Humanoid Robot Mechanisms for Responsive Mobility

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1. Introduction

Research of humanoid robots is challenging not only from the engineering view point of building intelligent machines, but also from the scientific view point of understanding the human, and therefore it is open ended. The reported models of humanoid robot[1] clearly show the success of the mechanical design. However, the authors claim that ever developing research of humanoid robots also demands the evolution of body mechanisms.

2. The Double Spherical Hip Joint

Figure 1 shows the conventional hip joints in the left hand side and the double spherical hip joint in the right hand side. The double spherical hip joint is the mechanism to realize the mobility of three degrees of freedom of waist joints for rotating the upper body without actually adding waist joint mechanisms. By adapting this mechanism to the humanoid robot, the manipulability of COG would be guaranteed being independent to the leg configuration.

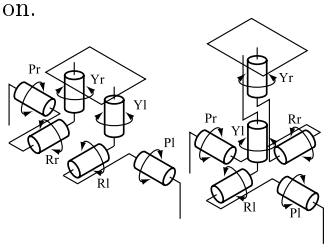

Figure 1: DOF arrangement of two types hip joint

3. Knee Joints with the Backlush Clutch

An intelligence of machines would be seen if they could acquire by themselves appropriate motions that their body accepts. However, the current design of transmission of humanoid robots is not prepared to interact with the environments. Figure 2 shows the principle of the backlush clutch which enables switching between the driving and free modes. This mechanism would be efficient for developing natural looking motions[2] for the humanoid robots.

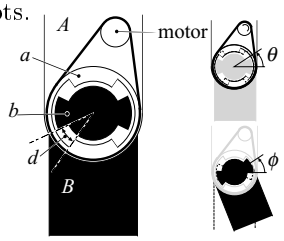

Figure 2: Principle of the backlush clutch

4. Development of the Humanoid Robot

We designed a humanoid robot adopting the double spherical hip joint and the knee joints with the backlash clutch. Figure 3 shows the photograph of the humanoid robot. It is 150[cm] in height and estimated to weigh approximately 45[kg].

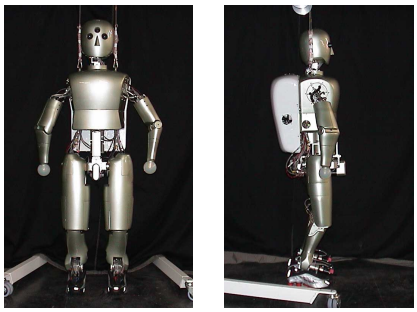

Figure 3: The humanoid robot UT-Θ

5. Conclusion

In this paper, we discussed the mechanical design of humanoid robots, the double spherical joint and the backlush clutch. This research was supported by CREST program, JST.

References

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