Development of a Hexapod Robot focusing on Leg Compliance

Hideki Hayashi, Toshiyuki Kondo, Koji Ito

Dept. of Computational Intelligence and Systems Science, Tokyo Institute of Technology
4259 Nagatsuta, Midori, Yokohama 226-8502, Japan
hayashi@ito.dis.titech.ac.jp,{kon,Ito}@dis.titech.ac.jp

1. Introduction

We developed a hexapod walking robot by focusing on the structural compliance mechanisms. The compliance mechanism of the developed robot was implemented by the combinational use of a DC servomotor and a linear DC solenoid. Through preliminary experiments, the validity of the leg compliance mechanism is demonstrated.

2. Robot Hardware

Fig. 1 and 2 shows the CAD design and Photograph of hexapod robot. Six DC motors and six linear DC solenoids are used as actuators. The robot consists of two-deck frames made by aluminum. The robot length is 180mm, the width is 247mm and the height is 85mm. The extensive width increases the stability against the lateral direction force. The total weight is about 1.0kg (in the case of external electric power supply). At the present time, no sensor is attached to take in the external information from the environment.

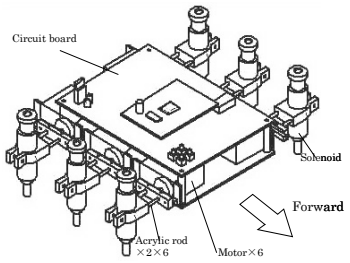

Fig.1 Design structure of hexapod robot

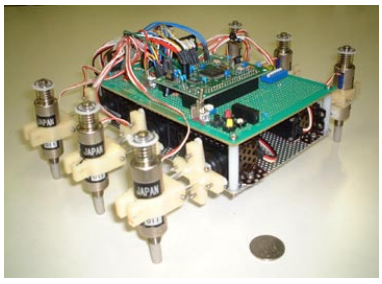

Fig.2 Photograph of hexapod robot

3. Leg Structure

A pair of acrylic rods is installed at the root of leg, which can be bent flexibly about the motor axis.

In addition, linear DC solenoid is used to absorb another external disturbance orthogonal to the motor axis. The solenoid is lengthened to +10mm at the maximum. The leg is also driven to propel the body forward and backward by the DC servomotor with PWM control. The rotation angle of each leg is set up with ±30 degrees (forward(+) and backward(-)).

4. Locomotion Control

It is possible to control the forward and backward velocity of robot by shifting the drive timing of the linear solenoid. The velocity of robot also depends on the electric power supplied to the solenoid. **Fig.3** shows the picture in the tripod gait. It is seen that the extension and contraction of solenoid is performed corresponding to each leg rotation.

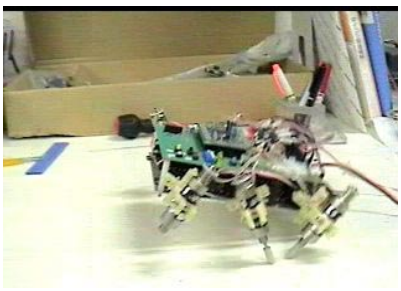

Fig. 3 Tripod gait

5. Conclusion

We designed and developed the hexapod robot that had flexibility at legs. And it was shown that the simple program could make a high-speed walk. It was verified that a pair of acrylic rods and the linear solenoid contributed to the leg compliance effectively.

References

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