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EDUCATION

April 2013- : graduate student

Graduate school of engineering science, Osaka University, Japan
・ Advisor: Professor Hiroshi Ishiguro

April 2011-March 2013 : undergraduate student

School of engineering science, Osaka University, Japan

MAIN PUBLICATIONS

K. Urai, Y. Okadome, Y. Nakata, Y. Nakamura and H. Ishiguro. "Estimation of Physical Interaction between a Musculoskeletal Robot and Its Surroundings", Journal of Artificial Life and Robotics, vol.19, 2014.

Y. Okadome, Y. Nakamura, K. Urai, Y. Nakata and H. Ishiguro. "Confidence-based roadmap using Gaussian process regression for a robot control", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Chicago, USA, September 2014.

RESEARCH INTERESTS

In my recent study, I designed and developed a musculoskeletal humanoid robot and made several motions in an open-loop manner. The purpose of our research is to realize a robot working in a real environment. There are a lot of inevitable disturbances such as physical interaction with human, e.g. holding, shaking hands and hugs. Since there is an inevitable noise, It is not easy for robots to act in such complicated situations flexibly. Human body structure is very flexible and can cope with various disturbances. It is suggested that these properties are realized by changing the passive dynamics depending on situations and tasks. I focus on this ability to change the passive dynamics and I have been trying to realize a flexible robotic system by considering this aspect. There are two important mechanisms for changing the passive dynamics, one is a high degree of freedom (redundancy of joints), and the other is a multi-articular muscle (redundancy of actuators). Thanks to these redundancy, we can obtain various movements and power adjustments. According to these ideas, we designed a robot with redundant actuators and joints, to change its passive dynamics proactively. We propose an actuation mechanism to change the physical property, and we call this mechanism 'physically connected actuator network'. In this network, simultaneously activated actuators and mutually inter-connected actuators are switched by changing the connection between actuators and the robot can change its structure and response to various external forces. That is, just by changing the connection of actuators, the robot can vary its response and behavior, and this means it can design its own passive dynamics. We expect this idea allows the robot to cope with various disturbances and enhances the adaptability of 'morphological computation'.

Since my research interest is the physical characteristics of a redundant musculoskeletal robot system based on biological principles of human, to develop a next generation robot, which is working adaptively and flexibly like human, it is crucial to explore the biological principles in the design and construction of robotics systems and study about robots focusing on its body structures.