

60th ESGI

EUROPEAN STUDY
GROUPS WITH INDUSTRY
IN PORTUGAL

13th - 19th April 2007

Instituto Superior de Engenharia de Lisboa



PT
MATHS
IN

rede portuguesa
de matemática
para a indústria
e inovação

Historical Note

European Study Groups with Industry (ESGI) originated in Oxford in 1968, under the name of Oxford Study Groups with Industry. Since then, the concept has been adopted by other countries and has proved particularly effective in creating links between mathematicians and industry in Europe.

Among different methods to create collaborative links between mathematicians and industrialists devised in different countries, the Study Group format has become an internationally recognised problem-solving forum for knowledge transfer [1]. Industrialists bring a problem to one of these week-long brain-storming workshops which are attended by a group of mathematicians with varied expertise. By the end of the week a mathematical approach to the problem has been identified and a strategy for further work can be devised.

Study groups have attracted companies from all sectors and of all sizes, including household names such as Philips, Unilever, IBM, or Jaguar. The workshops also provide a convenient and low-risk method for Small and medium-sized enterprises (SMEs) to access academic expertise. Both the number and diversity of problems addressed is impressive.

The first study group to be hosted in Portugal, the 60th edition of the ESGI series, came about as a result of the chance encounter of several people at the meeting of the Portuguese Mathematical Society that took place at the Instituto Superior de Engenharia de Lisboa (ISEL) in 2006. The study group itself took place approximately one year later, also at ISEL, and counted with the collaboration of several British specialists including John Ockendon FRS, the Research Director of the Oxford Centre for Industrial and Applied Mathematics [2] and one of the mathematicians with more study groups experience. [3] Since then, several dozens of companies, from SMEs to multinationals, have experienced this model with surprising results. On the academics and researchers side, hundreds of scientists had been participated on the workshops, contributing to find new solutions to company's challenges, enriching their scientific knowledge by exchanging new ideas with colleagues from different areas, and sometimes, getting new paths to their scientific research.

Find more and get enrolled at the Portuguese Network of Mathematics for Industry and Innovation (PT-MATHS-IN) webpage.

1. Mathematics and Industry website: <http://miis.maths.ox.ac.uk/how/>
2. Oxford Centre for Industrial and Applied Mathematics: <https://www.maths.ox.ac.uk/groups/ociam>
3. Pedro Freitas, European Study Groups with Industry in Portugal: importing a forty year old concept, 25th CIM Bulletin, December, 2008, <http://www.cim.pt/files/publications/b25.pdf>

working groups

CHALLENGE 1

industry_ **Confidential**
sector_ **Hospitality and Tourism**

A Stewart platform, also known as a hexapod positioner, is a kind of parallel manipulator using an octahedral assembly of struts. A Stewart platform has six degrees of freedom (x , y , z , pitch, roll, & yaw). There are six independently actuated legs, where the lengths of the legs are changed to position and orient the platform.

The forward kinematics problem: given the leg lengths, find the position and orientation, velocity and acceleration of the platform. The inverse kinematics problem: given the position and orientation, velocity and acceleration of the platform obtain the legs lengths dynamics.

CHALLENGE 2

industry_ **BRISA SA**
sector_ **Transport**



The BRISA problem was to calculate the real time travel information using the Via-Verde (VV) technology (floating data) and automatic data for the area defined by the triangle A5 Lisboa-Cascais and A9 Estádio-Queluz.

To solve the problem we will be able to make use of the large amounts of traffic data that will soon become accessible electronically in real time; indeed there are two different information sources producing different data for the same object and context. There is a tremendous demand for simple information concerning just the travel-time for a single origin-destination and service level for a motorway section. It was suggested that we should use a Hybrid Traffic Flow Modelling to cope with this challenge.

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