

## Video J: 3D Immersion-type Dynamic Simulation Environment for Developing Human Interactive Robot

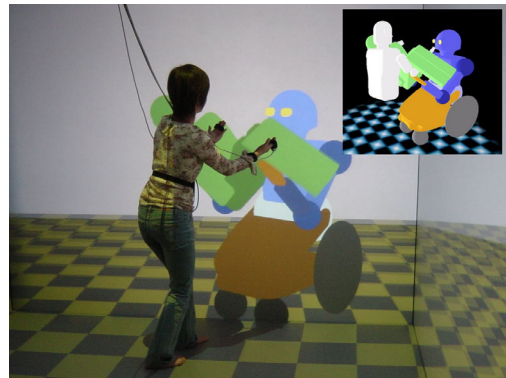
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<http://www.bmc.riken.jp/~robot/index-e.html>

The next generation of robot is highly expected to interact with human being friendly and to support our everyday life in complex environment. Towards this objective, dynamic simulation of human-robot interactions is important [1]. By integrating the advanced information science and robotic technologies, we are succeeded in constructing an immersion-type 3D dynamic simulation environment [2]. This environment consists of three parts. They are a 3D immersion type display part, a real



time dynamic simulator part, and a dynamic motion capturing part. This environment can calculate and display 3D dynamic motions of a robot in real time and provide human subject with high presence. This example shows how to capture a man's upper half body motion using 16 markers and to generate 10 reference joint angles for the robot. Inside the simulation environment, human subject can input forces to the virtual robot through natural body motions. In detail, the human motions are measured by 3 magnetic sensors and are followed by a white virtual subject. The motions of the virtual robot are then generated through interaction with the virtual subject. Using this simulation environment, we performed experiments to hold up a human-formed object from the robot. The virtual robot is equipped with many types of virtual sensors. For example, the robot has its own vision sensors to look around its world. Our system also realizes the collision experiment without really wound the human subject and the robot. In addition, the human subject can easily evaluate and change the robot's design such as its form and color. It provides us with powerful approach for developing human friendly robots.

### References

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- [2] T. Odashima, M. Onishi, Z.W. Luo, S. Hosoe, "Immersion Type Virtual Environment for Human-robot Interaction," Proceedings of IEEE International Conference on Systems, Man & Cybernetics (SMCC03), pp.3651-3656, 2003.