ANIMAL GAIT GENERATION BASED ON HUMAN FEELING FOR QUADRUPEDAL ROBOT

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ABSTRACT. In the field of pet robots and robot-assisted therapy (RAT), characterization of animal motion is important for the development of robots resembling various animals. This paper presents a method for the generation of animal gait in quadrupedal robots. In this study, we employed AIBO as an experimental quadrupedal robot and generated the gait of the robot on the basis of an animal's gait. First, we optimized the mono-leg orbit, which can efficiently output a propulsive force, by imitating a dog's gait using a genetic algorithm. Moreover, we generated the quadrupedal gait of AIBO using both the optimum orbit of the mono-leg and an animal's gait, classified as the gait of a walking dog based on zoology. Furthermore, we administered a questionnaire study to determine subjective human feelings to choose the best gait for AIBO from among the various gaits mentioned above.

Keywords: Robot-assisted therapy, Quadrupedal robot, Gait generation, Genetic algorithm, AIBO

1. Introduction. Animals have for long been recognized as being a positive force in healing processes [1]. In recent years, animal-assisted therapy (AAT), which makes use of the healing effects of animals has attracted attention [2]. Examples of the expected results of this type of therapy are buffering actions for stress, improvement of sociability and shortening of the medical treatment period through mental healing. Thus, the introduction of AAT is being considered in hospitals and health facilities. However, it is difficult to employ AAT in such facilities because of the risks of the spread of infection from animals to patients and the necessity of proper animal training.

Robot-assisted therapy (RAT), in which robots resembling animals are used instead of real animals, is important for patient safety [3]. Pet robots resembling various animals, such as the dog robot “AIBO”, seal robot “Paro”[4], etc., are used in this type of therapy. Banks et al. reported no difference between the effectiveness of a living dog and an AIBO robotic dog in reducing loneliness [5]. Shibata et al. applied a mental commit robot, Paro, to RAT, and they verified that the interaction with Paro has psychological, physiological and social effects on people [6, 7]. In these applications, it is important that the robot imitates the motions of a living animal, especially essential motions, such as walking, running, etc.

However, it is difficult for the robot to walk and run like an animal because it is affected by various types of dynamic noise in the real world, in contrast to the ideal world. In