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EXPERIMENTAL STUDY ON SPEED CONTROL OF RIDER ON TWISTED TAPE TETHER USING IMAGE PROCESSING

Abstract

This paper describes a method for controlling a rider speed on a tape tether using image processing techniques. A tape tether between the earth and a space station is twisted by a wind or a movement that a rider moves up and down on the tether. When a rider climbs on the twisted tether, problems that the tether or the rider is damaged may happen. One means of solving the problems is thought to control the speed of a rider according to a degree that a tether is twisted. The solution means requires to get both a position where a tape tether is twisting and a twisting angle at the position. We propose a method for controlling a rider speed by estimating the twisting state of a tape tether using image processing. The proposed method estimates twisting positions on a tape tether and the twisting angle of the tether at the estimated positions. Twisting positions are estimated by detecting constrictions on a tether in an image captured by a video camera on a raider. Twisting angle at the twisting position where is the nearest to the rider in the estimated positions are estimated from the ratio between the tether width at the twisting position and the original tether width in the image. In our study, we created a small rider model and made experiments with the small rider model and a vinyl tape tether. The small rider is 660 mm long, 120 mm wide, 160 mm depth, and 4.2 kg weight and climbs with DC motor. In experiments, our proposed method was able to estimate twisting positions and twisting angle at the positions within several percent error. The experimental results show the need of the speed control of a rider on a tape tether and the effectiveness of our proposed control method.