Development of Bio-mimetic Entertainment Dolphin Robots

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Abstract: - Development of bio-mimetic entertainment dolphin robots that act like real dolphins in terms of autonomous swimming and human-dolphin interactions are introduced. Body structures, sensors and actuators, governing microcontroller boards, swimming and interaction features are described for a typical entertainment dolphin robot. Actions of mouth-opening, tail splash or water blow through a spout hole are the typical responses of interaction when touch sensors on its body detect users' demand. A pair of microphones as the ears of a dolphin robot, in order to improve the entertainment dolphin robot's ability to interact with people, is used to estimate the peak sound directions from surrounding viewers. Dolphin robots should turn towards people who demand to interact with them, while swimming autonomously.

Key-Words: - Entertainment Dolphin Robot, Bio-mimetic, Interaction, Autonomous Dolphin System

1 Introduction

Recently one of the most rapidly growing areas of robot applications is the entertainment sector. Many kinds of toy/entertainment robots have been developed in the robot industry. A large portion of the products has a common feature: mimicry of animals. Several interesting and unique types of robots have been introduced and developed by the influence of bio-mimetics for the recent decades. Particularly, a fishlike underwater robot is one of these categories. Fish in nature move their bodies to generate propulsive power. It is also well known that fish achieve excellent power efficiency and maneuverability that have advantages over conventional propeller-based marine vehicles[1,2].

Our lab introduced a simple fishlike robot in 2005[3], and improved and added new functions in various manners shapes[4-7]. To confirm their effectiveness, our constructed fish robots have been tested in tanks and pools for user interactions as well as collision avoidance, maneuverability, control performance, posture maintenance, path design, and data communication.

In this paper, the development of a dolphin robot as a typical entertainment robot is described. Constructional parts such as body and chassis structures, several types of sensors and actuators, governing microcontroller boards and related interfacing circuits, swimming and interaction features are described as basic modules to construct a dolphin robot. Minimizing the degree of discrepancy compared to real dolphins and maximizing users' satisfaction are the most important two criteria in evaluation of the robot performance.

Actions of mouth-opening, tail splash or water blow through a spout hole are the typical responses of interaction when touch sensors on its body detect users' demand. In order to improve the entertainment dolphin robot's ability to interact with people, a pair of microphones as the ears of a dolphin robot is used to estimate the peak sound directions from surrounding people. The basic requirement for entertainment dolphin robots is the ability of turning towards people who want to interact with them, while swimming autonomously. It is assumed that the basic ways of