application group

AG-039

作品名稱

此魚非彼魚

This fish is not the fish

隊伍名稱

山中歲月 The time in the beautiful mountain

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作品摘要

市面上奇形怪狀的機器人很多，這些機器人也會表演各種動作，但是在水中活動的機器魚卻鮮少見到，製作機器魚最先碰到的難題是防水，其次才是動作控制，本作品全部做到了。本作品的機器魚能夠以自主模式悠遊及使用遙控器控制其游水動作，其運動行為包括：前進、左轉、右轉、下沉及上浮，除此之外還具有自動偵測電池電力之功能，當電力不足時，會自動浮出水面靠岸以進行充電，讓使用者可安心的玩樂及讓它進行水下探勘。除了可以利用遙控器使機器魚完成以上基本動作外，亦可透過魚體內部架設之攝影機，觀看水下的景觀；在自主模式下，不僅可利用紅外線感測器，測得障礙物的距離，達到自動避開障礙物之功能外，亦可透過內部之攝影機，將拍攝到的影像傳輸到電腦，再搭配影像辨識技術，達到追蹤目標物之功能。

本機器魚之架構大致分為魚體和魚尾架構，魚體架構含有：重心調校機構、沉浮機構、紅外線測距單元、控制電路、無線接收器、無線攝影機及電池，皆須具有防水功能，因此將控制電路及零件放置於防水艙之魚體內；魚尾架構則包含一顆伺服馬達及馬達軸心防水機構並放置於魚尾之防水艙中(如圖所示)。魚體水平移動與魚體重心平衡之動力均採用伺服馬達，透過PIC晶片(PIC16F877)進行擺幅控制；而魚體的上升與下沉動作，則以改變魚體防水艙內之氣囊大小完成之。在自主模式下本作品建立一移動策略作為各個機構之控制法則，使機器魚具有某種程度的智慧，悠游於水下，並能自動避開障礙物且自主追蹤目標物。因此，本作品為一隻可遙控、自主、監視及追蹤的智慧型機器魚。此機器魚更可以進一步研究改進，使其可以應用於國防軍事及海底探勘等方面，如水中尋物、探測海底生物、水底掃雷...等功能。

指導教授

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- 李教授2004年獲得台灣大學電機研究所博士後，先任職於聖約翰科技大學電子系及兼任研教組組長，2006年二月轉任至暨南大學電機系成立視訊處理及應用實驗室，帶領學生從事視訊處理與應用之相關研究。
- 她的專長領域為視訊壓縮、視訊傳輸、錯誤修補、影像處理、DSP及FPGA應用等。

Abstract

Nowadays, there have been a lot of types of robots to be developed. These robots can show many motions on the ground. However, the robot underwater is seldom designed in Taiwan since the waterproofing of the robot is very difficult. In this work, we implement a robot fish to accomplish waterproof and several motions control. The robot fish can swim forward, turn left and right, sink down and float up by remote control. There is a camera inside the fish to look around of the water; and if the battery is low, the robot fish can float up automatically and swim to the shore for charging. Based on the IR sensor and camera in the fish body, the fish can swim to avoid the obstacle and transfer the image underwater to PC such that the underwater target tracking is achieved.

The structure of the robot fish includes two main parts, one is the fish body and the other is the fish tail. In the watertight fish body, there are floating machinery, sinking machinery, weight-adjusting machinery, IR sensor, control circuit board, wireless receiver, wireless camera, and batteries. The fish tail includes a servo motor, and waterproof motor shaft that are placed inside of waterproof cabin. The complete structure is shown in the figure above. The horizontal motions and weight-adjusting of fish robot are achieved by using servo motors, and the PIC chip (PIC16F877) is used to control the swing of the fishtail. The floating up and sinking mechanisms are achieved by changing the size of gasbag inside the fish body. Furthermore, the swimming motions for avoiding obstacles and tracking target are controlled by our designed control strategy. We believe the robot fish can be improved in the future to be applied in the national defense or ocean exploration such as submarine mine detection, and underwater creature searching etc.