Motion Investigation of a Snake Robot with Different Scale Geometry and Coefficient of Friction

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Abstract

Most snakes in nature have scales at their ventral sides. The anisotropic frictional coefficient of the ventral side of the snakes, as well as snake robots, is considered to be responsible for their serpentine kind of locomotion. However, little work has been done on snake scales so far to make any guidelines for designing snake robots. This paper presents an experimental investigation on the effects of artificial scale geometry on the motion of snake robots that move in a serpentine manner. The motion of a snake robot equipped with artificial scales with different geometries was recorded using a Kinect camera under different speeds of the actuating motors attached to the links of the robot. The results of the investigation showed that the portion of the scales along the central line of the robot did not contributed to the locomotion of the robot, rather, it is the parts of the scales along the lateral edges of the robot that contributed to the motion. It was also found that the lower frictional ratio at low slithering speeds made the snake robot motion unpredictable. The scales with ridges along the direction of the snake body gave better and more stable motion. However, to get the peg effect, the scales needed to have a very high lateral to forward friction ratio, otherwise, significant side slipping occurred, resulting in unpredictable motion.

Keywords

Author Keywords: snake robot; snake scale; scale geometry; friction ratio; serpentine motion

KeyWords Plus: CONCERTINA LOCOMOTION; MUSCULAR MECHANISMS; NERODIA-FASCIATA; ELAPHE-OBSOLETA; KINEMATICS; DESIGN

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