

- velocity of the robot relative to initial frame along the ***x*** axis

- velocity of the robot relative to initial frame along the ***y*** axis

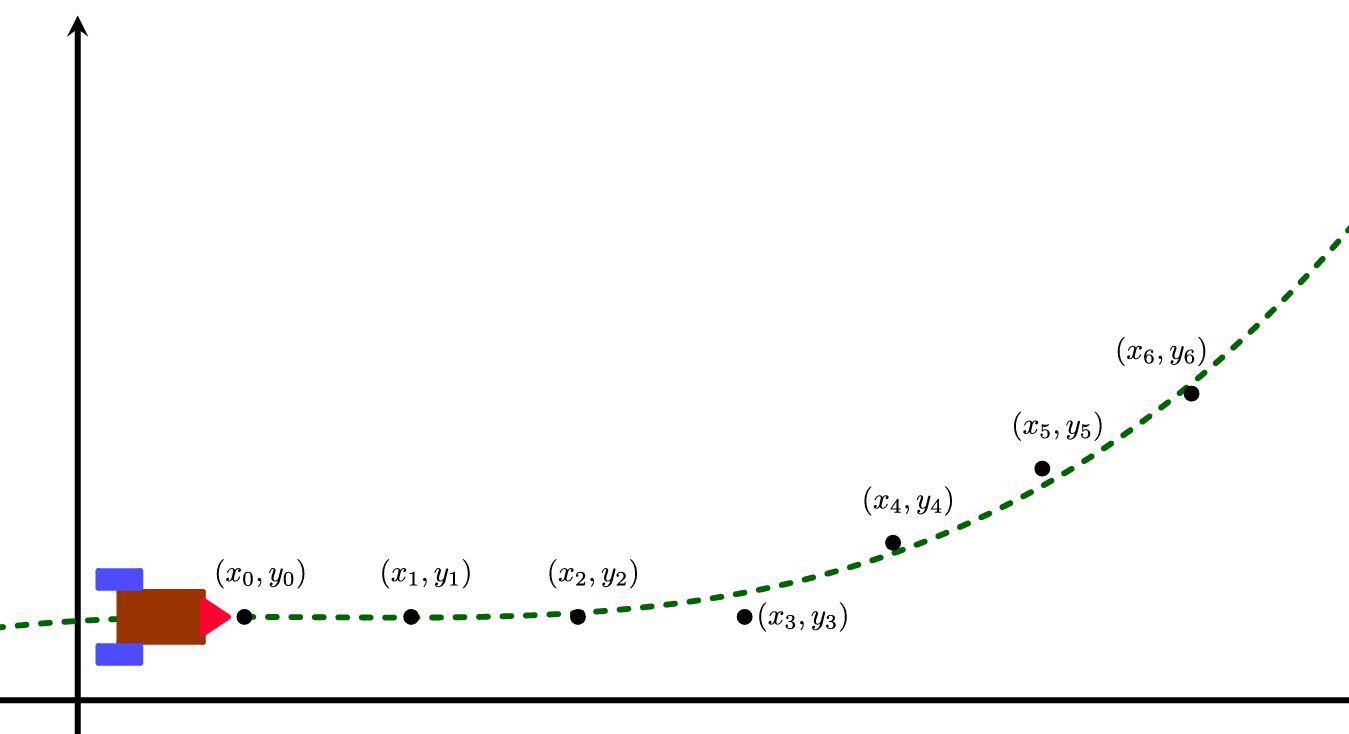
**From Rotation matrix,**

**Dynamics**

* **-** mass
* **-** inertia moment
* - viscous friction force along and
* - viscous friction torque with respect to the robot’s rotation axis
* – Coulomb friction forces along and
* - coulomb friction torque with respect to robot’s rotation axis

**Discrete State Space Model for mobile robot,**

**The Contouring Control**

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parameters obtained using least square error method, under the following conditions

A diagram of a graph

Description automatically generated

The objective is to steer along a continuously differentiable and bound two-dimensional geometric path

**Desired path,**

Let at

At ;

Likewise,

**Contouring Control**

**Assuming motor is a first order control system**

Applying Tustin transformation,

**Applying Motor dynamics to mobile robot**

Approximated input solution

State output based on approximated input series

**Linearization of Discreet Dynamic Model**

**Optimization**

**Cost Function**

Static obstacle (wall) can be represented as a series of points.

Upper polygon Equation

Taking current orientation(based on current state ) as initial reference frame, polygon equation at

, , N - predictive horizon.

Transform of point (0,L) at relative to initial frame

Gradient of the line is

**=**

Transform of point (0,-L) at relative to initial frame

Gradient of the line is

**=**

First, points that are needed to be avoid should selected, for that coordinates of obstacle is applied to equations, Assume a point as (.

Out of all the point, points that are satisfy following conditions were selected.