

## **Conference Report for the Royal Academy of Engineering International Travel Grant 04-882**

The 23<sup>rd</sup> International Modal Analysis Conference (IMAC) provided the usual environment for those in the modal analysis field to discover new progress, put forth their own studies and to discuss with others the usefulness and future direction of current work. Further to this, this year's conference focussed largely on the topic of Structural Health Monitoring, that is to say the study of how the vibration characteristics of a structure can be used to infer potential damage to it, which is also my area of interest. Although I have previously attended an IMAC, it was this fact that encouraged me to be present this year and I found it to be worthwhile. Additional to the parallel conference sessions, there was a keynote presentation and guest talk on Structural Health Monitoring and many of the papers presented had this theme in mind.

In fact, I found that having attended last year and having my supervisor with me this time put me in good stead in terms of talking to many people in the same field and setting up acquaintances. Indeed, I had the opportunity to discuss my own work and received useful feedback both following my presentation and outside the parallel sessions. This will hopefully help me focus in the final stages of my Ph.D. research.

Having a little experience from the previous IMAC, I had drawn up a schedule, based on a brief reading of the papers, of which presentations to attend across the sessions. Although this was eventually not absolutely adhered to, it was useful in not missing out on particularly interesting and valuable talks. With two of us there this year, it was possible to spread ourselves across a number of good presentations. One experience that stood out was that presentations can wrongly be deemed relevant based on reading the abstract or a brief reading of the paper itself – a thorough examination of the paper is necessary but this is completely impractical considering the number of submissions to an international conference.

My own presentation was placed in the last session on the final day. I was a little disappointed with the attendance as compared to what it had been during the week. However I did manage to receive some useful comments. I felt that my talk had raised some interesting points that people do not usually consider when conducting structural identification (the determination of structural properties through inspection of vibration characteristics). In fact, I found that in other presentations people were identifying problems that I had actually overcome in my work, but given the scheduling of my talk they did not attend. Some were quite interested in some phenomena I showed experienced by the natural frequencies of some three-dimensional trusses and suggested ways in which such phenomena could be anticipated mathematically<sup>†</sup>.

The conference helped to strengthen and make new acquaintances. Those strengthened were with the dynamics groups at the universities of Bristol and Sheffield. There were many people I met of a similar age who had vaguely similar interests. I met the head of a Canadian Space Agency laboratory in Ottawa who had people working on antennae trusses and who was happy for me to pay a future visit should the opportunity arise.

It seems as if the main areas of current interest are in the uncertainty of modelling structural aspects, e.g. unaccountable joint properties. There seems to be growing interest shown by certain industries in the practicality of Health Monitoring; over the two years I have many attendees from areas such as the automobile and

aeronautics industries and also from space agencies. In what is an already well established field, there seem to be a number of areas which could still prove worthy of research including output-only damage detection (monitoring a structure without driving it but instead utilisation the response due to ambient excitation), health monitoring of structures other than civil engineering structures (e.g., aerospace, aeronautic and marine). The expositions and receptions provided an opportunity to see the latest technology offered by companies, including laser vibrometers, accelerometers and analysis software. However, I don't see that there can be any revolutionary advance in modal analysis itself, but perhaps there can be useful instances of its application. Indeed, this is where I hope I can make some contribution with my thesis. It was useful to see current trends in research in order that my own research so far could be put into perspective in terms of practicality, usefulness and originality. I hope to make the most of the experience to better my thesis and keep in mind current motivations in the modal analysis community.

I am certainly pleased to have presented at IMAC XXIII and have found it a fruitful visit. I believe it is important to maintain the United Kingdom's presence in what is largely an American-based modal analysis community and I hope to make more contributions in the future. I have also found that a conference is much more than just presenting one's own work and hope to uphold contact with some of the modal analysis community I met there.

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<sup>†</sup> The phenomena is eigenvalue loci veering (c.f. 'On a curve veering aberration,' *Journal of Applied Mathematics and Physics (ZAMP)* **25** (1974) 99-111, for example); the suggestion was to monitor the condition of 'A'-matrices approaching the veering event, which had previously not been considered.