Fig.11 (a) Initial state Fig.11 (b) The head prepares to turn

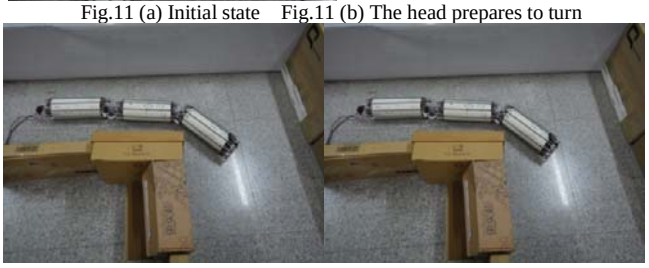

Fig.11(c) The head turns φ Fig.11 (d) The second link turns φ

Fig.11 (e) The head turns - φ Fig.11 (f) The second link turn - φ

D. Experiment of Ditch Crossing

With the slender body, the snake-like robot can span a wide ditch. Fig.12 shows the process of crossing the ditch of the snake-like robot. The strategy is: the head must reach to the far-end of the ditch before the center of gravity of the robot reach the near-end of the ditch. The experimental condition of the ditch crossing is as shown in Fig. 12. In theory, the snake-like robot can get through a ditch whose width equals to a half length of the robot as long as the joints have sufficient stiffness. The experiment verifies this theory.

Fig.12 (a) Prepare to cross the ditch Fig.12 (b)The head is arriving at the far-end

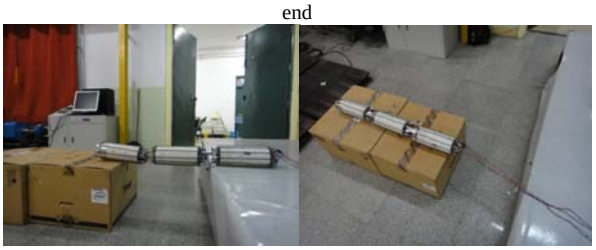

Fig.12 (c)The head arrives at the far-end Fig.12 (d)Get through the ditch

V. CONCLUSIONS AND FUTURE RESEARCH DIRECTION

Based on the idea of epidermal-drive we design a rope-drive snake-like robot, which has better terrain adaptability and better development prospects compared to traditional snake-like robot relied on twisting to forward.

The main achievement of this paper is to develop a new type of rope-drive snake-like robot, based on the principle of epidermal-drive, the whole body of the robot has power, and the obstacles will provide driving force for the rope-drive snake-like robot rather than resistance. Rope-drive snake-like robot has a strong athletic ability is verified by experiments.

At present, the velocity of the rope-drive snake-like robot is not fast, reduce weight and increase flexibility are the directions of future efforts. And the snake-like robot uses a wired mode power supply, limiting its range of applications. In the future, we plan to provide power by fixing one battery in the last link. Snake-like robot needs for sophisticated sensors and the ability of the independent movement to adapt to the complex and changing environment, which requires quality control, this paper just makes a basic research in this regard. To achieve full autonomy movement is an important direction for future snake-like robot research.

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