

Can We Build a Better Voting System?



THE VOTING TECHNOLOGY PROJECT (VTP), a joint endeavor between Caltech and MIT, was established in December 2000 to prevent a recurrence of the problems that threatened the 2000 U.S. presidential election. While legal battles were still being fought in Florida, Caltech President David Baltimore and MIT President Charles Vest stepped forward to mobilize a team of computer scientists (including Professor Shuki Bruck of Electrical Engineering and Computation and Neural Systems), human factors engineers, mechanical engineers (including Professor Erik Antonsson of Mechanical Engineering), and social scientists (including Professors R. Michael Alvarez and Thomas Palfrey of Humanities and Social Sciences) to respond to the need for strong academic guidance in this intersection of technology with democracy.

After an initial six months of intensive work, the VTP recently issued its first report on the current state of the reliability and uniformity of U.S. voting systems, made concrete proposals to improve the election process before the next national election, and

offered guidance in setting the direction of future technological innovation. This report concluded that between 4 and 6 million votes were “lost” in the 2000 election. This staggering find was widely reported by the media. The seriousness of the situation was underlined by Baltimore and Vest in their preface to the report:

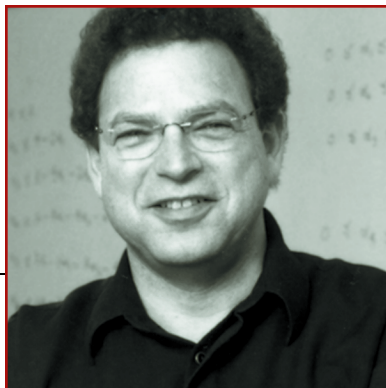
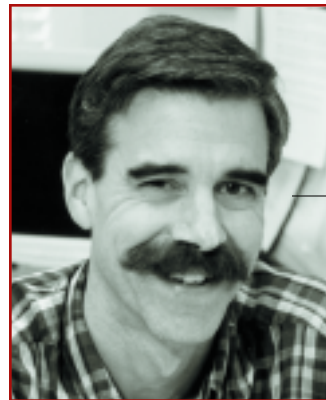
“In the last election, Americans learned that at the heart of their democratic process, their ‘can-do’ spirit has ‘make-do’ technology as its central element. For many years, we have ‘made do’ with this deeply flawed system, but we now know how poorly these systems function. Until every effort has been made to ensure that each vote will be counted, we will have legitimate concerns about embarking on another presidential election.”

The technological heart of the report describes a new framework by which to design voting systems. This framework is called AMVA—A Modular Voting Architecture—and separates the process of (1) recording a voter’s choices on a physical recording

device (playfully called a FROG) and (2) casting the vote using the FROG as input. The separation of these two processes is crucial, and is seen as the key to reduce, even eliminate, a number of problems that plague current technology. These problems include security threats posed by complex electronic voting machines, the decline in openness and public control, the need for improved ballot designs, the need for more voter feedback so voters can catch errors, and obstacles to creating independent audit trails, especially on electronic machinery. The actual design and structure of the FROG—which is more than a ballot—may be different from say, state to state, but each FROG would capture information on the voter's choices, the precinct voted in, the official who signs in the voter, and the form of the ballot. It is deposited and becomes part of the audit trail when a voter casts his/her vote. "Building the dream voting machine is not what we were after," explains Shuki Bruck, Gordon and Betty Moore Professor of Computation and Neural Systems and Electrical Engineering, "instead, we focused on redesigning the voting process to facilitate innovation and competition in the creation of high-quality solutions that will help in making every vote count."

Erik Antonsson, Professor of Mechanical Engineering, observes however, that "Contrary to intuition, the patchwork of voting systems in use throughout the country has eliminated systematic fraud, and this should serve as a caution to developers of new systems to maintain this robustness."

"The atrocities of September 11 reinforce the need for a voting system that the electorate trusts, and underscores the importance of the work of this project." —[Professor Erik Antonsson](#)



"On a personal level, the Voting Technology Project was a unique opportunity to understand and contribute to an important multidisciplinary project that combines social, political, technological, and business issues." —[Professor Shuki Bruck](#)

Visit the VTP website <http://www.vote.caltech.edu> to learn more about this work or download the complete July, 2001 report.