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Computer-Aided Engineering

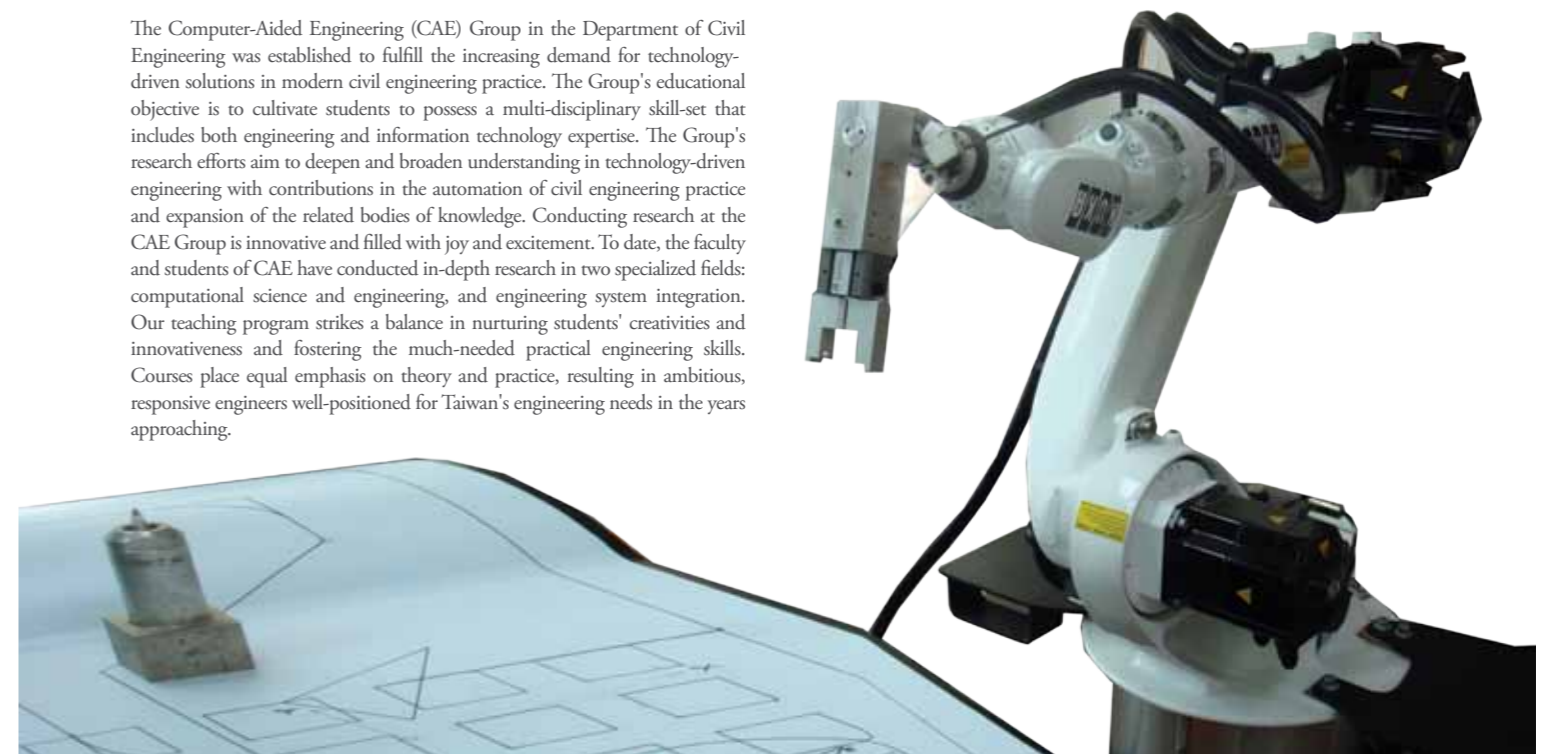


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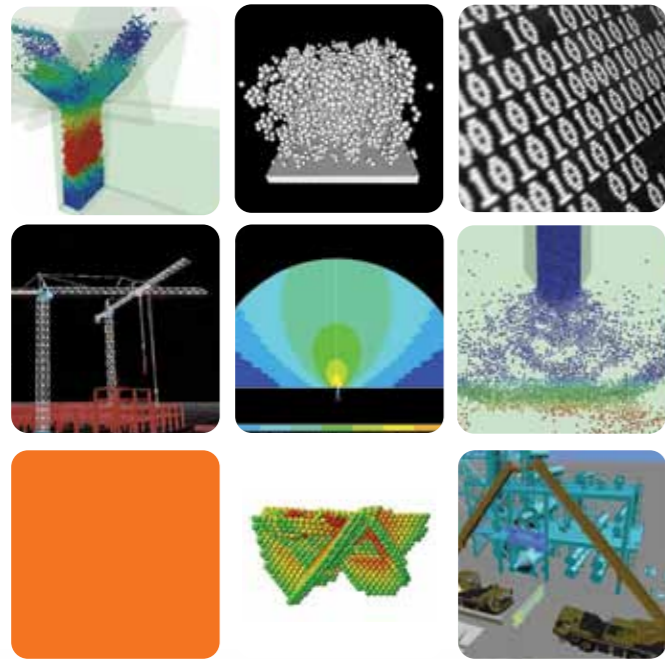


Introduction

The Computer-Aided Engineering (CAE) Group in the Department of Civil Engineering was established to fulfill the increasing demand for technology-driven solutions in modern civil engineering practice. The Group's educational objective is to cultivate students to possess a multi-disciplinary skill-set that includes both engineering and information technology expertise. The Group's research efforts aim to deepen and broaden understanding in technology-driven engineering with contributions in the automation of civil engineering practice and expansion of the related bodies of knowledge. Conducting research at the CAE Group is innovative and filled with joy and excitement. To date, the faculty and students of CAE have conducted in-depth research in two specialized fields: computational science and engineering, and engineering system integration. Our teaching program strikes a balance in nurturing students' creativities and innovativeness and fostering the much-needed practical engineering skills. Courses place equal emphasis on theory and practice, resulting in ambitious, responsive engineers well-positioned for Taiwan's engineering needs in the years approaching.



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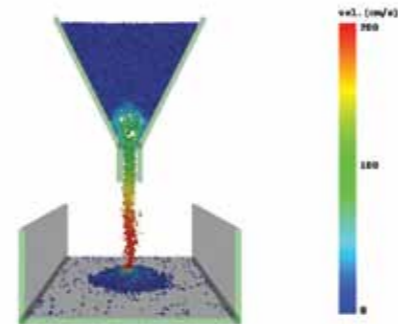


Research Areas

The research interests of the CAE Group are on developing and utilizing advanced IT and frontline technologies to solve challenging engineering problems. The research is usually multi-disciplinary and cutting-edge. The current research can be categorized into two areas:

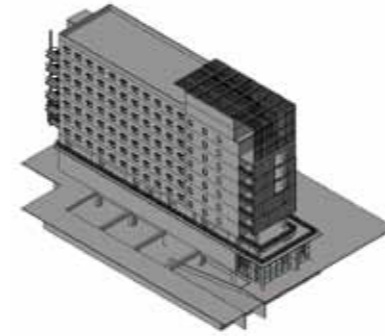
(1) Computational Science and Engineering

Computational science and engineering research uses the high-speed and high-capability computing power to solve engineering problems. The complexities of dynamics and physics behind these problems are studied through modeling and simulation. In the 21st century, computer simulation, theoretical science and experimental science have become indispensable strengths with which to promote technical innovation. We cooperate with researchers who possess theoretical or practical expertise, to seek breakthroughs collaboratively. Our current research focuses on simulating multi-scale and multi-physics problems. Multi-scale simulation aims to link the microscopic, often the concern of physicists and chemists, with the macroscopic, the main concern of engineers. Multi-scale simulation allows engineers to leverage cutting-edge nanotechnology and biotechnology discoveries and adopt them to innovate in engineering practice. On the other hand, multi-physics simulation is closely related to the simulation of advanced engineering systems (for example, micro-and nano-electromechanical systems, smart materials and structure systems). In the simulation of these systems, various physical actions (such as mechanical motions, electromagnetic actions and photoelectric actions) affect each other and need to be considered concurrently.



(2) Engineering System Integration

Engineering system integration research aims to solve engineering problems by using advanced computational and robotics techniques. We research and develop various applied engineering systems to improve the quality and safety of products in the construction industry, which, in turn, improves the sustainability and end-user service of projects. Research in this area requires multi-disciplinary skills such as engineering problem analysis, man-machine interface design, program structure analysis and conducting surveys. It is also required to integrate advanced information, telecommunication, control, and management technologies to develop innovative systems with practical value. Current research topics include: building & infrastructure information modeling and management, engineering knowledge management, engineering monitoring & control systems, decision-support systems, construction process simulation, construction equipment automation, computer-aided engineering education and virtualization of real-life applications.



Research Facilities

The Group provides the staff and students with an open and interactive environment for research and study. We also value team-work, cross-disciplinary research and development, and utilization of advanced IT and state-of-the-art technologies to solve all kinds of challenging engineering problems. Our department is equipped with a high-speed computing unit, which includes computer clusters, database servers and high-speed Internet connections. Researchers are able to simulate multi-scale and multi-physics problems and explore the mysteries of various engineering problems by using the high-speed computing unit. The department also founded an engineering visualization laboratory (V-Lab), a robotics laboratory (R-Lab) and a molecule enabling mechanics and physics laboratory (M-Lab). The V-Lab is equipped with advanced graphics workstations, game consoles and multi-touch panels for conducting research in Building Information Modeling (BIM), virtual/augmented reality, game-based simulation and intelligent living spaces. The R-Lab includes a KUKA KR16 arm and two Mobile Robot P3AT and 25 LEGO 9797 educational sets. It supports research in construction automation, intelligent engineering instruments, engineering safety equipments and railway automation. The M-Lab is equipped with cutting edge nanomanipulators and measurement platforms to characterize engineering devices powered by biomolecular interactions at nanoscale.



Faculty

Professor Shang-Hsien Hsieh

Engineering Information & Knowledge Management, Computational Mechanics, Parallel & Distributed Computing, Computer-Aided Education

Associate Professor Chuin-Shan Chen

Multi-scale Modeling, Multi-physics Modeling, Nanoengineering and Nanomechanics, Biosensing, Computational Mechanics, Software Development

Assistant Professor Shih-Chung Kang

Robotics in Construction Automation, Intelligent Construction Machinery, Computer Graphics, Human-Computer Interaction, Robotics, Engineering Education

Professor Hui-Ping Tserng (by courtesy)

Construction Estimating & Scheduling, Project Performance Evaluation, Construction Automation & Robotics

Professor Feng-Tyan Lin (by courtesy)

Urban and Regional Studies, Geographic Information Systems, Computer-Aided Design

Adjunct Faculty

Professor San-Cheng Chang

Finite Element Analysis, Computer Graphics, Computer-Aided Design

Assistant Professor Jen-Diann Chiou

Patent Analysis and Retrieval System, Intellectual Property Management System

