PhD Proposal 2017

School: Ecole Centrale de Nantes	
Laboratory: IRCCyN	**Web site: www.ls2n.fr**
Team: Robotics And Alive	**Head of the team: D. Chablat**
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Title: Modeling and design of reconfigurable robots
Scientific field: Robotics
Key words: Parallel Robot, Accuracy

Details for the subject:

Background, Context:

The team "Robotics and alive" has a long history in the analysis and design of parallel robots [1, 2, 3, 4] and their use in the design of bio-inspired robots (robot eel to validate the robot locomotion [6] or to make piping inspection for nuclear applications [7] (Figure 1)).

Starting from the needs of users, the team is able to define the most appropriate architecture for a given task, and after to realize its optimization to obtain a virtual or physical prototype.

The objective of this thesis is to design robotic platform able to move in constrained environments and capable of carrying a serial robot can perform welding operations. The goal of our team is to solve design problems through bio-inspired approach.

Many animals successively use several support points or inking to move. Considering the legs or arms of these robots as drivelines, design of such robots often means studying parallel robots with actuation redundancy and/or sensors. It is on this area that the team worked for 20 years with great success.

To reduce the cost and weight of these new robots, we will focus on defining the number and location of actuators for space the greatest possible mobility with kinetostatic performance guarantees.

Figure 1 : Bio-inspired robot for pipeline inspection using the locomotion of worms

Research subject, work plan:

The project begins with a study of the different modes of animal locomotion. The objectives will be to find invariants of design and find technological barriers to transfer to an industrial product.

The student then turns the locomotion needs in motion generator. From the literature on mechanisms, several architectures will be selected and then analyzed according to the need.

An important part of the work will be for the study of the actuating and the minimization actuators and encoders to achieve positional accuracy. The study will analyze the kinematics as well as the stiffness of the structure.

The mode of locomotion changes are also designed to minimize energy consumption [5].

Demonstrator feasibility will be realized during the thesis and intermediate prototypes made by additive manufacturing will be performed to validate mobility.

Finally, a transfer of the proposed solution will be offered for industrial application to which the project promoter is currently working for the naval industry. The results will be enhanced by publications in journals or conferences. A patent will be considered if the solution found as often allows the team.

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