Alfred S. Gilman

Education:
B.S. in Mechanical Engineering, the Cooper Union, 1963
D.Sc. in Control Systems, Washington University, 1972

Employment (latest first):
Independent consultant, 1996-present.
Coordinating teams negotiating formats and protocols for sharing knowledge.

Intermetrics, Inc. 1975-1996.
Navigation algorithms, aerospace software, software development software, and software for the computer aided design and testing of electronics.

MIT Lincoln Laboratory, 1972-1975.
Systems analysis for communications, sensor, and control systems including surveillance for air traffic control, orbit planning and station-keeping for satellite communication, and spread-spectrum modulation schemes for low probability of detection and high interference resistance.

Sheng Kung Hui Middle School, Hong Kong, 1965-1967.
Mathematics and science teacher in Forms 2 and 3 (corresponds to grades 8 and 9 in U.S.)

Relationship to proposed research (earliest first):

Summary: Dr. Gilman has a distinguished history of accomplishment in aerospace and engineering design software. He is currently active in the areas of universal design of human/computer interfaces, particularly World Wide Web media. Fortuitously, Dr. Gilman's experience with aerospace navigation algorithms provided a practical introduction to networks of autonomous agents. Likewise his experience with software and languages for the design of computer chips provided a similar practical introduction to knowledge representation. His recent experience working with the World Wide Web Consortium on the accessibility of web media suggests that academic research is required to establish a better theoretical foundation for practice in this area. The evolution of the Document Object Model in this industry group will most likely not be accessible-by-design unless the industry consortium process is supported with suitable academic research on the orientation knowledge requirements of navigable information spaces.

Math/Science Teacher: Before entering graduate school, Dr. Gilman taught mathematics and science in junior high school grades for two years. Trying to coach concept-poor students through a great leap forward in abstraction put intense pressure on his own mathematical formation, and helped him obtain a fellowship for graduate study. This left him with a firm grasp of the principle that to understand knowledge one must observe those who are learning it.

Aerospace Engineer: Dr. Gilman was the lead programmer for the navigation software that operated the first user equipment to be flown in the proof-of-concept flight testing of the Global Positioning System. Based on this success he won for his company the role of defining system requirements and evaluation methods for a related function, the "relative navigation" function in the Joint Tactical Information

Computer Scientist and Software Manager: Computer aided design software offered yet another application of network concepts. Dr. Gilman was later the deputy program manager and system engineer for the development of VHDL, the VHSIC Hardware Description Language. The specific application of VHDL is the design of logic circuits and systems. It is used to describe logic at levels ranging from small functions performed by macrocells within a chip to multi-board systems. It is a common mode of expression used by design tools from competing vendors. It has expresses how the circuits behave based on a "communicating sequential processes" execution model. Each VHDL process operates autonomously; control must be explicitly modeled by the signals that communicate the control.

VHDL logic designs can be very complex, and iterative, top-down design is often employed. VHDL includes data abstraction capability so that the overall block diagram topology can persist as a design progresses through this process of incremental refinement to more detailed designs. To support the incremental design process, it was desired to be able to not only retain but exchange intermediate states of partially known designs. This forced strong emphasis on modular description and multiple, but interoperable, levels of design abstraction.

One of Dr. Gilman's duties as deputy program manager was to coordinate the documentation of the "design library," a repository for design work in progress with a public Application Programming Interface (API) so third-party tools could participate in the design process. He also coordinated the training of third-party tool writers in this API, which was exported from a core set of tools developed by Intermetrics. Teaching others this API forced the team to deal in greater depth with the issues of data abstraction and knowledge representation in the design and test process for electronics. To help the industry capitalized on the potential of this technology he served for several years as vice-chair of the Design Automation Standards Subcommittee (now Committee) in the IEEE Computer Society. VHDL is a living, growing phenomenon in the design of digital electronics. To track ongoing progress start at <http://www.eda.org/>.

Later, DARPA funded work to extend design languages into the domain of analog electronics via the MHDL (MIMIC Hardware Description Language) project. This intensified the knowledge representation challenges. For analog circuits, the designer moves back and forth between equational descriptions of passive circuits and functional or algorithmic descriptions of active circuits. Integrating descriptions framed in these two views is a knowledge representation challenge that had to be addressed in MHDL. For recent research that extends the progress made in the VHDL and related projects see the DARPA programs "Intelligent Information Integration" and "Evolutionary Development of Complex Systems."

Accommodation Analyst and Mediator: Recently, Dr. Gilman has served as chair of a working group in the Web Accessibility Initiative of the World Wide Web Consortium which reviewed technical specifications for the basic Web hypertext and stylesheet languages (HTML 4.0 and CSS 2.0). This team was charged with reviewing these draft specifications for support of access by people with disabilities. The accessibility benefits of this review are reflected in the W3C website at <http://www.w3.org/WAI/#Resources>. He continues to serve as co-chair of the related "Protocols and Formats working group" in the WAI. As the web media migrate from HTML toward XML, some of the assurance of standard semantics is eroding, and it is not clear that accessibility can be assured without a stronger layer of knowledge requirements above and beyond the bare syntax of XML. From this experience Dr. Gilman has become an advocate in this community for knowledge engineering as a discipline that can help to extract simple but effective access accommodations and automate them in a way that makes their satisfaction affordable and sustainable.