

**5<sup>th</sup> International Symposium on Nanomanufacturing: Nanopositioning Design Competition – 2<sup>nd</sup> prize winner**

The 5th International Symposium on Nanomanufacturing (ISNM-5) was hosted by the Singapore-MIT Alliance in Singapore from 23<sup>rd</sup> – 25<sup>th</sup> January 2008. The ISNM-5 was created to foster interactions between the well-established manufacturing community and the emerging nanotechnology community. During the ISNM-5, the pre-symposium professional course focusing on Nanopositioning for Nanomanufacturing Equipment and Instrumentation was conducted by Professor Martin Culpepper from Massachusetts Institute of Technology (MIT), USA. Additionally, Professor Culpepper organized the Nanopositioning Design Competition as shown in Figure.1 which was open to students who attended the professional course.



**Figure.1:** ISNM-5: Nanopositioning Design Competition.

The nanopositioning design competition involved various representative teams from MIT, National University of Singapore (NUS) and Nanyang Technological University (NTU). The representative team of NUS shown in Figure.2 was made up of 7 NUS students; 6 of them are graduate students namely Mr. Tan Yen Kheng, Mr. Krishna Mainali, Mr. Andi Sudjana Putra, Mr. Nie Maowen, Mr. Zamani Mohsen and Mr. Chua

Teck Wee and 1 undergraduate student, Ms Ju Lijing. The NUS team was led by NUS professors namely A/P Sanjib Kumar Panda, A/P Tan Woei Wan and A/P Tan Kok Kiong.



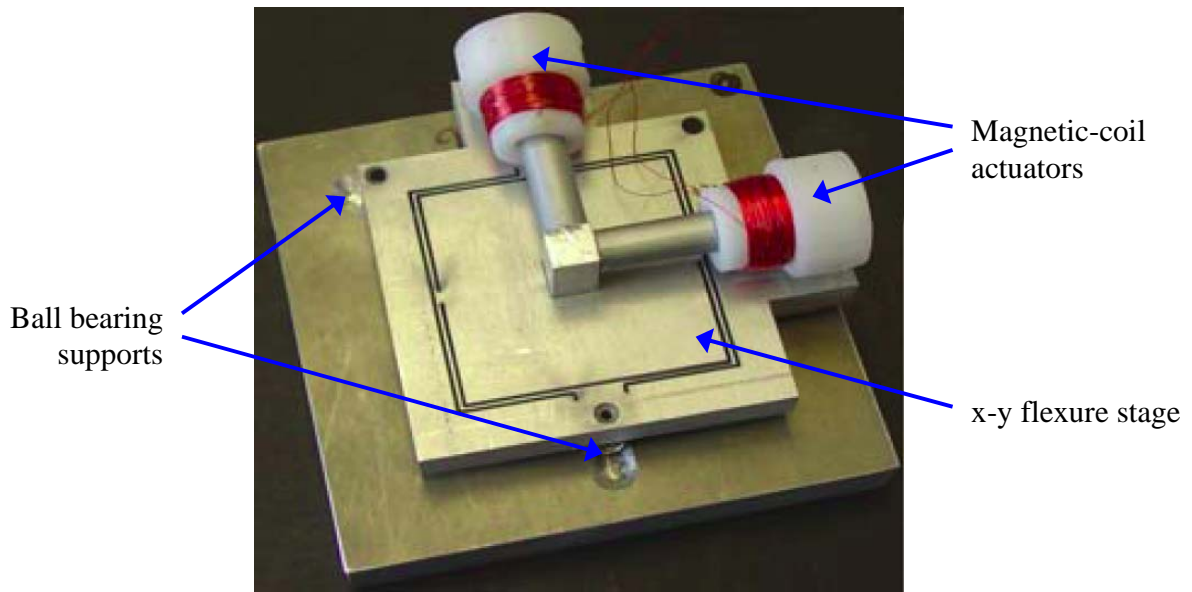
**Figure.2:** Starting from left – Mr. Zamani Mohsen, NUS; Mr. Krishna Mainali, NUS; Mr. Nie Maowen, NUS; Professor Martin Culpepper, MIT; Mr. Tan Yen Kheng, NUS; Ms Ju Lijing, NUS; Mr. Chua Teck Wee, NUS; Mr. Ryan, MIT. Sitting in front – Mr. Andi Sudjana Putra, NUS.

Prior to the nanopositioning design competition, the pre-symposium professional course was organized and it comprised of a half-day lecture on the fundamentals of nanopositioner followed by hands-on experimentation to learn practical design of x-y nanopositioner. The goals of the course are as follows: -

- i. Teach the fundamentals of nanopositioner design via short lectures
- ii. Provide the participants with the opportunity to construct a nanopositioner
- iii. Learn practical design/fabrication/use knowledge via hands-on experimentation

Nanopositioner as shown in Figure.3, which consists of an x-y flexure stage driven by two magnet-coil actuators and tracked by two inductive sensing systems in both x and y axes, are finding wide applications recently in the precision engineering industries.

Nanomanufacturing instruments/equipments have nanositioners, which are often electromechanical systems, to position minute parts/probes with nanometer level of resolution. These machines require special knowledge and care in their design, fabrication and usage.



**Figure 3:** Nanositioner.

The nanositioning design competition was judged based on two categories namely the written quiz and the racing competition. The written quiz focused on the theoretical design considerations, while racing competition highlighted the design realization. Students were given one and a half day to finalize the design. Finally, the racing competition took place at Grand Copthorne Waterfront Hotel, Singapore. Students were given a 30x 30 micron maze that was projected upon the screen via digital projector and then they must drive their virtual vehicle through the maze without hitting any of the maze walls. Figure.4 shows the competition scene where NUS team driver Mr. Andi Sudjana Putra was trying to navigate the virtual vehicle to the finishing point in full concentration.



Figure.4: Competition between NUS team and another team.

After several competing rounds among the various teams, NUS team had shown excellent performance standing first in the written quiz category and as a whole second place in the overall performance.