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Artificial Intelligence

Editorial

The journal *Artificial Intelligence* published its first issue in the spring of 1970, and is now publishing its 100th Volume. It was the first journal in the field and it remains the field's most important expression for quality research. However, the journal *Artificial Intelligence* has not simply published quality research papers that were submitted to it. It has played a key role in defining and shaping the field through a variety of mechanisms: for example, regular, timely, publication of special issues (most of which were commissioned by the Editorial Board); publication of technical AAAI Presidential addresses and Research Excellence Award Lectures presented at IJCAI; and the innovative Book Review and Research Notes Sections. Artificial Intelligence is a young, and rapidly moving field, and the Journal has moved to keep up with it and to guide it.

The world of publishing is also changing rapidly, in response to equally rapid developments in computing and communications. The first and most immediate example of this changing scene is the World Wide Web; but the Web is the first, not the last, word in qualitatively enhanced communications. These changes have profound implications for the world of publishing. To better serve the readers of *Artificial Intelligence*, now and in the future, we need to take timely and well thought-out steps to leverage new technologies and distribution mechanisms. Elsevier Science, in consultation with the Editors, and the Editorial Board is doing so. Though the medium of publishing the Journal is doubtless important, we, the Editors, are also concerned about the message—the content, breadth and importance of the work we publish. For this reason, it seems timely that we write an Editorial about how we see the subject of AI developing.

First, we reaffirm our belief in the fundamental tenet of AI: computation, with its rich and developing store of ideas concerning process and representation, provides the most powerful approach to date for understanding and creating intelligence.

We are gratified to note that AI has become truly established as a discipline. Its ideas and techniques are now widely understood, appreciated, and used in a wide diversity of disciplines, for example philosophy, psychology, linguistics, chemistry, biology, medicine, and engineering. Philosophy, for example, has thankfully tired of the Turing Test debate and has become more interested in the AI ideas of representation of knowledge, and calculi of reasoning. In biology, the Human Genome Project would be unthinkable without the tools and ideas of AI. Even in engineering, where could formerly be found many of AI's most steadfast academic skeptics, concepts such as neural network and expert system controllers, constraint propagation for mechanism design, and

“smart” signal processing are all well-established and AI has a good reputation. From its very beginning, AI has enjoyed a symbiotic relationship with the most advanced ideas in computing science. Symbolic computation, garbage-collection, extended ideas of object-oriented programming, RISC architectures (Alto, LISP machines, . . .), and the importance of declarative representations of knowledge are just some of the many contributions AI has made to Computing Science. Conversely, whenever novel ideas have been developed in computing science, most recently neural networks, they have been embraced by AI.

Outside academia, increasingly one finds policy makers in government, administration, and business understanding and recommending AI approaches to problems. Such progress is reflected in the AI applications conferences, where each year contributions arising from AI solutions can be measured in many millions of dollars, in lives saved, or qualitatively but equally beneficially. AI works, and is recognizing as working. Indeed, it is hard to recall that as little as 15 years ago AI was often regarded by today’s business enthusiasts as a fringe activity having little of relevance to the real world! Similarly, it is hard to remember that just 20 years ago the Lighthill Report in the UK savagely attacked AI and recommended that funding be sharply curtailed!

This increasing recognition of the intellectual and practical worth of AI is indeed gratifying. We are sure that there will be equally positive stories to tell about future innovations in AI.

As Editors of the journal *Artificial Intelligence*, we have seen many changes in the field through the papers that we receive for review. It is interesting to compare a recent random sample of *Artificial Intelligence* journal papers (or, indeed, a random sample taken at any recent major AI conference, say IJCAI, ECAI, or AAAI) with what a similar random sampling might have produced 20 years ago.

First, a number of what were then regarded as central/key subdisciplines of AI are regrettably far less prominent today. We refer to subjects such as Natural Language, Vision, Robotics, and Speech. Some of the major AI advances in the 1970s were in these subdisciplines. Consider some examples: Hearsay and Harpy were major outputs from the ARPA Speech Understanding Project; the natural language understanding programs of Winograd, Wilks, Schank and their colleagues had a major impact on AI and on computational linguistics; Waltz’s program to interpret line drawings of shadowed scenes was a key contributor to constraint propagation and to vision; while the hand-eye work at Stanford and MIT made many contributions not least to systems architecture of intelligent systems.

Second, applications of AI tend nowadays to be presented at specialized conferences that run parallel to AI “theory” conferences, and are reported in application-specific journals. Increasingly, it seems to be implicit that an application should necessarily follow the development of a technique. This is in sharp contrast to the situation 20 years ago, where demanding applications were the inspirations and focus of developments of new general purpose ideas and tools. Consider that A* search and the STRIPS reasoning system were developed to enable Shakey the Robot to navigate its environment; Dendral introduced the ideas of practical heuristic search including blackballs on structure linking, and it also led to expert systems such as MYCIN. Hearsay was the origin and exploiter of blackboard architectures.

Third, papers are nowadays often far more mathematical than formerly and far more resemble the papers of mathematicians, replete as they are with theorems and proofs. That they are detailed, precise, and technical is laudable; that they are often presented with little or no mention of implementation or experimentation is a more dramatic change.

The journal *Artificial Intelligence* does **not** believe that key subdisciplines such as natural language, vision, robotics, and speech can be allowed to drift away. To this end, we have, over the past few years, commissioned special issues on Planning and Scheduling, Computer Vision, Natural Language, Interaction and Agency, Empirical Research in AI, Scientific Discovery, The journal *Artificial Intelligence* **continues to welcome** high quality contributions in all these fields, for it believes that any one of these subdisciplines needs to be firmly rooted in AI and that AI needs to keep abreast of these aspects of intelligence if it is to develop in a balanced way.

The journal *Artificial Intelligence* does **not** believe that groundbreaking applications should rely on yesterday's AI! Challenging applications such as the design of complex artifacts, financial information services, interplanetary robotics, and intelligent vehicle and highway systems will depend crucially on state-of-the-art AI and will contribute as good as they take. The journal *Artificial Intelligence* **continues to welcome** contributions that develop innovative ideas about computational intelligence within the context of a demanding and inspiring application.

The journal *Artificial Intelligence* believes that the reasoning for intelligence in the face of complexity is inevitably a dynamic process and that implementation is as important as formal theorems. It **continues to welcome** contributions that demonstrate the growing power of machines to reason and learn about complexity.

AI has already made a major impression in many fields. It has matured into a coherent discipline with a panoply of exciting ideas that are fundamental to understanding intelligence. The journal *Artificial Intelligence* looks forward eagerly to continuing its leading role in helping to shape that future.

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Editors