3) **Terms and Conditions:** This is included for legal reasons.
- (4) **Why Not?:** An attempt to overcome resistance to submission by emphasizing that ownership and control of the notes stays with the author.
- (5) **Other Resources:** Links to various other resources. This needs more careful thought.
- (6) **Your Manuscript:** This provides optional advice about how to improve the appearance and value of a manuscript with minimal effort.

We do not give any further description of the portal, since it is available at the address above. The appearance and design are far from optimal, but that would obviously be fixed as and when the site is upgraded as indicated in the next section.

### 3. Future developments

The above portal has been run as a pilot project for two years by one person, and takes up no more than an hour per month. Developing the idea will require close attention to scaling issues. We argue that this can be achieved by using automatic systems that involve very little human intervention.

Adding items to the portal cannot be done by using robots, because of the idiosyncratic nature of authors' websites. We envisage that they be expected to fill in a very simple web form to register their lecture notes. This will result in an editor receiving an e-mail that contains the address of the website and a button to signify the editor's approval of the submission; it could also have a field in which the editor composes text to be e-mailed to the person submitting the link. Approval is intended only to confirm that the notes are indeed graduate level mathematics, and not pornography or some other topic. The editors will not be expected to exercise any further quality control. On acceptance the author will be sent an e-mail containing the address of the relevant portal page, and asked to report if there is an error.

The main problem in increasing the scale of the portal is persuading authors to submit links to their manuscripts. Current resistance is due not so much to unwillingness as to inertia or ignorance. For this reason the submission procedure must be kept as simple as possible, and the publicity given to the portal must be very effective. This would best be done by having the portal promoted at an institutional level.

Once the submission has been put into the portal, it will make automatic weekly checks that the link is functioning. If it fails then it will try several more times over a week or two in case the problem is simply that the website has crashed. After two weeks it will send an

automatic e-mail to the author, who is expected to provide this on submission, to advise him of the problem. If the e-mail address is rejected then it will seek a new e-mail address by one of a variety of methods. If several automatic attempts to contact the author fail over a month, then an editor could be contacted or the entry could be deleted.

We do not envisage that broken links will be a huge problem. The current site has had more about fifty links for two years. In that time only one broke, and that was restored within a day or two by an e-mail to the submitting author.

The entries in MAO are currently sorted by using the MSC subject classification system, and then alphabetically by author. However a mature system would be much more flexible. A search engine would sort entries using many different criteria. One of these would be the number of times that links have been viewed. This may be used as a proxy for the quality, or at least usefulness, of the lecture notes themselves; another possibility is to use a web search engine to give an opinion about the popularity of the lecture notes. The portal would have a complete copy of the MSC listing, so that users can simply go to the relevant section if desired. When authors fill in the submission form they are required to stipulate at least one MSC code, or more in order of priority, and they take responsibility for getting this right. They could also be invited to provide keywords.

There is a huge amount of low level material on the web – sites with only two or three pages of content and a large number of links to other similar sites. Such sites would be excluded. The portal would automatically check that the link was to a page that contained files of type dvi or pdf or ps whose total length was at least 25 pages. Alternatively this could be left to the editor, who would have to look briefly at the site on submission anyway.

Links to commercial or restricted web pages would also be forbidden. The portal would check that it was possible to open a dvi, pdf or ps file of length greater than 50 pages from the submitted link. Published monographs that allow the reader to download the first chapter would therefore be permitted, but this is acceptable since such a site would provide substantial real content free of charge.

It would be possible for the portal to make periodic checks not only that the link still existed, but that its form had not radically changed. This would safeguard against the remote possibility that a webpage was put to a different use after acceptance. This could be done by counting the length of the page and the number of links it contained. If these changed too much it would prompt an editor to review it.

It is clear that setting up such a system involves substantial expertise, but it is expected that once produced it will need minimal attention. This is of great importance, because active researchers do not want to spend time doing work of a routine character. The editorial work involved is at a low enough level that it could be entrusted to junior staff.

## References

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