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**JSME DESIGN AND SYSTEMS DIVISION:
WHAT WE HAVE DONE AND WHAT WE HAVE NOT**

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ABSTRACT

The Design and Systems Division (DSD) of The Japan Society of Mechanical Engineers (JSME) and the Computers and Information in Engineering Division (CIE) of ASME cover many common technical fields and interests. In this paper, the history and activities of JSME DSD are first outlined. Then, the author's experience on the research, development and commercialization of a stereolithography system is described as an example of the cooperation between academia and industry in JSME DSD. As concluding remarks, the future directions of JSME DSD are discussed.

INTRODUCTION

The Japan Society of Mechanical Engineers [1] has 38,635 members (as of the end of February 2005) and is one of the largest academic societies in Japan. JSME now has 21 technical divisions, and the Design and Systems Division (DSD) covers research areas such as CAD, CAM, CAE, optimization, concurrent engineering, design education, kansei engineering, rapid prototyping, human interface, virtual reality, artificial intelligence, system planning, and technology management. In this sense, JSME DSD and ASME CIE [2] cover many common technical fields and interests.

In the following sections, the past, present and future of JSME Design and Systems Division are described so that the two divisions will successfully cooperate to be at forefront regarding relevant research and education issues internationally.

JSME DESIGN AND SYSTEMS DIVISION

JSME started its division system in 1987. DSD was established by academic and industrial members in technical fields such as design engineering, system engineering and product design and development. Prof. Shinsuke Akagi (Osaka University, at that time), who was the Executive Board Director

of JSME, made intensive efforts to establish DSD, and Prof. Naomasa Nakajima (The University of Tokyo, at that time), Prof. Shuichi Fukuda (Tokyo Metropolitan Institute of Technology), Prof. Hiroshi Yamakawa (Waseda University), Prof. Michitaka Hirose (The University of Tokyo), Prof. Tetsuo Tomiyama (The University of Tokyo, at that time), Dr. Koichi Ootomi (Toshiba), Prof. Masataka Yoshimura (Kyoto University) and Prof. Koetsu Yamazaki (Kanazawa University) have all served as previous Division Chairs. Chair and Vice Chair for 2005 are the author and Prof. Kikuo Fujita (Osaka University), respectively.

JSME individual members and companies can register themselves to up to five divisions, and Table 1 shows some statistics on the 21 divisions such as the numbers of registered members and companies who selected each division as their 1st, 2nd or 3rd choice (only 1st choice for student members). Although being middle or average in size among the JSME divisions, DSD should be above average in companies' interest. DSD has been playing very important roles in the research and education of design engineering, system engineering, and product design and development.

EXAMPLE OF COOPERATION BETWEEN ACADEMIA AND INDUSTRY

In the fields of design engineering and system engineering, not only academic activities but also the cooperation between academia and industry is very important. As an example of such cooperation, the author has studied a new stereolithography system and commercialized it as an actual product.

In conventional stereolithography, solid objects are fabricated in a liquid photopolymer resin. In contrast, in the new stereolithography method proposed by the author, solid objects are fabricated in solid photopolymer resin, eliminating the need for the "support" structures for isolated or overhanging

Table 1 JSME division statistics (as of the end of February 2005)

No.	Division Name	No. of regular members (Rank)	No. of companies (Rank)	No. of student members (Rank)	Web top page access (Sept. 2004 - Apr. 2005) (Rank)
1	Computational Mechanics	5,277 (5)	48 (13)	66 (6)	161,479 (6)
2	Bioengineering	1,927 (19)	11 (19)	62 (7)	337,512 (1)
3	Materials & Mechanics	5,551 (4)	80 (7)	119 (2)	61,105 (15)
4	Materials & Processing	4,863 (8)	127 (1)	60 (8)	131,648 (7)
5	Fluids Engineering	6,773 (1)	102 (3)	159 (1)	316,913 (2)
6	Thermal Engineering	6,136 (3)	66 (8)	90 (5)	197,244 (4)
7	Engine Systems	3,036 (15)	49 (12)	53 (9)	79,948 (11)
8	Power & Energy System	4,942 (7)	57 (11)	14 (17)	174,790 (5)
9	Environmental Engineering	4,062 (10)	81 (6)	17 (16)	43,182 (16)
10	Dynamics, Measurement & Control	6,414 (2)	112 (2)	104 (4)	235,671 (3)
11	Machine Design & Tribology	3,116 (14)	58 (10)	39 (10)	68,575 (13)
12	Design & Systems	4,162 (9)	85 (5)	21 (14)	103,183 (9)
13	Manufacturing & Machine Tool	3,637 (12)	100 (4)	24 (12)	66,034 (14)
14	Manufacturing Systems	2,544 (16)	62 (9)	10 (18)	19,762 (20)
15	Robotics & Mechatronics	5,078 (6)	47 (14)	112 (3)	118,507 (8)
16	Information, Intelligence & Precision Equipment	3,886 (11)	39 (16)	18 (15)	41,693 (17)
17	Industrial and Chemical Machinery & Safety	1,972 (18)	44 (15)	1 (20)	29,176 (18)
18	Transportation & Logistics	3,484 (13)	26 (17)	29 (11)	NA* (NA*)
19	Space Engineering	1,829 (20)	11 (20)	23 (13)	94,594 (10)
20	Technology & Society	2,406 (17)	13 (18)	4 (19)	69,395 (12)
21	Law & Technology**	134 (21)	1 (21)	0 (21)	22,160 (19)

* Using a web server outside JSME. ** Since April 2003.

shapes. A Japanese resin company read a newspaper article on this study, became interested and contacted us. This company developed a special sol-gel transformable photopolymer resin, which enables the efficient utilization of our fabrication process [3]. After further improvement of the method, system and materials, our research results were used in the commercialization of the stereolithography system SolidJet SJ-200P by Denken Co., Ltd., Japan (<http://www.denken-eng.co.jp/>) in June 2001. Our cooperation with the company is still ongoing [4].

FUTURE OF DESIGN AND SYSTEMS DIVISION

The research and development described in the previous section is just one example of many other successful activities performed by JSME DSD members. There might be, however, some issues to which we put more effort as follows.

- The number or size of division activities is insufficient from both academic and industrial viewpoints when we consider the growing importance and necessity of design engineering and system engineering. For example, the numbers of participants of JSME DSD annual conferences are 257 (Nov. 1998, Tokyo), 271 (Nov.1999, Osaka), 175 (Jan. 2001, Tsukuba), 148 (Nov. 2001, Kagawa), 278 (Nov. 2002, Tokyo), 209 (Oct. 2003, Kanazawa), and 157 (Nov. 2004, Fukuoka). We should attract more attention and interest of both academia and industry so that the number of participants continuously increases or is constantly large.

- The numbers of presently active division members and conference participants from industry are much lower than those from academia. Since design engineering and system

engineering should contribute to society and industry, we must exert more effort or develop a more effective framework for the promotion of participation in the division activities from industry and academic-industrial cooperation.

- As indicated in Table 1, JSME DSD might be below average in students' interest and participation among the 21 divisions. Therefore, we must exert more effort or develop a more effective research and education framework for informing students of the importance and how interesting design engineering and system engineering can be as technical fields.

- Presently, design and system technologies are becoming more and more international. Although JSME DSD has already some international activities, the number and scale of international cooperation, such as this JSME DSD panel in the CIE conference, should be increased.

REFERENCES

- [1] <http://www.jsme.or.jp/English/>.
- [2] <http://divisions.asme.org/cie/>.
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