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Advances in intelligent design of structures

We are facing a knowledge economy and digital era. What is the process of an engineering design? It can be understood as the designer under the design requirements “to make a series of decision under uncertain design environment” in order “to do the right design”; “to do the design right” as well as “to get the design right implementation”. The designer needs to go through system analysis; i.e., to review past design alternatives in their mind (experiences) and make a comparison among them for satisfying design requirements; “To do the right design”. Secondly, “To do the right design” is guaranteed by engineering rules and specification as the design constraints and the third one “To get the design right implementation” means the design should be well treated through acceptability to the related stakeholders. The intelligent design methodology needs to follow designer’s intelligence during design processes through simulation by artificial intelligence technology, among them, first of all is the designer’s fuzzy reasoning processes of comparing his past design samples (experience) in their mind with the assigned design requirements. According to above statements, the available Computer Aided Design (CAD) nowadays is no longer CAD, but CAG, for there will have no design parameters from the fuzzy reasoning by computer, but the heuristic considerations from the designer and input to the drawing machine for the engineering drawing. As the emergence of digital era, characterized by “Softening of theory” and “Hardening of the experience”, the theorem are going more and more softened by uncertain mathematics such as fuzzy logic for accommodating to the changeable environment; on the contract, the experiences are going more and more hardened and stored in computer as the knowledge base. It provides the theoretical basis and possibility of realizing intelligent CAD (as we prefer to ICAD), a conclusion can be made that Fuzzy-AI model is suitable for intelligent design.

Biography

Lin Shaopei is the Professor at Civil Engineering Department in Shanghai Jiao Tong University; Fellow and Chartered Engineer of the Institution of Civil Engineers (ICE, UK) and CEO of ICE China Education and Training Center. He has been the Chair of AI application panel, Chinese Society of Civil Engineering. His award includes the Government Special Allowance of the State Council PRC in 1991, the Lifetime Achievement Award of PMI (China) in 2012, the Excellent Service Award of ICE in 2015 and the Service Achievement Award of PMI GAC in 2016. He has had a long-term experience in engineering research during past 60 years and had been Research Professor in Cornell University, USA and Hong Kong University and published eight books and nearly 200 papers in domestic and international journals, conferences covering a variety of disciplines, including engineering, economics, system engineering, computational mechanics, IT & computer application, fuzzy mathematics and artificial intelligence applications, etc.

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