A Roller Skating Robot

Keywords:
Mobile Robot, Skating, Legged, Wheel, VTM

Abstract

Such a robot can help the wheeled mobile robot with good speed on a surface which is nearly smooth when it meets an obstacle. However, when the terrain has large elevation, a wheeled omnidirectional traction ground can keep the wheeled mobile robot on the legs of a mobile robot, it can gain the benefit of motion control. This paper discusses the design and possible goals of wheeled mobile robots. When the terrain is smooth and the wheels' weight is large, the benefit of mobile robot can gain the benefit of motion control.
Length of the connection members will preserve the nodes [1].

The force diagram of using a pin-jointed frame design for the leg is that it is

Fig. 2. Applied torque to the leg when it collides with an obstacle.

A problem in designing and modelling the kinematics of a leg or manipulator
connection members and aluminium blocks as connecting nodes.

Fig. 1. Structural model of roller skating robot (pneumatics cylinders and
wheels are ignored in this drawing).
3.2 Inverse Kinematics

The joint angles of the leg \( \theta \) can be found relative to the foot position and joint position if the inverse kinematics problem can be utilized to locate the inverse kinematics solution. Using the inverse kinematics method [1], the joint angles of the leg \( \theta \) can be found relative to the foot position and joint angles.

\[ \begin{align*}
\theta_1 & = \frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\theta_2 & = \frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\theta_3 & = \frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\theta_4 & = \frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi}
\end{align*} \]

Where:

\[ \begin{bmatrix}
\theta_1 \\
\theta_2 \\
\theta_3 \\
\theta_4
\end{bmatrix} = \begin{bmatrix}
\frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi} \\
\frac{\tan^{-1} \left( \frac{y}{x} \right)}{\pi}
\end{bmatrix} \]

From Mekkowitz [2], the Jacobian matrix for the leg takes the form:

\[ \begin{align*}
C &= \cos \theta_1 \cos \theta_2 \cos \theta_3 \cos \theta_4 \\
L &= \sin \theta_1 \sin \theta_2 \sin \theta_3 \sin \theta_4 \\
S &= \sin \theta_1 \sin \theta_2 \sin \theta_3 \sin \theta_4 \\
S' &= \sin \theta_1 \sin \theta_2 \sin \theta_3 \sin \theta_4
\end{align*} \]

Where:

\[ x = z' \cos \theta = \frac{d_0}{\sin \theta} \]

From the above table, the foot position \( (x', y', z') \) is calculated to be:

\[ \begin{bmatrix}
x_1 \\
y_1 \\
z_1
\end{bmatrix} = \begin{bmatrix}
0 \\
0 \\
0
\end{bmatrix} \]

and other equations like similar homogeneous forms.
Fig. 4. Walking gait

Problem of the conventional four-legged robot

- The body is moved to the front position in Fig. 4, a foot being lifted to the ground versus the initial position of the leg.
- The control of leg movement is aimed to minimize the moment of the force applied to the ground.
- The gait is shown with the gait order in the figure.

Since the definition of position is based on the joints and joint displacements on the vector's instantaneous displacement, the initial and final positions of the foot are known. The vector used is to represent the vector of the force acting on the foot.

To calculate the force acting on the foot, the moment of the force can be used.

\[ F \times d = \text{constant} \]

where \( F \) is the force acting on the foot and \( d \) is the displacement of the force.

The relationship between the differential foot position and differential joint angle is:

\[ \theta = \frac{d}{dx} \]

From equation (2) the inverse kinematic solution is:

\[ x = \theta / \phi \]

where \( \phi \) is the given angle.

The relationship between the differential foot position and differential joint angle is:

\[ \theta = \left( \frac{d}{dx} \right) \]

where \( \theta \) is the angle change of the joint and \( x \) is the foot position change.
A Six-Legged Hybrid Walking and Wheeled Vehicle

Abstract

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Keywords: hybrid, walking, wheeled vehicle, complex terrain control, real-time simulation, energy efficient, efficient control

1. Introduction

2. The walking platform

3. The wheeled platform

4. The Control System

5. Conclusion

Reference