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Rescue Boats

救援船

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作品摘要 Abstract

本作品主要的動機是希望設計並建構一個能夠在水面上靈活移動的自主載具。其中系統將可撓結構的概念應用在水上載具上，將類似機器蛇的多節結構移植到船體上，使船體可機動彎曲，藉此提高水上載具航行的靈活度與機動性。一般的轉向方式如差動驅動、船舵等，都有其一些缺點存在，故系統採用船體型態可變的方式來取代一般差動或是船舵的轉彎方式，並且結合嵌入式視覺系統和馬達的推動力來完成此自主導航式的水上載具。

本載具系統的轉向機制是使用巴爾沙木與塑膠板組成可撓性結構的船艏，另外搭配伺服馬達來機動調整可撓性結構的彎曲度，以此達到靈活轉向的功能；而載具推進的部分利用一置於船艉的直流馬達及螺旋槳帶來前進的動力。為了使系統具備目標追蹤與避障的自主航行能力，採用小型電腦Ebox搭配微控制器做為處理核心，結合攝影機進行視覺影像處理與運動控制。另外為了增強載具整體姿態的平衡，使用三軸陀螺儀模組，搭配微控制器讀出姿態資訊，必要時啟動馬達調整重心以防止水上載具翻覆。

此智慧型載具主要利用電腦視覺偵測目標物與障礙物，在進行追蹤的過程中同時避障，並且利用陀螺儀在切換姿態時控制船體平衡避免翻覆。利用此系統機制使載具在複雜的水上環境中快速到達目標物，藉以達成救援的任務。

The objective of this work is to design an autonomous quick-response surface vehicle. One feature of this system is the transplantation of flexible structure to the vehicle's body, which can be adaptively adjusted according to the turning angle. This mechanism can improve the surface vehicle flexibility and mobility, compared with the differential steering or rudder operations. Combined with an embedded vision and motor control module, this vehicle can perform tasks autonomously.

The flexible turning mechanism is made of balsa wood and plastic panels and is controlled by a servo motor. The main propelling mechanism is actuated by a DC motor and is placed in the back of the vehicle. In order to have visual tracking and obstacle avoidance capability, a visual serving system is equipped. The kernel of the vision control system includes a small-sized computer for image processing and a microcontroller for motor control. Furthermore, a gyro is used to sense vehicle's attitude and retain its balance.

The vehicle is a vision-based system with autonomous tracking capability. It is designed to have excellent mobility for reaching the target as quick as possible such that the rescuing tasks can be achieved.

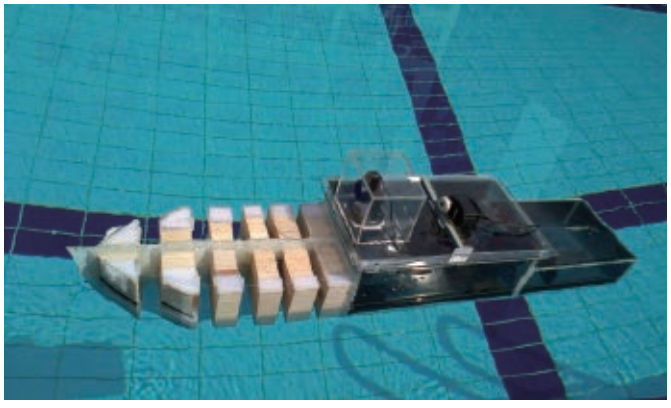

圖1 > 具可撓性結構之水上載具於水上平衡狀態