

## IARIA Fellow

### Summary of Accomplishments

Hermann Kaindl's major contribution is a wide spectrum of research in requirements, systems and software engineering, HCI and artificial intelligence.



### Accomplishments

After 24 years of industrial experience, Hermann Kaindl (HK) moved in early 2003 to academia as a full professor, where he is responsible both for research and teaching. He was also elected as a member of the University Senate of the Vienna University of Technology. He has been leading many research and software development projects.

Based on his extensive empirical investigations of heuristic search techniques in his early research, HK co-developed a computer chess program. It competed at two World Computer Chess Championships (sponsored by the ACM), ranking in the upper half of the competition. Insights gained from this more empirical work led HK to theoretical results for several algorithms computing exact minimax values in terms of their pruning efficiency. Based on his research on the benefits of minimaxing, HK gave the most plausible theoretical explanations to date of why minimaxing actually works in programs playing computer chess and similar games.

In the context of problem-solving heuristic search, HK demonstrated why bidirectional heuristic search had not been successful. (The assessment of this kind of search has been incorrect for a quarter of a century after its first publication, since there was a major misunderstanding about the reasons behind.) Based on his improved understanding, HK developed a new and successful approach to bidirectional heuristic search.

HK did both theoretical and applied work on knowledge-based systems, where he mainly took a software engineering approach and finally established metrics. Using insights from artificial intelligence theories that he combined, he defined a scenario-based design process. It is useful for both software engineering and human-computer interaction.

HK integrated functional and scenario-based approaches (including use cases) to requirements engineering, and provided a theoretical basis for the integration. Based on it, use cases and more traditional writing of functional requirements can be applied together successfully in practice.

HK defined a practical approach to combining requirements definition and object-oriented (OO) analysis as the basis of a novel method for requirements engineering. He led the development of an innovative software tool supporting this method, and consulted for real-world applications.

HK explained the real difficulty of the transition from OOA to OOD. Recognizing the differences between what is modeled in the analysis and design phases can lead to a better development approach.

In the context of reengineering, HK showed that traces to the reverse-engineered requirements and design information can facilitate new software development within the same reengineering effort. An important finding was a distinction between immediate and long-term benefits of traceability.

HK combined theories from human communication for a new dialogue metamodel. From such models, user interfaces for diverse devices can be automatically generated. An early version of this approach already led to a real-world application in a museum. This approach is currently extended for use in multimodal communication with and between semi-autonomous robots.

All this work is published in peer-reviewed scholarly and professional journals as well as conference proceedings. Overall, HK published more than a hundred refereed papers and three books.

HK is an IEEE Senior Member since 1999, and an ACM Distinguished Scientist member since 2008. He is on the executive board of the Austrian Society for Artificial Intelligence. HK served as a guest editor of a special section of the CACM and a program chair for two scientific conferences. He chaired several panels at major conferences such as CHI and OOPSLA. He gave many tutorials at conferences in different fields, such as IEEE RE'01, RE'02, RE'03, RE'04 and RE'08, ACM OOPSLA'06 and '07, IFIP Interact'07, AAAI'06 and '07, as well as IARIA ICONS'07, ICCGI'08 and ICSEA'08.

HK has been teaching as an (external) lecturer at the Vienna University of Technology from 1984-1989, and after that as an adjunct professor, before he took the position of a full professor as a faculty member.