CHAPTER I

INTRODUCTION

1.1 Motivation and Object of Study

The effectiveness of a wheeled mobile robot has been proven by NASA by sending a semi-autonomous rover "Sojourner" landed on Martian surface in 1997 [1]. Future field mobile robots are expected to traverse much longer distance over more challenging terrain than Sojourner, and perform more difficult task. Other examples of rough terrain applications for robotic can be found in hazardous material handling applications, such as explosive ordnance disposal, search and rescue.

Corresponding to such growing attention, the number of research papers with technological issues on field mobile robot is increasing dramatically. The researches vary from mechanical design, performance of the robot, control system, navigation system, path planning, obstacle avoidance, field test and so on.

However, there are very few concerning dynamics of the robot. This is because the field robots are considered too slow to encounter dynamic effect. And the high mobility of the robots, moving in 3 dimensions with 6 degrees of freedom (X, Y, Z, pitch, yaw, roll), makes the kinematics modeling a challenging task than the robots which move on flat and smooth surface (3 degrees of freedom : X, Y, rotation about Z axis).

In this research work, a small six-wheel robot with Rocker – Bogie suspension is designed, built and tested. The method to derive mathematical modeling such as, the wheel-ground contact angle estimation and kinematics modeling also described. Finally, a traction control system is developed and implemented on this robot.

1.2 Objectives

1) Develop a mobile robot which capable to traverse uneven terrain.

2) Develop a control system to achieve maximum traction force with minimum slip.

3) Develop a remote control system to use with the robot.

1.3 Outline of Thesis

1) The robot can travels across uneven terrain using low-level control system onboard.

2) The operator can control the robot from distance via the wireless communication.

1.4 Benefits

1) The robot has capability to travel across uneven terrain.

2) The robot can be controlled from distance to explore dangerous area.

3) The robot can be used as a test bed for high-level control.

4) The robot can be used as a test bed to equip additional instruments and used as a field mobile robot.

1.5 Procedures

1) Literature review

2) Make a conceptual design of the robot.

3) Simulate the mechanism.

4) Design and manufacture the robot's parts.

5) Design a low-level controller.

6) Assembly all parts into a robot. And correct any error occurred.

7) Test the basic movements.

8) Build the wireless communication.

9) Test robot control with the new wireless communication.

10) Test overall system and conclusion.