APPLICATION GROUP

應用組

A9-034

作品名稱	**具遠端監控/遙控與停車輔助功能之智慧型載具** An Intelligent Vehicle with Remote Monitoring/Control and Parking Assist Functions
隊伍名稱	**扭轉乾坤 Reverse the course of events!**
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作品摘要

本參賽作品為一部仿實車之智慧型載具，其具備人性化的遠端監控/遙控與停車輔助功能，讓使用者可透過遠端操控平台掌握車艙內及車外環境狀況，並在必要時(或緊急狀況下)以遠端操控平台遙控載具；此外，使用者亦可透過停車輔助功能輕鬆地將載具停放於適當的停車位子。本載具以嵌入式系統為運算與控制核心，利用該核心控制器之週邊溝通管道及Controller Area Network (CAN) Bus整合週邊感知器之信號，包括雷射測距儀、網路攝影機、超音波感知器、前輪轉角感知器及後輪磁阻感知元件等。本團隊結合上述感知器之信號與自行設計的前輪轉向驅動與控制電路、後輪轉速擷取與控制電路及兩軸影像伺服平台控制電路，並開發關鍵演算法以實現具遠端監控/遙控與停車輔助功能之智慧型車型載具。

遠端監控/遙控系統是結合嵌入式系統與慣性感知元件所實現之可攜式操控平台，該平台可經由無線網路即時地接收遠端車輛上的網路攝影機之影像資訊並顯示於控制平台之螢幕上。其原理在於利用擷取到的慣性感知訊號配合姿態估測演算法，來估測出遠端控制平台之姿態，使用者只需改變遠端控制平台之姿態即可控制攝影機之視線及控制遠端車子的速度與行駛方向；另外，在旋轉螢幕時，該影像資訊會依辨識出的旋轉資訊來調整影像顯示之角度，使該影像資訊正對使用者，讓使用者無論在何時何地皆能自在地監控或操控遠端載具。如此一來，使用者便可透過遠端監控/遙控平台之功能輔助駕駛進行緊急狀況處理或實現防盜之功能。

停車輔助系統主要實現了自主式平行停車與倒車入庫兩項功能。該系統之自主式平行停車是利用超音波掃描器偵測停車空間大小，來尋找出一合適的停車路徑，並利用基因模糊控制器作為停車路徑追蹤控制器，以實現具強健性平行停車之功能，讓車子能夠停入較小的停車空間。倒車入庫之功能則是使用雷射測距儀掃描停車週邊環境資訊，並利用倒車空間擷取演算法辨識出車子與車位之相對位置，並以類神經模糊控制器學習使用者於特定車庫之停車習慣，讓使用者可以快速且輕鬆地將車子停入車庫中。本參賽作品之目標不僅要賦予車型載具強健自動路邊停車功能與具學習行為的自動倒車功能，更要讓使用者能遠端監視與控制載具以實現『停的順心，放的安心』。

指導教授

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- 於1996年及1997年取得美國密蘇里大學哥倫比亞分校電機工程系學士及碩士學位。於2001年在美國印地安那州普渡大學電資學院取得電機博士學業。
- 王教授於2002年加入國立成功大學電機工程學系，現職為副教授。
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Abstract

Our entry for this competition presents an intelligent vehicle with human-based remote monitoring/control and parking assist functions. The functions are realized by embedded systems that utilize a Controller Area Network (CAN) bus to receive signals from sensor modules and transmit control commands to the driving devices and mechanisms of the vehicle. The sensor modules include an inertial sensor module, ultrasonic distance sensors, a laser scanner, a camera, drive steering sensors, and variable reluctance sensors.

The remote monitoring/control system integrates an embedded system and an inertial module to realize a portable remote motoring/control platform. This portable platform can receive the video signal captured by the camera installed on the vehicle, and can display the video on its monitor simultaneously. In addition, the portable platform can remotely control the orientation of the camera for different view angles, and the speed as well as the direction of the vehicle by simply adjusting the posture of the portable platform. This function allows users of the platform to remote monitor and control the vehicle easily anytime, anywhere. Thus, with this function, the user of the portable platform can play a role as an anti-theft preventer or help the driver of the vehicle to deal with emergencies.

The parking assist system realizes two main functions, parallel parking and reverse (garage) parking. The parallel parking function is implemented by a fuzzy controller whose parameters are optimally searched by a genetic algorithm. This function can greatly increase the robustness of the parking function for small parking lots. The reverse parking function is implemented by a neuro-fuzzy controller that is capable of leaning the operating behavior of the driver for parking the vehicle to a specific garage. This function enables the driver to park the vehicle quickly and effortlessly. The ultimate goal of this entry is not only to provide drivers with robust parallel parking and behavior-learning reverse parking functions, but also to enable users of the portable platform to monitor and control the vehicle remotely to enhance the safety and prevent auto theft.