i-CentiPot: A Centipede-like Robot Wanders in the Wilderness

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1 What is "i-CentiPot"

We developed a kind of centipede-like robot named i-CentiPot (Implicit controlled centipede robot) shown in Fig.1. i-CentiPot is the total length of 1.23 m, the width of 185 mm, the height of 60 mm, and the weight of 1.69 kg. A torso of i-CentiPot has 16 segments with a pair of foot, i.e. 32 feet.

Figure 1: i-CentiPot

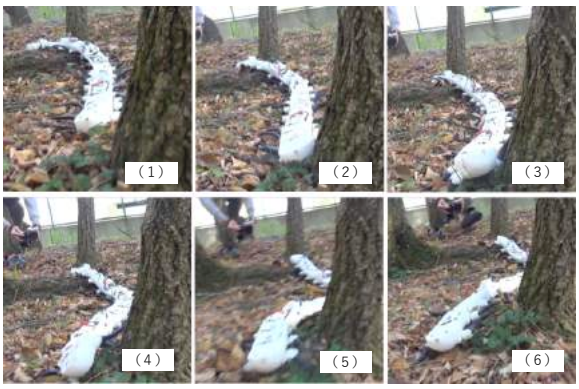

Figure 2: Field test of i-CentiPot

We conducted some field tests to prove adaptability and robustness of i-CentiPot. Fig.2 shows sequential snap shots of a field test. The ground comprised soil, fallen leaves, branches, roots of wood, etc, and had various undulation, i.e., the natural landscape as shown in Fig.2. From the figure, i-CentiPot traveled on the fallen leaves (top left), climbed over a rock (top center), approached to a wood (top right), attempted to avoid colliding to the wood (bottom left and center), and finally, avoided it autonomously and proceeded.

2 Secret of "i-CentiPot"

As shown in Fig.2, i-CentiPot seems to have some intelligence. That is, i-CentiPot seems to have computers, sensors and control law. But actually, i-CentiPot has no these devices in the body. He has no control law. The adjoining segments of the torso are connected by a spherical joint and rubber sponge, that is passive joint. All the pairs of foot were connected by the warm gear system (reduction ratio of 1/84 with a spurgear) driven by the flexible shaft, " torque coil ", penetrated through the torso. The flexible shaft was directory connected and actuated by 6 DC motors.

In generally, we have a concept of Explicit-Implicit Control as shown in Fig.3[1]. That is, we are thinking that all control law must be constructed with Explicit control law and Implicit control law. This Implicit control law comes from interaction between the body and the field. In this sense, i-CentiPot has no Explicit control law. But he has only Implicit control law.

Control=Explicit Control + Implicit Control

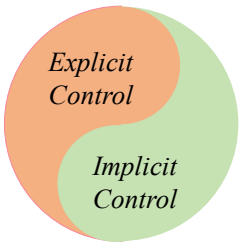

Figure 3: Structure of Control

References

[1] Koichi Osuka, Akio Ishiguro, Xin-Zhi Zheng, Yasuhiro Sugimoto, Dai Owaki: Dual structure of Mobiligence—Implicit Control and Explicit Control—, 2010 IEEE/RSJ International Conference on Intelligent Robots and Systems, 2010