Exact Regenerating Codes for Byzantine Fault Tolerance in Distributed Storage

Yunghsiang S. Han

Department of Electrical Engineering

National Taiwan University of Science and Technology

Abstract Due to the use of commodity software and hardware, crash-stop and Byzantine failures are likely to be more prevalent in today's large-scale distributed storage systems. Regenerating codes have been shown to be a more efficient way to disperse information across multiple nodes and recover crash-stop failures in the literature. In this talk, we present the design of regeneration codes in conjunction with integrity check that allows exact regeneration of failed nodes and data reconstruction in the presence of Byzantine failures. A progressive decoding mechanism is incorporated in both procedures to leverage computation performed thus far. The fault tolerance and security properties of the schemes are also analyzed.

Biography Yunghsiang S. Han received B.Sc. and M.Sc. degrees in electrical engineering from the National Tsing Hua University, Taiwan, in 1984 and 1986, respectively, and a Ph.D. degree from the School of Computer and Information Science, Syracuse University, NY, in 1993. He was with Hua Fan College of Humanities and Technology, National Chi Nan University, and National Taipei University, Taiwan. From August 2010, he is with the Department of Electrical Engineering at National Taiwan University of Science and Technology.

Dr. Han's research interests are in error-control coding, wireless networks, and security. Dr. Han has conducting state-of-the-art research in the area of decoding error-correcting codes for more than sixteen years. He first developed a sequential-type algorithm based on Algorithm A* from artificial intelligence. At the time, this algorithm drew a lot of attention since it was the most efficient maximum-likelihood decoding algorithm for binary linear block codes. Dr. Han has also successfully applied coding theory in the area of wireless sensor networks. He has published several highly cited works on wireless sensor networks such as random key pre-distribution schemes. He also serves as the editors of several international journals.

Dr. Han was the winner of the Syracuse University Doctoral Prize in 1994 and a Fellow of IEEE.