

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

組別：遙控組

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一、指導老師：洪春鳳

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貳、機器人簡介

一、構想與策略分析

一、構想：

起初我們構想是做出兩隻手臂，一隻抓娃娃，另一隻拿籃子，兩隻手同時進行；而腳的機構是源自於機械蜘蛛的機構，以馬達做為動力源，並以鏈輪來傳動機構。

而後來，在進一步的討論與構想後，我們的想法有些改變，因為籃子滑行的鋼管在兩公尺高的地方，如果以手臂拿籃子的話在機構的設計上會有些麻煩，所以我們想設計一個放置籃子的垂直升降平台，以及一個提供娃娃滑行進入籃子的斜面。待籃子中的娃娃放滿後，把機器人遙控到鋼管附近直接把籃子升高到鋼管處並放置籃子，如此一來就可達到我們的目的了。

(At first, our idea is to make the two arms, a grasping doll, another

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

took only basket, two hands simultaneously; foot institutions from the mechanical spider institutions, to the motor as a power source and to the chainwheel to the transmission mechanism.

Later, after further discussion and idea, we think some changes, because the basket of sliding steel pipe in two meters high, arm to take the basket on the design of the institutions would have some trouble, so we want to design a placed baskets of vertical lifting platform, as well as provide a doll glide slope into the basket. Doll basket to be filled, the robot is remote to the steel pipe near the basket rises directly to the steel pipe at and placed the basket, this way you can achieve our objective.)

二、 策略分析：

1. 時間：

(1) 因為場地的尺寸為 950cm x 1100cm 算是一個蠻大的場地，另外加上時間被限制在四分鐘以內，所以我們決定選一個機械效益較高的機構。經過網路及書本資料的查詢與比較後，我們決定採用機械蜘蛛的足型機構，這種機構可以提供較高的移動速度及一個穩定的機構。

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

(Because of the size of the venue for the 950cm x 1100cm be considered a pretty big venues, plus time is limited to less than four minutes, so we decided to choose the agency with a high mechanical advantage. After data query and compare Internet and books, we decided to use a mechanical spider foot institutions, such institutions can provide high movement speed and a stable institution.)



2. 便橋區：

- (1) 由於比賽中的便橋是由斜面與平面所組合而成，為了防止機器人在上坡時因為摩擦力不足而下滑，我們將會在腳上裝置高摩擦力的腳掌。

(Due to the competition of the temporary bridge by bevel and

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

flat-screen combination, the device will be on their feet in order to prevent the robot decline uphill because the lack of friction, high friction of the soles of the feet.)

3. 橫木區：

(1) 為了增加通過橫木的流暢度，我們會設計具有有高摩擦力以及擁有較大接觸面積的腳掌裝在機器人的腳上。並使用類似狼牙棒的結構，來幫助機器人通過障礙。

(In order to increase the fluency through the crossbar, we will design a high friction soles of the feet, and has a larger contact area mounted on the robot's feet. And use a mace-like structure, to help the robot through the obstacles.)



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

4. 娃娃的抓取：

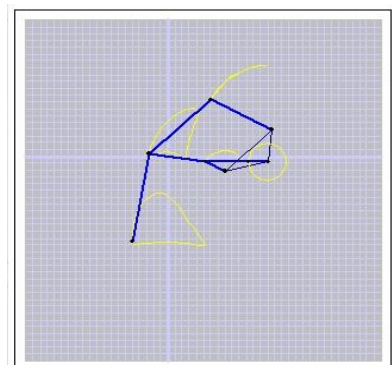
(1) 為了減少夾娃娃的時間，我們不是利用手臂把娃娃放到籃子裡而是利用一個斜面讓娃娃自行滑進籃子中。當操控手要將娃娃放置於鋼管上時，只要將機器人遙控至鋼管旁並將在有籃子的平台升高並放上籃子即可。

(To reduce folder doll time, we do not make use of the arm to the doll into the basket doll itself slid into the basket but the use of a bevel. Manipulation Hand To doll placed in the pipe, as long as the robot is remote next to the steel pipe and basket platform elevated and put a basket can be.)

二、機構設計

一、 腳部設計：

我們所選用的足部機構會因為輸入桿件的長度與地桿的位置而有不同的運動模式，這次比賽所使用的運動模式主要是為了因應橫木區關卡所選定的。機構地桿的部分，在原設計圖中是呈現一個三角形的形狀，為了加工上的方便與精度的要求



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

之下，我們把此
三角形的地桿
轉換至一鋁板
材上，既解決了
精度的問題也
提高了加工的



方便性；而輸出桿件的特殊角度也是利用此種方法來製作的。在每個關節的部分，是以空心的鋁條、鋼條作為轉軸，具有階級的軸則是負責侷限與固定；整個機構的連接與帶動是由一厚兩毫米的鋁桿所負責的。此外為了防止運動時打滑，我們還特別製作腳掌以增加機構與地面的摩擦力。

(The foot mechanism chosen because of the input of the length of the rod member and the ground position of the rod have different motion mode, this motion mode are used by the game is mainly to crosspiece zone checkpoints selected. Institutional part of the rod is presented in the original design, the shape of a triangle, and order processing ease and accuracy on the request, we convert the triangle ground rod to an aluminum sheet only solve the problem of accuracy also processed convenience; special angle of the

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

output rod is to make use of such methods. In each part of the joint in a hollow aluminum, steel bars as the shaft, with the shaft of class is responsible for the limitations fixed; the entire connection driven by a 20 mm thick aluminum rod responsibility. In addition, in order to prevent the exercise slip, we also specially produced to the soles of the feet to increase institutional friction with the ground.)

二、 手臂設計：

在經過多組的手臂測試後，我們最後選用有辦法一次性夾取三隻娃娃的手臂機構。這種機構由一組滑槽滑塊組成一滑動對來上下移動，而夾爪則是使用拉線的方式來進行開合。夾爪打開後，將娃娃掃至機體正中央後，在將其夾起，被夾起來的娃娃會通過一斜面滑至籃子中，等待掛欄。

(The arm of the multi-group test, the final selection of a way to one-time gripping the arms of three dolls institutions. This mechanism consists of a set of chutes slider for opening and closing a slide to move up and down, while the jaw is using PULL. Jaws open, sweeping the doll to the body center of the dish, the doll will be caught up by an inclined plane slipped

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

basket, waiting for the hanging bar.)

三、 平台設計：

為了將籃子升高至接近兩米的高度，我們使用交叉機構來滿足我們的需求。為了增加其機構的穩定度我們在每一個節點都使用鋁條來貫穿，使其成為一個穩定度高的升降平台。



(In order to rise to the height of nearly two meters the basket, we use cross-agency to meet our needs. To increase the stability of its institutions in each node using an aluminum throughout, making it a high stability of the lifting platform.)

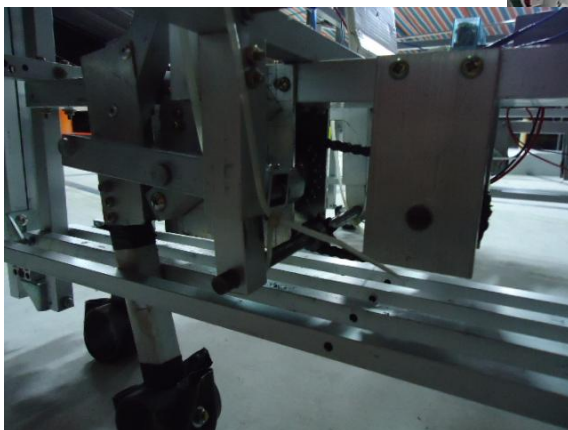
參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

三、輪子驅動設計

- 一、 這次我們所採用的方式為一組機器足使用一顆馬達並使用細鍊條來帶動，如此一來，每組腳都可以獲得充沛的動力，以免發生扭力不足的情況發生，尤其是我們這次是採用的計構的機械利益較高，對於扭力的需求較大。另外我們還將惰輪作成可調整的，以便在比賽中快速的調整。

(This time we used a set of machines enough to use a motor and use a fine chain driven, this way, each foot can get plenty of power, in order to avoid torque insufficient happens, especially this time we higher mechanical advantage count configuration for larger torque demand. We also idler Rotation adjustable to quick adjustment in the game.)



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

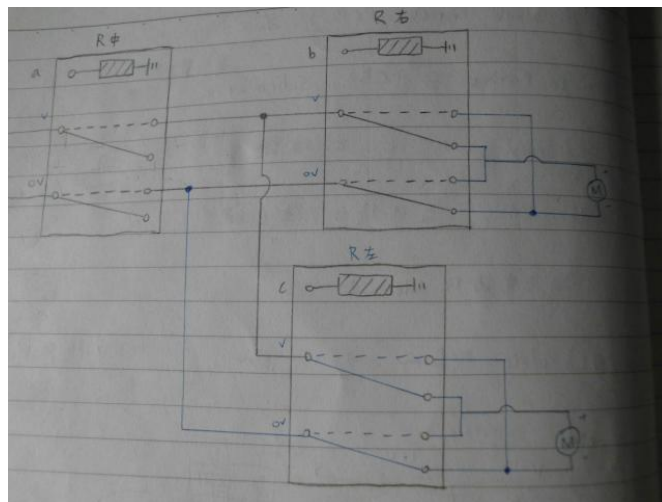
四、電路設計

一、 腳步驅動電路：

(1) 轉向控制電路：

如下圖所示，繼電器 1 為馬達電源的總開關，繼電器 2 與繼電器 3 分別控制兩顆馬達的正、反轉。

(As shown in the following figure, relay 1 for total motor power switch, relay 2 and relay control two motors, reverse.)



二、 手臂控制電路：

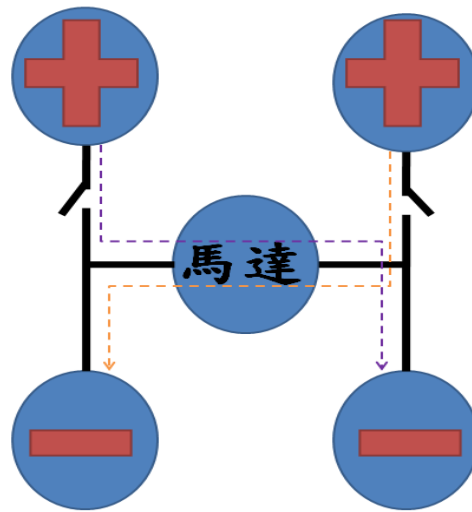
(1) 手臂電路採用簡化版的 H 型電路設計，如下圖所示，紫色代表正轉，橘色代表反轉，由開關去控制正反轉。

(Arm circuit using a simplified version of the H-type circuit design, as shown in the following figure, purple represents forward, orange representatives reversal, reversing switch

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

control.)



五、組裝、測試與修改

一、腳的部分：

(1) 載重部分：

原先我們的桿件都是採用厚 1mm 的鋁桿，原本想說這樣應該就夠了，但是下地測試與加上負載後，我們發先這樣的設計沒辦法完全符合我們的需要，所以我們將某些地方換成了厚 3mm 的鋁桿和實心的鋁塊來改善此問題，同時也解決了側向撓動的問題。

(Original rod is 1mm thick aluminum rod originally want to say this should be enough, but of Shimoji test plus load us first so that the design can not completely meet our needs, so we will be asome places replaced by a 3mm thick aluminum

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

rod and solid aluminum block to improve this problem, but also solve the problem of lateral Perturbations.)

(2) 傳動部分：

此次比賽的限重為 25 公斤，為了應付最糟糕的情況，測試時我們有將整個機構的重量增加至 20 公斤左右，這時我們發現馬達處於高附載的狀況，而且轉速與扭力都大幅的降低了，為了改善這種狀況，我們將鏈輪齒比降底。這樣一來，原來的情況就被大幅的改善了。

(The game limit weight of 25 kg, in order to cope with the worst case scenario, the test we have the weight of the entire organization is increased to 20 kilograms, when we found that the motor is annexed situation, and the speed and torque are dramatically reduced to improve this situation, we will sprocket teeth than down at the end. As a result, the original situation is significantly improved.)

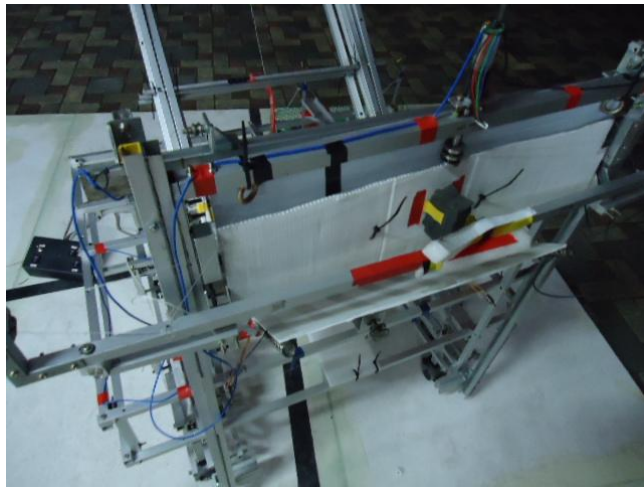
參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

二、 手臂部分：

測試夾爪時，我們發現一個非常嚴重的問題，那就我們設計的夾爪無法完全夾緊娃娃，再三商討之下，我們決定利用海綿來改善此一狀況。果然在加上海綿之後，狀況改善了許多。

(The test jaws,
we found a
very serious
problem, then
we design the



jaws can not completely clamping doll, repeatedly discuss below,
we decided to use a sponge to improve this situation. Sure
enough, plus sponge, the situation improved a lot.)

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

三、 電路部分：

這次我們是使用繼電器來控制馬達，但是這次要傳動的足部機構需要較高的電流來驅動，而又因為馬達屬於電感性負載，其端壓與電流的變化有關，所以在開關投入與切斷的瞬間會感應一高電壓，此高電壓會造成繼電器接點的碳化。我們利用電容兩端端電壓不能順變的暫態特性，在馬達端並連一電容，來改善此現象。電源線也用直徑較粗的線，使其效率提升。

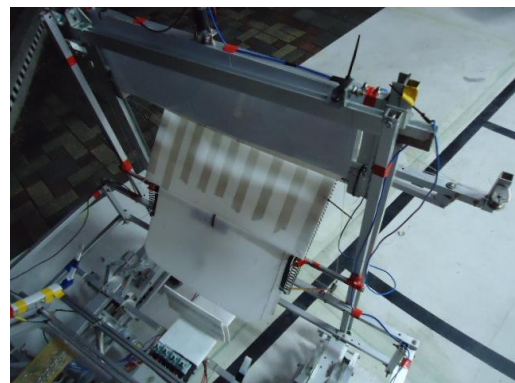
(This time we are relays are used to control the motor, but this time to the transmission foot mechanism requires a higher current to drive, but because the motor is an inductive load, the terminal voltage and current change, so in the switch input and cut off the moment will be the induction of a high-voltage, high voltage will cause the relay contacts carbonation. We used across the capacitor terminal voltage not smoothly varying transient characteristics, with a capacitor in the motor end and to improve this phenomenon. Power cord with a diameter thicker lines, its efficiency.)

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

六、機器人創意特色說明

- 一、 採用 Mechanical Spider 的機構。(Using the Mechanical Spider institutions.)
- 二、 利用一斜面讓娃娃滑進掛籃裡。(The use of a ramp doll slid into the hanging basket where.)
- 三、 利用交叉機構來升高掛籃。(The use of cross-agency increased the hanging basket.)
- 四、 在掛籃的鉤子上套上培林，增加掛鉤與鋼管間的滑順度。(Put in a hanging basket hooks bearings to increase the degree of smoothness of the hook and the steel pipe.)
- 五、 利用一隻夾爪來同時抓取三隻娃娃。(Using a gripper to grab three dolls.)



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

參、參賽心得

游子慶：

多少個難熬、與隊友苦思的日子，就為了上場的那幾分鐘。對我來說結果似乎並不是那麼的重要，重要的是一起奮鬥的那個過程。這次的比賽讓我見識到了各種機構的巧妙運用也激發了許多新的想法，果真是「讀萬卷書行萬里路」，這次的比賽讓我們學習到了許多卻也發現了許多應該檢討的地方，相信接下來的我們會更棒。這次要特別感謝中洲的各位教授與各位學長的幫助，沒有你們的幫助，我們不可能會有這麼好的成績。雖然這次只拿了第二名，但對我們來說已經夠了，這次真的謝謝各位了。

(Number of tough, day trying to come up with his teammates, just to play a few minutes. Results for me does not seem so important, important is that the struggle with the process. This game makes me an insight into the clever use of the various institutions also inspired many new ideas, is really a "read a Hangwanlilu", this game allows us to learn a lot but also found that many should review I believe that we will be even better the next. The pay special sense Xiezhong Zhou professors with fellow seniors help, you help, we can not be such a good result. Although this took only a second, but enough for us, this really Thank you.)

陳彥衛：

第一次參加 TDK 盃機器人競賽，感覺好新鮮，這是第一次和社團同學們一起做一台「機器人」；從暑假開始動工，起初做比賽場地、構思、討論、動工、修改、測試、組裝，到最後不斷的練習、修改，沒想到轉眼間就只剩下比賽前一個禮拜，依然還在測試，深怕比賽會出現問題，希望問題都出現還可以趕快修改，避免再比賽中途發生問題。

在比賽當中，每個隊員都很緊張，比賽時間只有 4 分鐘，不能出差錯，就算不小心出錯了，也只能一直比下去到下一關進行救援，很幸運地，晉級到了決賽，而決賽不像初賽，還有時間進行維修，晉級了就準備比下一場，時間很趕，也很殘忍，輸了就出場，我們的機器人在冠亞軍賽，軸不小心斷了，很可惜的只拿了第二名，也在這段旅程上畫上一個美好句點，沒拿第一名，我們並不難過，因為我們知道，我們是最棒的。

而這次比賽辦在彰化中洲科技大學，在比賽三天裡，看了智控組和遙控組比賽，發現很多東西是沒想過、沒看過、沒聽過，看了才知道原來還有這些方法，不只是在比賽，也交流到不少東西，這些是經驗，無可取代的。

(Participate TDK Cup Robot Competition for the first time, I feel good fresh, this is the first time students and community together to do a "robot"; commence from summer venue to do at first, the idea, discussed commence, modify, test, assembly, to

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

final constant practice, modify, did not expect the blink of an eye only a week before the game, still still test the myth that the game will be a problem and hope that the problems can quickly modify to avoid game in the middle and then the problem occurred.

Them in the game, each player is very nervous, only four minutes of game time, can not go wrong, even careless error, can only have been par to the next level to rescue very lucky to advance to the final, while the final unlike the preliminary round, still have time to repair, and advanced to the ready than the next game, the time is in a hurry, very cruel, lost on the appearance, our robot championships, shaft accidentally broken, unfortunately took only second place, but also painting journey a wonderful period, did not take first place, we are not sad, because we know that we are the best. The competition to do in Changhua Zhongzhou University of Science and Technology, in a game three days, looked intelligent control group and the remote group game, found a lot of things is thought, not seen, heard, read come to realize that these methods not just in the game, but also exchanges to a lot of things these experience irreplaceable.)

王詞興：

多少個夜晚，多少個方案 大家一起努力只為了設計出優質的機器人! 直到比賽結束後才覺得一切都是那麼的值得。比賽當天，第一場就讓我們心驚膽跳因為失誤連連，然而經過一再的努力我們這一組獲得第2名!這都是我們一開始沒有想到的，但我們做到了。比賽的過程我們受到各界的幫助，感謝學校指導老師的幫助與中洲科技大學各位教授與學長們的幫助讓我有機會角逐冠軍，雖然最後沒獲得第一名但我們已經非常高興了，相信明年的我們會比去年更好!!期待下次的 TDK 比賽。

(How many nights, how many programs we work together only until after the end of the game in order to design a high-quality robot! Feel that everything is so worthy. On race day, first let us all very scared because mistakes again and again, however, after repeated efforts to get our group 2 and this is what we did not think of the beginning, but we did it. Competition process, we help by all walks of life, thanks to the help of the school guidance teacher let me help you Zhongzhou University of Science and Technology Professor seniors the opportunity to compete for the championship, although the last did not get first place but we have been very happy, I believe next year we will be better than this year! TDK game to look forward to the next.)