



Serpentine Robot

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Many kinds of animal motions have mysterious characteristics. One example is serpentine motion. The motion made by eels, lampreys, rattlesnakes and garter snakes looks like sinusoidal or S-curve. These animals can propel their bodies by muscular forces. In this research, we are interested in snake motion, suitable for moving over various terrains. The serpentine motion is useful in exploring task, especially in complicated and hazardous areas. i.e. nuclear power plants, piping inspection platform and various manufacturing systems as well as some applications in aerospace.

The idea of having a nuclear plant in Thailand has prompted the Center of operation for field robotics development (FIBO) at King Mongkut's University of Technology Thonburi (KMUTT) to design and built a multi-joint robot, SR-1. This prototype is now extended to study serpentine motion, based on the Active Cord Mechanism theory initialed by Shigeo Hirose at Tokyo Institute of Technology Japan.

At present, we have implemented this theory in our seven revolute D.O.F SR-1, which is the 2nd generation. SR-1 can move forward to the direction with different torques provided by actuators in serpentine patterns. It has many passive wheels attached to the body. Passive means no actuator on each wheel. The robot motion is constrained by each wheel, allowing the motion in the tangential direction. The different torque can generate forces acting on its body. When this force overcome the tangential friction will propel SR-1 to moves forward or backward directions.

We will integrate an artificial intelligent algorithm (AI) such as potential function method into generalized veronoi motion planning and others for increasing the capability of our serpentine robot in obstacles avoidance.

FIBO extremely appreciates financial support form the Thai-Toray Foundation. It is expected that the outcome of this research leads to discovery of control methodology in maneuvering this type of robot in highly constrained environment. The byproduct is a prototype to be used as a testbed for further study.

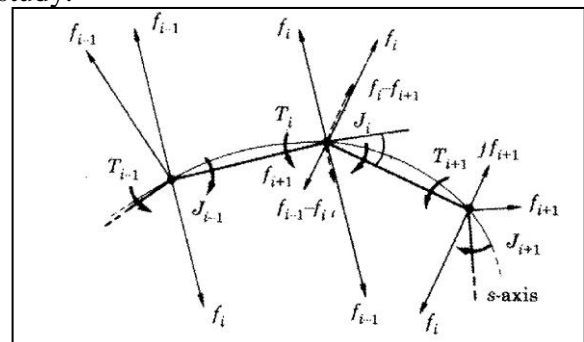


Fig 1. Force acting on link of Serpentine robot

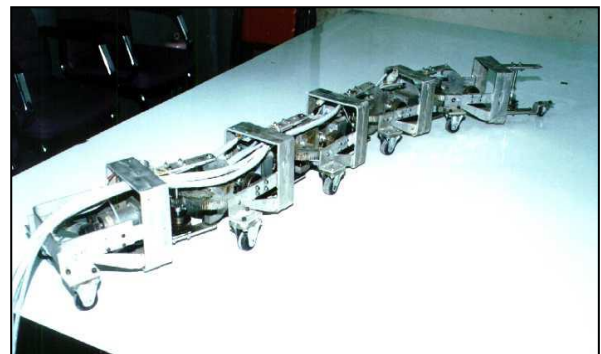


Fig 2. View of our Serpentine robot