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A Gait Transition Method for Hexapod Robots

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ABSTRACT

In this paper, a gait transition method has proposed that allows a hexapod robot to switch from one gait to another gait with stable condition, during different terrain navigation. Typical gaits of locomotion are analyzed for hexapod robot. Hexapod robots frequently operate various gaits to locomote over a variety of surfaces. To enable locomotion in a changing surface, hexapod must be able to stably change between gaits while continuing to locomote. A comparative study, based on different gaits for different surface locomotion, concludes that the hexapod robot use two types gait for complex surfaces with concurrent gait transition during navigation. Finally, a gait transition algorithm is developed for hexapod robots.

1. INTRODUCTION

The hexapod robots have best possible ground negotiation technique because these robots can navigate on different surfaces. But, one of the most important problems is to keep the robot in stable condition. Mainly, it is difficult to keep the stability of robots while robots change their gaits from one to another to turn and step aside. The gait change without considering the gait transmission causes the robot to lose balance and liable to be damaged. As a result the stance of the robots becomes rickety, while the robot changes the gait instantaneously.

Hexapod robot uses the track motion for navigation [1]. There are some approaches to the problem of generating motions for hexapod robots were proposed by [2]. First approach is to design a rapid system whose developing behavior resembles a desired motion. While it is possible to predetermine stability within such a system, it is difficult to design the emergent behavior, and these systems often lack common perception. Secondly, opposite approach is to plan the individual motions for the legs and feet of a robot, while ensuring stability of the resulting overall motion. Hexapod locomotion necessarily involved with complex constraints relating to surface contact. One popular alternative is to take an abstracted view of hexapod locomotion by simply specifying the gaits a robot may use. A method to robot control can then be taken: locomotion by switching through a sequence of gaits. The safe transition between gaits is the primary focus of this paper. More specifically, a method has developed that address how gait transitions can be used to combine behaviors to produce safe and capable locomotion over different terrain.

Researchers have been trying to manufacture robots that can be able to perform real motion since first robots were developed. Biologists reverse-engineered the neuronal bases of locomotion [3], [4] while their applied counterparts created robots that used networks of simple reflexes and coordination schemes to locomote [4] [6]. These policies result in networks of simple computational elements from which gait like behaviors emerge. There is no concept of "changing between gaits", as all motions are produced by the reactive policies. The opposite approach has been deliberate and careful planning of every footfall a robot makes [7], [8]. It requires very accurate sensor information of the constraints related to locomotion which are difficult to achieve on a mobile platform. With high-level behaviors, these methods have generally been unsuccessful on small, fast, and possibly dynamic mobile robots. An alternative approach is to explicitly store individual gaits each designed for a specific purpose. In the absence of sensor information, intuitive feed forward motion patterns can be rapidly developed and are often quite successful at various tasks [9].

Gait analysis commonly involves the measurement of the movement of the body in space and the forces involved in producing these movements. Many researchers studied on the gait analysis of