Program

	Monday	Tuesday	Wednesday	Thursday	Friday
8:45 – 10:15 (1.5h)	**Kinematics** Lecture Speaker : S. Caro	**Kinematics** Plenary lecture Speaker : M. Husty	**Dynamics & Control** Plenary lecture Speaker : A. Müller	**Advanced Control** Lecture Speaker : A. Chemori	**Cable-Driven Parallel Robots** Plenary lecture Speaker : J-P. Merlet
10:15 – 10:45	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
10:45-12.15 (1.5h)	**Dynamics** Lecture Speaker : S. Briot	**Control** Lecture Speaker : A. Chemori	**Design** Lecture Speaker : O. Company	**Cable-Driven Parallel Robots** Lecture Speaker : M. Gouttefarde	**Performance indices** Lecture Speaker : S. Krut
12:15 – 14:15	Lunch	Lunch	Lunch	Lunch	Lunch
14:15 – 15:45 (1.5h)	**Introduction to ADAMS/Simulink** Simulation lab 1	**Project** Simulation lab / Experiments Lab	**Industrial Issues** Plenary Lecture Speaker : M. Bouri	**Project** Simulation lab / Experiments Lab	Round table
15:45 – 16:15	Coffee break	Coffee break	Coffee break	Coffee break	**Farewell Reception**
16:15 – 18:15 (2h)	**Introduction to ADAMS/Simulink** Simulation lab 2	**Project** Simulation lab / Experiments Lab	**Social event**	**Project** Simulation lab / Experiments Lab	

Admission

The number of participants is restricted to 30. Priority will be given to Ph.D. students and Post-docs from the European Community but a significant number of researchers and professionals, as well as students from extra-EC countries will be accepted.

The registration includes two steps, a preregistration before the 14th of February 2016, where a scientific committee will select the candidates based on their CVs and send a confirmation as soon as possible. Accepted participants should proceed to final registration by February 28th, 2016 (www.lirmm.fr/pkm-2016/registred.html).

The lodging expenses and the meals will be supported by the organizers thanks to sponsor funding and completed by the registration fees of the participants. Participants must cover their own travel expenses.

Contact

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Spring School On Parallel Robotics PKM 2016

March 14-18, 2016
Montpellier (France)

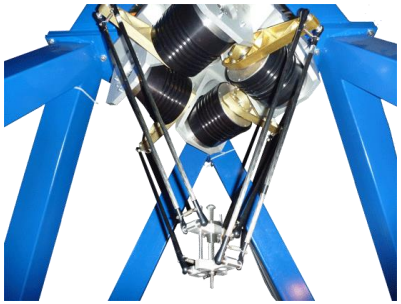

Image: VELOCE PKM ©: LIRMM

Coordinated by
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www.lirmm.fr/pkm-2016

ANR ARROW, Université de Montpellier
Pôle Viaméca, Ecole doctorale I2S

Parallel Kinematic Systems

Control and mechanical Robotics community have devoted a huge research effort on parallel kinematics systems in the past four decades. The interest was motivated by a clear breakthrough compared to conventional serial robot architectures such as anthropomorphic, SCARA or gantry robots. Parallel kinematics systems have demonstrated higher performances in:

- dynamic capabilities in terms of high accelerations (up to 1000 m/s^2 accelerations have been reached by prototypes, pushing the limits of the mechanics, control and actuators),
- high payloads where hexapod systems can lift today several tons and position them accurately with six degrees of freedom,
- increased stiffness.

Scientific community has addressed many research topics. This work was mainly specific and as an example, we can cite in an unsorted manner: kinematics, dynamics, singularities, type-synthesis, dimensional synthesis, control, simulation, calibration, identification, design, technology, performance indices, reconfigurable devices and experiments.

A good control of these points is requested to obtain a convincing running prototype with potential applications in industry as a special machine or as a commercially available product.

As a short list of products that have reached the industrial market, we can mention:

- Hexapods or hexapod-like robots (also known as Gough, Stewart or Gough-Stewart platforms). Among them we can mention some products from PI, Symétrie company or Fanuc,
- Delta or Delta-inspired robots, licensed to ABB (Flexpicker) and now whose patent has entered the public domain. As a consequence, this kind of robot is available from several robot manufacturers (Fanuc, Codian Robotics, SIG Pack Systems, Panasonic…),
- Tricept (Neos Robotics) and Exechon (Exechon AB),
- Quattro (Adept).

Indeed, it is worth to notice that despite the huge research effort devoted to this domain, only few products are available on the market. The main explanations lie on one hand in the fact that such robots can seem complex and require a big research investigation an on the other hand that academic research is split into specialized domains. Moreover, when prototypes or demonstrators are built, the goal is to validate theories through experiments and not to convince industrial partners for future products or applications.

Nevertheless, some demonstrators are built in that way and allow meeting industrial applications. On a research point of view, theory has to face today's state of the art technological limitations in several points like:

- Industrial control systems,
- Active and passive joints integration,
- Collision avoidance.

The goal of this spring school PKM 2016 is to share the knowledge on parallel kinematics machines design, modelling and control during a whole week, targeting realistic prototypes to face real problems met in the industry.

The courses are divided in lectures, plenary lectures, experiment labs and simulation labs. They are addressed to PhD students, post-docs and researchers already involved in the area or interested in parallel kinematic machines. Basic background in mechanical, computer science, control and electrical engineering is recommended.

Content

Different session formats will be planned:

- Lectures by the members of the ANR ARROW project consortium,
- Plenary lectures by invited speakers,
- Project sessions with experiments,
- Simulation sessions.

The topics tackled during the sessions are:

- Kinematics,
- Dynamics,
- Design,
- Performance indices,
- Control,
- Simulation (with Matlab/Adams coupling),
- Special sessions on cable driven parallel robots.

Invited lecturers

Chosen among the most well-known experts worldwide, the lecturers have a significant theoretical and practical background in parallel kinematic mechanisms communities:

Jean Pierre Merlet, INRIA, France
Andreas Müller, Johannes Kepler University Linz, Austria
Manfred Husty, University of Innsbruck, Austria
Mohamed Bouri, EPFL, Switzerland
Stéphane Caro, Sébastien Briot, IRCCyN, CNRS, France
Sébastien Krut, Ahmed Chemori, **Olivier Company, Marc Gouttefarde,** LIRMM, UM/CNRS, France

Lectures and school materials

All lectures will be given in English. The lecturers' slides will be available online at the time of the class. *The students are advised to bring their own laptop with a running Matlab version and a "student version" of ADAMS software.*

ECTS

The 36-hour courses of the Summer School will be accredited by the Doctoral School on Information, Systems and Structure (I2S) of the University of Montpellier (a Doctoral School in the French Universities manages the Ph.D. degree). 5 ECTS credit points will be awarded to student attendees.

Accommodation

All the lectures will be given at the Mercure Hotel La Grande Motte Port, which is located at La Grande-Motte (seaside resort near Montpellier)
www.lirmm.fr/pkm-2016/get.html.
The attendees will have the choice between individual rooms or sharing double rooms for two persons.