

Smart Shopping Cart (Siemens)

The Smart Shopping Solution team is composed of 17 students from Peking University, University of Toronto, and the National University of Singapore. We work on providing a solution in the form of a mobile application and a smart shopping cart in order to improve the shopping experience of Chinese hyper-supermarket shoppers. Our design is based on customer and market research. We try to realize our specialties in designing the product and building out a real prototype to further demonstrate our design.

Automatic Pattern Recognition of Blood Cells (Siemens)

This project is to conduct a feasibility study of an automatic pattern recognition process for blood cells using a novel lensless imaging system. The novel imaging system prototype, named ePetri, is based on the Sub-pixel Perspective Sweeping Microscopy (SPSM). We were expected to make the imaging system be suitable for an image-based hematology application. Our work includes sample preparation, automatic pattern recognition, and sample disposal.

Stack-Type Electrostatic Actuator (Siemens)

Electrostatic actuator is a kind of device to convert electrostatic energy into motion. For its high efficiency and sensitivity to distance, it is an amazing micro device, and robotics is one of its hottest application aspects. Compared to traditional micro electrostatic actuators, the stacked-type electrostatic actuators enables us to get larger stroke without decreasing of generative force. In the presentation, we will present our research of stacked-type electrostatic actuator in centimeter scale, which mainly discusses the measurement of single-layer actuator and possible structure of multi-layer actuator.

Shale Gas Production Theory and Case Analysis (Siemens)

We researched the process of oil recovery and shale gas recovery and compare the difference between conventional and unconventional gas reservoir and recovery technologies. Then we did theoretical analysis on the shale gas production. According to the production theory, we assumed that we can promote the production of shale gas by control the well according the condition of well. The application of optic-fiber sensors is a good way to 'watch' the well so as to improve production.

Indoor Locator System (Boeing)

We investigated several approaches of locating indoor and chose wifi signal as our indicator of position. We devised a procedure to plot wifi characteristic maps and find location on it, managed to establish communication between client and server. Finally we developed our Android application out of a set of existing open source projects. Our mobile application works well and the Java libraries we wrote can be further used and developed by others.

The Future Business Value for Social Media Marketing (Boeing)

To look into the future business value of social media marketing, the project begins with investigating the features of two mainstream social media in the China market. Utilizing the results gathered, we focus on the potential market of social media marketing particularly for products that haven't involve Internet marketing in its past marketing activities. Then as a case sample, we consider possibilities to market Boeing products through social media in the future.

Effective Debris Removal during Buffing (Kinergy)

In a buffing machine, the friction between buffing wheel and copper frame generates a huge amount of copper debris, which

moves according to the air flow in the chamber and eventually deposits in the machine, decreasing working efficiency. Students from PKU and NUS conducted numerical simulation of the multiphase flow pattern in the space and physical experiments, both of which cast light upon how to ameliorate the dust accumulation.

Vent Dehumidification System for Aircraft Cabins (Bombardier)

When the Bombardier Dash-8 plane is boarded, moist air enters and is sealed inside the plane. The trapped moist air condenses in the under-cabin and may corrode the electrical components. To reduce condensation accumulation in the airplane, we developed the vent dehumidification system, which condenses and lets out required amount of water vapor by cooling the moist air. We then build the prototype and it works very well.

Sonification of Well-Log Data (Schlumberger)

During drilling process in oil well, operators must pay great attention to the data of multiple wells on screen. A mentally exhausted operator may oversee important signals and make skewed judgment. We estimate the different situations of wells by complex data and translate them into different sounds. Operators could judge the situation of drilling depending on sounds. Therefore, they will be released from the heavy work and make less mistakes.

Fluid Dynamics of Karst Reservoirs (Schlumberger)

We designed a simulator that is able to simulate the multiphase flow problem in Karst Reservoir. The characteristics of Karst Reservoirs are that lots of caves and fractures in the system, creating complex connectivity. Since the matrix is made of carbonate, the

matrix permeability is considerably low. We use Cellular Automata with probability rules to simulate it, for it resembles the reality. Moreover, we solve the global balance problem to make the simulator more physical.

Cave Modeling and Fractal Simulation (Schlumberger)

A new method for estimating oil recovery factors from cave systems is developed. It provides - for the first time - a statistical model for distribution of recovery factors of single caves based on geomorphology. Also the link between irregular geomorphology of caves and limited oil recovery due to attic traps in the cave ceiling is established. More important is that it can be integrated in future karst reservoir studies and can contribute improving production results.

Research on Filtration and Cleanup Process in Formation Testing (Schlumberger)

Two specific processes in well drilling and testing- "filtration" and "clean-up" are studied through numerical simulation method. Filtration happens due to the invasion of the miscible filtrate- a mixture of drilling fluid and mud, while "clean-up" describes the process that when sampling fluid, it takes time to eliminate the portion of the filtrate and get high-quality samples. Several parameters, including filtration time, reservoir conditions and mudcake quality are discussed in the analysis and a comparison is made between the efficiency of several probes with different shapes and arrangement.

项目展示安排 (2013年6月3日)

理教 414 教室 (Siemens China)

Adjudicators: Fu Ling, Zhou Zhen Sheng, Chen Haifeng, Chen Pu

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|--------------------------|-------------|
| Smart Shopping Solutions | 19:00-19:45 |
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| Automatic Pattern Recognition of Blood Cells | 19:45-20:10 |
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| Shale Gas Production Theory and Case Analysis | 20:10-20:35 |
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| Stack-Type Electrostatic Actuator | 20:35-21:00 |
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理教 416 教室- Various Sponsors

Adjudicators: Feng Tao, Wang Jinzhi, Zou Ruqiang

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| Effective Debris Removal during Buffing (Kinergy Singapore) | 19:00-19:30 |
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| Vent Dehumidification System for Aircraft Cabins (Bombardier Canada) | 19:30-20:00 |
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| Indoor Locator System (Boeing China) | 20:00-20:30 |
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| The Future Business Value for Social Media Marketing (Boeing China) | 20:30-20:45 |
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理教 418 教室 (Schlumberger China)

Adjudicators: Ken Hauser, Zhang Xinrong, Wang Qining

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| Research on Filtration and Cleanup Process in Formation Testing | 19:00-19:30 |
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| Fluid Dynamics of Karst Reservoirs | 19:30-20:00 |
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| Cave Modeling and Fractal Simulation | 20:00-20:30 |
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| Sonification of Well-Log Data | 20:30-21:00 |
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感谢教务部、工学院对课程和项目的支持，感谢各参与企业和合作学校的指导和帮助！

课程组织团队

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课程团队欢迎即将大四的本科生选修 2013-2014 年度工程顶点设计 (Capstone Design) 课程！

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Design Night 2013

北京大学工学院

2013年6月3日



北京大学工学院



Schlumberger

SIEMENS

2012-2013 学年，北京大学工学院工程顶点设计 (Globex Design) 课程与西门子 (中国)、波音、斯伦贝谢、庞巴迪 (加拿大)、Kinergy (新加坡) 等国际知名公司以及新加坡国立大学、加拿大多伦多大学合作，选拔北京大学优秀的大四本科生，在企业工程师和大学教师共同的指导下，完成了对企业有实际应用意义的工程项目。Design Night 2013 将为这些学生展示他们的研究和创作提供平台！