Statement of research interest (Thang N. Nguyen)

My current research interest is in the ecology of software and its impacts to e-business in the digital economy. More specifically, I am interested in the characterization (structure, function and relationship) of software automation in a spectrum from the microscopic level to macroscopic level. The spectrum consists of bit streams (in the sense of Holland’s genetic algorithm, 1992), primitive data structures, complex data structures, programs, OO foundation classes (containing OO classes), programs, components, frameworks, product family, application systems, and business ecosystems (in the sense of Moore’s business ecosystems, 1993). The above enumeration of items is considered respectively as biologically analogous to particles, atoms, molecules, genomes (containing genes), cells, tissues, organs, organ systems, population, community, and ecosystems. The ecology of software is as real as the natural ecology, and it currently impacts e-business environment. In particular, I am exploring two major characteristics of e-business software automation: fully-connectedness and self-organization.

I was drawn into the ecological thinking of business after reading an article by Moore – Predators and Prey (1993) and his book – The Death of Competition (1996). I also have been fascinated by the work of numerous notorious researchers, at the biological level, on biologically-inspired systems (genetic algorithm, genetic programming, cellular automata, evolutionary computing, and ALife). The above and other research topics such as building robust autonomy and robust intelligence in e-business software, as well as the arguments by those who think that pursuing a study of an open and interconnected Internet as a possible self-organizing system is delusional, represent a real challenge to me.

Through (1) my partial course work in MSOR (early 1970’s) during my MS program in Information and Computer Science at Georgia Tech, (2) my training during my Ph.D. years at GMU on SE/IS, AI/KE, reasoning under uncertainty (late 1980’s) and my dissertation on intelligent robotics as a symbolic-numeric integration, (3) my 25 years of professional experience in the private sector in automated operations and business-IT integration, from operating systems to OO application development to enterprise IT architectures (Zachman, De Boever), or Gartner’s service-oriented architecture, including emerging technologies (such as XML, J2EE, JMX, message queuing, web services), and (4) my readings of von Bertalanffly (general system theory), Capra (web of life), Kauffman (complexity theory), Langton (Alife), Ray (synthetic biology), Maturana and Varela (autopoiesis), Starling (wisdom of the body) and others, I have attempted a formulation toward a bio-ecological theory for e-business software automation. The formulation is based on two postulates: (1) software as a living species, and (2) there exists a software automation continuum from the bit streams that make up executable computer programs (biologically analogous to living cells) to e-business software systems (ecologically analogous to natural ecosystems) that drives e-commerce of all kinds on the fast growing Internet in the digital economy. As applications, my primary focus is to address (1) fragmentation in e-business integration, (2) software autonomy (collaboration between perception and action) and intelligence (collaboration between perception and decision making) in addition to intelligent agents and data mining/business intelligence, (3) e-business crisis problem solving, and eventually (4) e-business software automation impact to the digital economy. My methods include the adaptation of known methods and techniques in evolutionary computing and ALife and that of previous ecological approach to modeling e-business. Of particular, I expect that software may reach robust autonomy and robust intelligence as required by the Internet if it is built from the bottom up such as in living species through its embryonic development from fertilization to embryo, to newborn with OO extended foundation classes as genomes and guided by a combination of bottom-up/top-down approaches during its subsequent growth and development.