Session Summary

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Humanoids have the important roles of human-robot interaction beyond walking. The session covered such scientific aspects of humanoids by the following four papers. The first paper touched upon the psychological aspect of human robot interaction; ‘“Robovie” – An interactive Humanoid Robot – Interdisciplinary research approach between cognitive science and robotics’ by H. Ishiguro. Questions and answers were concentrated on the communication channels between human and robot. Facial expression is needed especially for elderly people and handicapped people. The people can touch the skin sensors on the body, arms and shoulders, because the torque is very low. The system is not equipped with powerful hands, because it is designed just for communication purpose. These discussions made clear the new aspect of the robotics research.

The second and the third paper discussed on the learning and imitation aspects through human robot interaction. They were ’Learning and Cooperative Multimodal Humanoid Robots’ by R. Dillmann and ’Real-Time Statistical Learning For Robotics and Human Augmentation’ by S. Schaal. The last paper of ’A New Generation of Compliance Controlled Manipulators with Human Arm Like Properties’ by R. Koepp was on humanoid manipulator targeted to human arm.

The third talk by S. Schaal described a statistical learning framework that is well suited for real-time learning in complex high-dimensional motor control problems. The essence of the learning methods was to employ piecewise linear function approximation to represent complex nonlinear functions, and to use probabilistic dimensionality reduction techniques to keep the computational complexity of the learning low. Results on learning in a humanoid robot were presented, including real-time inverse dynamics and inverse kinematics learning and learning from imitation. Interactions with the audience emphasized that the presented learning methods are not the universal solution to learning function approximation. It is also necessary to note that the local linear learning approach requires a proper initialization of some initial learning parameters. The presented learning tools should have large applicability in many real-time learning applications in robot and human interaction.

The session time is too limited to discuss the whole matter of human-robot interaction, however, the session clearly showed that the human and humanoid interaction has been forming a new and important area of robotics.