The Future of Publishing

Some of you might be participating in the 2050 Workshop on the Past of Publishing. The workshop will be interdisciplinary, gathering scientists, librarians, historians, sociologists, and philanthropists. For three days, participants will try to unfold one of the biggest sociological mysteries of the Internet transition: how the academic world proved resilient for more than three decades to a publishing model turned obsolete overnight by the invention of a new technology.

Both this column and the "President's Message" column in this issue are devoted to the open access (OA) question. In a joint effort, we decided to share our views by providing personal answers to a set of common questions.

WHAT IS OPEN ACCESS?

Conventional publishing models provide access to an article for a fee. This fee covers the production cost of the article and possibly generates a revenue. With the advent of the Internet, it became technically possible to post an article online, making it freely accessible to every reader. The fundamental question of OA is how to reconcile the conventional model of publishing with this new possibility. The ultimate goal of OA initiatives is to make scientific publishing free *both* for authors and readers while covering the cost of publication by different means.

IS OPEN ACCESS POSSIBLE?

One of the first historical examples of transition to OA has been in the Machine Learning community [1]. *Journal of*

The many benefits of open acess.

Machine Learning Research (*JMLR*) was established as an OA alternative to the journal *Machine Learning*. In 2001, [under the initiative of Editor-in-Chief (EIC) Michael Jordan], 40 editorial board members of *Machine Learning* resigned, saying that in the era of the Internet, it was detrimental for researchers to continue publishing their papers in expensive journals with a paywall. The OA model employed by *JMLR* allows authors to publish articles for *free* and retain copyright, while archives are *freely* available online. For the past 20 years, *JMLR* has comfortably established itself as the prime journal of the field and as the flagship of a vibrant research community.

IS OPEN ACCESS DESIRABLE FOR THE IEEE CONTROL SYSTEMS SOCIETY?

There are many reasons for a scientific society to value OA. OA considerably increases the impact of a publication. It also contributes to diversity and equality by providing access to the journal to any researcher and any author regardless of their institution. Most importantly, it creates a vibrance and a sense of community similar to the open source initiative, which is, in many ways, analog to OA in the area of software development. Last but not least, OA raises the scientific level of a journal by attracting a larger flow of submissions, which

translates into higher selectivity for a fixed journal budget.

Besides the many positive scientific reasons for the IEEE Control Systems Society (CSS) to value OA, there is also an evolutionary necessity for any publisher to adapt to survive. If a growing number of competing societies and journals embraces OA models, how long can the conventional publishing model survive? If a scientific society relies on publishing to balance its budget, how long can it survive without adapting to OA?

IS THE "AUTHOR-PAYING" MODEL AN ADEQUATE RESPONSE TO OPEN ACCESS?

Many publishers (including IEEE) have responded to the OA initiative by implementing an "author-pays" publishing model: The author of a publication can choose to make its article OA for a fee. The new CSS journal, *IEEE Open Journal of Control Systems*, is an example of author-paying (AP) model.

While some journals (such as *Public Library of Science*) have adopted an exclusively AP model, most scientific societies and commercial publishers have adopted a mixed model, allowing authors to choose between the conventional model (reader-paying) or the AP model.

By making publications freely available online, the AP model is partially addressing the objectives of OA. However, this model comes with severe limitations and is increasingly questioned. From a financial viewpoint, research institutions and funding bodies are concerned that the AP model has increased rather than decreased the cost of publishing. In a mixed model, institutions need to maintain their journal subscriptions while bearing the extra cost of the AP fees.

Paradoxically, from a scientific viewpoint, the AP model has also aggravated rather than remedied the shortcomings of the conventional model. The AP model has aggravated the *inflation* of conferences and journals, each of which creates extra load for editorial boards and the community of peer reviewers. It has aggravated *inequality*, as an increasing number of institutions are opting out of unaffordable bundled digital libraries. Those institutions are often the ones with less revenue from research grants, thus barring OA to their authors for their own publications. Last but not least, the AP model creates considerable pressure on the publisher in favor of quantity rather than quality. A strong peer-review system is hardly sustainable when each accepted paper translates into a revenue and each rejected paper translates into a loss.

In short, many of the benefits of OA have not been observed with the AP model. The AP model was perhaps part of the transition to OA but is unlikely to provide a sustainable and desirable OA model.

HOW CAN A SCIENTIFIC SOCIETY TRANSITION TO OPEN ACCESS?

Successful OA models are likely to arise from decentralized and bottom-up, rather than centralized and top-down, initiatives. To date, the *JLMR* story remains one of the most striking successes of OA. It is the result of an individual initiative, raising initial support from a few colleagues and institutions and quickly becoming transformative for an entire research community. It has survived and flourished for 20 years. In contrast to the AP model, it has provided a vivid illustration of all of the benefits that can be expected from OA.

Replicating the *JMLR* model might appear overly ambitious or not entirely appropriate to the financial model of a scientific society. Two recent OA initiatives deserve special attention from the CSS community.

The Association for Computing Machinery (ACM), the largest educational and scientific computing society (approximately one-tenth of the IEEE in size and budget), recently launched a transition to OA, pledging to remove any paywall for the entirety of its publications by the year 2025. The ACM model [2] is simple and transparent. The initiative started with a detailed report [3] of the publishing costs and revenues of the society (an annual budget in the range of US$25 million, including both conference and journal publications). Subsequently, ACM developed a business model that will guarantee that revenue directly from institutions.

The basic idea of this tier model is that the subscription fee of an institution is based upon the number of papers published by its authors. Most publications emerge from a handful of wealthy institutions. This top-tier category sees a strong increase in its subscription fees, justified by the single fee to read and publish. For such institutions, the increased subscription fees are largely compensated by putting an end to the "double tipping" of the AP model. In contrast, the broad basis of institutions that subscribe to read but contribute few articles to the publications see their fee drastically diminished. Those institutions pay less because they publish less. The number of institutions that have embraced the proposal is growing by the day [4]. It is likely that this OA initiative will be a large success, making ACM the first scientific society to transition to a fully OA model.

An even simpler OA model to implement is the Open to Subscribe model [5], recently initiated by Annual Reviews. Annual Reviews is a nonprofit journal publisher of 51 authoritative review series in specific disciplines in science

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and social science, including *Annual Review of Control, Robotics, and Autonomous Systems* as one of its most recent launches (2018). Open to Subscribe is an evolutionary response to OA. A given journal pledges to remove its paywall at the beginning of a given year, provided that the level of subscriptions does not drop below the number necessary to balance the journal budget. If this happens, the paywall is reinstalled in the following year. The model is so simple to implement that it is hard to believe that it can work. Yet, the results of the model are so far very encouraging [6]. Pilot journals that experiment with the model have seen a surge in the number of downloaded articles, an increase in their revenues, and (above all) an en-thusiastic response from the research community. If you can spare a 15-min lecture, there is no better advocate for the model than its initiator, Richard Gallagher, EIC of Annual Reviews [7].

CONCLUSION

One thing that is still unclear about the 2050 Workshop on the Past of Publishing is the format of its proceedings. However, it is reasonable to hope that it will be OA, free for authors, and free for readers. We can also hope that the control community will play its role in the transition to OA. Bottom-up initiatives succeed when they benefit to the group. Decentralized control, adaptive control, and evolutionary game theory have no secrets for our community. Make it happen!

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Suitcase Words

Minsky labels as suitcase words terms like consciousness, experience, and thinking. These are words that have so many different meanings that people can understand different things by them. I think that learning is also a suitcase word. Even for humans it surely refers to many different sorts of phenomena. Learning to ride a bicycle is a very different experience from learning ancient Latin. And there seems to be very little in common in the experience of learning algebra and learning to play tennis. So, too, is Machine Learning very different from any sort of the myriad of different learning capabilities of a person.

The word "learn" can lead to misleading conclusions.

—Rodney Brooks, "Machine Learning Explained," rodneybrooks.com/forai-machine-learning-explained/.