# 參賽隊伍人員及機器人簡介

## Team Member and Robot Introduction

組　　別：□遙控組　■自動組　　指導老師：劉昭恕

學校名稱：國立高雄應用科技大學　　隊伍名稱：KUAS _ D.C.T.W

(School：National Kaohsiung University of Applied Sciences)

(Team name：KUAS _ D.C.T.W)

## 壹、參賽隊伍人員：

### 一、指導老師

### (Instructor)

劉昭恕 助理教授

主要研究領域為動力機械、機電整合、智慧型控制、伺服晶片設計等，且將伺服晶片應用於智慧型機械手臂和智慧型自走車之控制。針對此機器人之製作，提供機構設計、控制核心及機電整合等方面的建議及指導。將理論與實務結合，使機器人達到創新、快速、靈巧、簡易、決策之設計目的。

(Advisor：Chao-Shu Liu　Assistant Professor)

The research areas are mainly focused on Power Mechanical, Mechatronics, Intelligent Control, Servo Chip Design, ect., and applying the servo chip to the controls of intelligent robotic manipulator and intelligent autonomous vehicles. As to the implementation of the robot, he provides the suggestion and guidance for the mechanical design, control kernel and the combination of mechanism and circuits. Through the link between theoretical concepts and practical implementation, ICKA_AR-1000 can acts toward the purposes of innovation, high speed, deftness, simplification and right decision.

### 二、組員

### (Team Member)

1. 戴源宏

組員:負責機構、電路及程式設計大方向指導及技術支援等。

(1nd team member: Yuan-Hung Tai)

Group member: Agency responsible, circuit and program design the general direction guidance and technical support.

2. 張宗皓

組員:機構設計及加工製作、書面報告撰寫、材料採購、現場比賽之操作等。

(2nd team member: Jhong-Hao Chang)

Group member: Mechanical design and manufacture a written report writing, material procurement, live game operations.

3. 曾宇章

組員:負責程式設計、闖關流程安排、書面報告撰寫、材料採購、機構加工製作等。

(3nd team member: Yu-Jhang Zeng)

Group member: Responsible for program design, the checkpoints flow arrangements, written report writing, material procurement, Mechanical manufacture.

4. 王梓銘

組員:負責電路規劃、驅動電路設計、材料採購、感測器設計、書面報告之彙整與撰寫、現場比賽之操作等。

(4nd team member: Zin-Ming Wang)

Group member: Responsible for circuits planning, drive circuit design, sensor design, reports collection and writing, and operation in the competition.

## 貳、機器人簡介

### 一、構想與策略分析

機構方面,將各項闖關功能所需機構整合,減少機構的個數。電路方面,將驗證電路後,以軟體繪製電路板,達到模組化,方便日後整合。感測器方面運用了 CNY70 作為循軌之用途,紅外線作為避障功能,顏色感測確認隊伍。

本次競賽與往年相比關卡較為困難,時間非常緊迫,所以正確的拿到分數比過完全部關卡更為重要,機構設計必須容易分辨與分類吉祥物,並且規劃放置救援區上吉祥物放置地點,避免吉祥物掉落而沒拿到分數。

(Idea And Strategy Analysis)

Sector, the various checkpoints required institutions to integrate, reduce the number of agencies. Circuit aspects, will verify that the circuit, software drawing board to achieve modular, to facilitate future integration. Sensors aspects of the use of the CNY70 as patrol rail use, infrared for obstacle avoidance, color sensing Confirmation team.

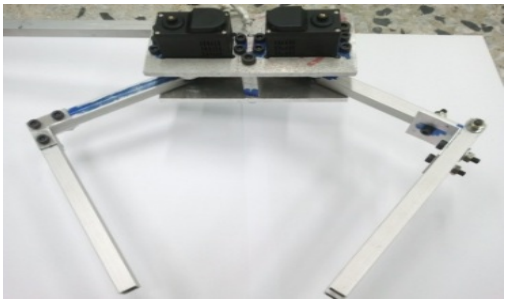
The competition hurdles compared with previous years is more difficult, time is very tight, so get the correct scores than completed checkpoints more important, the institutions must be designed to be easy to distinguish the classification mascot, and planning to place the rescue on mascot location avoid

mascot fall and did not get the score.

## 二、機構設計

1. 上升機構：

利用螺桿具較大減速比的特性來傳送動力，使前輪部分以及後輪部分能夠上下移動。使用較準確的鋼珠滑軌能夠讓前輪部分以及後輪部分能夠滑順的上下移動，並且限制運動方向為直線上升下降達到要求的動作。且為了改善前後段主體在上升時把主要的力量集中在螺桿上方，所以我們將與螺桿配合的部分，加上了軟墊，主要是為了要把螺桿上的力分散至滑軌，此方法大大的減輕了螺桿的負荷。



2. 夾爪：

利用兩部伺服機直接驅動小方管組成的夾爪。

3. 兩端加長夾爪：

將中間之夾爪兩端加長，便可用於剷除障礙物。

## (Mechanism Design)

1. Rising institutions:

Using a screw with a larger reduction ratio characteristics to transmit the driving force, so that the front wheel portion and rear portion can be moved up and down. More accurate use of the ball bearing slides allow the front wheel section and smooth the vertical movement of the rear wheel portion can be decreased to achieve the required operation for the straight up, and restrict the movement direction. In the rise and in order to improve the body of the posterior segment of the main power concentrated in the screw top, so we will in conjunction with the screw portion, with a cushion, mainly in order to put on the screw force is dispersed to the rail, this method greatly of reducing the load of the screw.

2. Jaws:

Two servo drives directly drive small square tubes jaw.

3. Both ends lengthened jaws:

The middle of the jaws both ends of the longer, can be used to eradicate the obstacles.

## 三、輪子驅動設計

1. 中間輪：

中間輪是使用伺服馬達，驅動的方式為利用正齒輪搭配減速機帶動輪胎。

2. 後輪：

後輪是使用了伺服馬達搭配減速機後，利用傘形齒輪傳動。

## (Wheels Drive Design)

1. Middle wheel:

The middle wheel is servo motor driven spur gear with reducer drive tires.

2. Rear wheel:

The rear wheel is the use of a servo motor with a bevel gear drive reducer.

## 四、電路設計

1. 電源規劃：

電池是使用五顆 2200mAh 鋰電池，後輪驅動之兩顆伺服馬達各一顆電池，上升機構驅動之兩顆馬達共用一顆，驅動夾爪開合之伺服機與收起夾爪之馬達共用一顆，主板電路與感測器共用一顆。

2. 直流馬達驅動電路：

以 8051 單晶片輸出低電壓經由邏輯閘互鎖在輸入光耦合器 PIC817 轉換為高電壓，啟動 P 型 IRFP9540 與 N 型 IRF540 場效電晶體組成的 H 橋式驅動電路，並為了因應 PWM 的控制，在陰極加設一個 N 型 IRF540 場效電晶體控制速度。

## (Circuit Design)

1. Power Planning:

The battery is five 2200mAh lithium battery, rear-wheel drive of two servo motors a battery, a rise institutions drive two motors shared drive folder jaw opening and closing of the servo Less folder claw Motor sharing a teeth, motherboard circuits and sensors shared one.

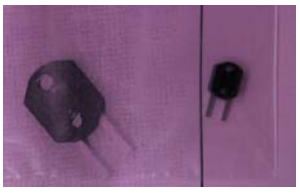
2. DC motor drive circuit:

8051 output low voltage via logic gate interlock input op to coupler PIC817 converted to high voltage, start the P type IRFP9540 with the N-type IRF540 field-effect transistor the H-bridge driver circuit, and the order in response to the PWM control IRF540 field-effect transistors control the speed of an N-type cathode plus.

## 五、感測器設計


1. 循軌感測器：

使用 CNY70 感測，利用紅外光反射原理，判別是否有在軌跡上，再用 LM358 放大訊號，使訊號更明確。



2. 顏色感測器：

顏色感測器利用光線照射物品所反射光的波長判別顏色，在經過 LM358 放大訊號。

3. 紅外線感測器：

利用發射紅外線碰到物體反射紅外線後接收器所感應的能量形成類比電壓，再經由 ADC0804 將訊號轉換成數位訊號。

4. 近接開關：

使用感應式感測，是透過外部磁場改變，檢測出表面產生的渦電流所引起的阻抗變化，通常用於檢測金屬等導體。

(Sensor Design)

1. Tracking sensors:

To use the CNY70 sensing, infrared light reflection principle, determine whether there is a clearer signal on the track, and then LM358 amplifier signal.

2. Color sensor:

Color sensor uses light irradiation items are reflective the discriminant color wavelength of light and amplify the signal after LM358.

3. Infrared sensor:

Emits infrared light form analog voltage encounter energy induced by the object reflects infrared receiver, and then through ADC0804 would signal converted into digital signals.

4. Proximity switch:

The use of an inductive sensing, through the external magnetic field changes, the detected change in impedance caused by the eddy current generated on the surface, usually used for detection of metal conductor such.

## 六、組裝、測試與修改

將討論出來的想法繪製成立體圖後，便開始收集材料與加工，將完成的機構先手動測試，然後在裝上馬達驅動，第一版的機器人因為尺寸制定太過於保守，導致很重，除此之外並沒有機構上並沒有太大問題，稍微修正便可以，所以第二版便是以輕量化與簡單加工為目標。製作完成後重量約為第一版之 60%，也修正第一版機構過於繁雜難以加工，讓加工精度更高。

(Assembled, Test, And Modify)

Discussion out of ideas drawn into the body diagram, began to collect the materials and processing, the agency will complete the first manual test, and then mounted on the motor drive, the first version of the robot because of the size of formulated too conservative, leading to heavy and, apart from outside agencies and there is no problem, a little correction that will be, so the second edition is a lightweight and simple processing target. Finished weight is about the first edition of the 60% of the first edition institutions also fixes too complicated and difficult processing, higher machining accuracy.

## 七、機器人創意特色說明

將車體設計成三部分，分別可以相互移動，仿效堆高機的設計。夾爪以小方管堆疊而成，中間夾爪後段加長可以用來移開山崩區的障礙物。

(Robot Ideas Features Description)

Bodywork design into three parts, respectively, can move relative to each other, to emulate stacker design .Jaws stacked small tube, the jaws both ends in the middle longer can be used to remove the obstacle of the landslide area.

## 參、參賽心得

參加這競賽需要投入許多時間與精力，但其中學習到的一定也很多，我們所做的機器人是不須由人操控，而是藉由我們事先下達給機器人的程式命令與感測器，使它按照我們所想的動作來作動，對於相關技術生疏的我們，製作前期一定會非常辛苦的解決問題之方法，但我們都克服了，雖然成績不盡理想，但過程中的收穫才是最寶貴的。

Need to invest a lot of time and effort to participate in this contest, but learn must have a lot of robots that we have done is not subject to manipulation, issued by us prior to the program commands and sensors of the robot so that it the action we want to make the move, related technologies rusty, pre-production will be very hard to solve the problem of the method, but we have to overcome, although the results were less than ideal, but the harvest is the most valuable.