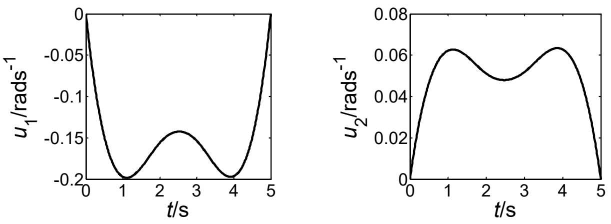

(a) (b)

Figure 3. Optimal control input law of robot motion

The above figures show that the trajectory of the robot, as well as the angular velocity and expansion linear velocity of the leg, were all smooth and continuous. Besides, the initial and final velocities were both zero.

6. CONCLUSIONS

In engineering, the motor control of robot attitude motion requires the initial and final control inputs to be zero. However, the common optimization methods like Fourier approximation cannot guarantee the control inputs are zero at the start and end of the robot motion. To solve the problem, this paper combines spline approximation and the PSO into a novel algorithm, and uses it to solve the optimal control problem of attitude motion planning for a hopping robot system under nonholonomic constraints. The proposed algorithm can optimize the motion trajectory of the robot, eliminating the nonzero initial and final values of the control inputs. The algorithm inherits the advantages of the PSO, such as simple structure, limited number of parameters, ease of programming and fast convergence. The research findings shed new light on solving motion control problems of nonholonomic systems.

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