



PhD Proposal 2017

School: Ecole Centrale de Nantes	
Laboratory: LS2N (Currently IRCCyN)	Web site: http://www.irccyn.ec-nantes.fr/en/
Team: REV (Robotics)	Head of the team: D. Chablat
Supervisor: S. Sakka and D. Chablat	Email: sophie.sakka@ec-nantes.fr
Collaboration with other partner during this PhD:	
In France:	In China:

Title: Design of a giant humanoid robot
Scientific field: Robotics design
Key words: Humanoid, giant robot, bipedal, design

Details for the subject:

(Maximal length of 2 pages, including images, list of reference, ...The pdf file should not exceed 1Mo)

Background, Context:

Some giant machines already exist to manipulate heavy material. They are controlled by a human operator, who makes sure the object to be manipulated is correctly handled, the weight is correctly balanced, and so on. We wish here to build a prototype of giant humanoid-shaped robot, for industrial and demonstration applications.

Research subject, work plan:

The candidate will have to design a robot with the following characteristics: large size (5m high), capable of carrying the operator, humanoid-shaped and capable of carrying external weights. All characteristics (energy, aso.) will be embedded. In comparison to machines, the robot will have a control increasing its tasks autonomy. Control and experimental validation is also expected

The thesis progression will be as follows:

- **Year 1: Understanding the problems involved. 1) Bibliographic study and positioning (6 months), leading to a research report and a presentation to the research group; 2) first numerical draft of robotic solution, evaluation of the costs.**
- **Year 2: Realizing the legs. Testing and validation of the prototype. Publication.**
- **Year 3: Realizing the arms, assembling, testing and validation of the arms then the global robot. Concluding Ph.D. Publications, finish experiments, thesis writing and defence.**

References:

- [1] Mechanical design of humanoid robot platform KHR-3 (KAIST Humanoid Robot 3: HUBO). Ill-Woo Park, Jung-Yup Kim, Jungho Lee, Jun-Ho Oh (2005). IEEE-RAS International Conference on Humanoid Robots.
- [2] Design and development of research platform for perception-action integration in humanoid robot: H6. K Nishiwaki, T Sugihara, S Kagami, F Kanehiro, M Inaba, H Inoue (2000). IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).
- [3] Humanoid robot HRP-3. K Kaneko, K Harada, F Kanehiro, G Miyamori, K Akachi (2008). IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).
- [4] Cognitive developmental robotics as a new paradigm for the design of humanoid robots. M Asada, KF MacDorman, H Ishiguro, Yasuo Kuniyoshi (2001). Robotics and Autonomous Systems, Vol. **37**(2-3).
- [5] Modular joint design for performance enhanced humanoid robot LOLA. S Lohmeier, T Buschmann, H Ulbrich, F Pfeiffer (2006). IEEE International Conference on Robotics and Automation (ICRA).