SIMULATING MODELLING OF QUADRUPED ROBOT GAIT CONTROL

Robert Grepl*

This paper presents the concept of computer simulating model for robot-environment behaviour study and control. The modelling is aimed to particullar physical implementation of fourlegged robot. The schema of simulating model includes four main sub-models: environment-robot interaction, sensory data processing, robot action planning and action execution. Forward and inverse kinematics of robot is also mentioned. Described model was used for the development and testing of control gait algorithm for irregular terain. Further, arbitrary other action planning algorithm can be engaged in the model.

Key words: *walking robot, control algorithm, simulating modelling, fourlegged robot*

1. Introduction

Modelling and implementation of mobile walking robots belongs to interesting and challenging topics of present research and development at universities as well as in the industry. The importance of study of mobile robots and walking machines generally is especially given by: 1) direct use of research results – design of autonomous machines for various intentions e.g. rescue robots, service and inspection activities in dangerous or inaccessible environment; 2) secondary use of developed technologies in common industry (automotive, automation etc.). Further, a popularity of robot research plays an important role in university education process. Mobile robot and its modelling and design can be considered as an ideal example of complex mechatronic system.

The work presented in this paper is related to previous publication, among others: basic conception and design of our four legged robot [5], description of control using Matlab-Simulink in testing phase of design [4] and design of electronic control unit of robot [6].

Results of previous simulating research were tested on physical laboratory model (see Fig. 6). The potential environment for such robot is generally irregular terrain with limitation of roughness and other obstacles.

The general aim of this work can be specified as: building of a virtual simulating tool usable for modelling of interaction between the robot and the environment. Motivation for such effort is clear – the development of a new algorithms, e.g. gait algorithm, needs knowledge of behavior of robot in specific conditions, and certainly, virtual prototyping on computer is much easier and cheaper than on real machine. Simulating model is obliged to behave as real system as much as possible. Possibility of non-real time computation allows relatively complicated simulating structures and approaches.

* Ing. R. Grepl, Ph.D., Laboratory of Mechatronics and Robotics, Institute of Solid Mechanics, Mechatronics and Biomechanics, Faculty of Mechanical Engineering, BUT; Institute of Thermomechanics, CAS