參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

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※內容需中、英對照※

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貳、機器人簡介

一、構想：(1)首先必須克服離地且不能使用輪軸類運動,並且要能負荷機械手臂、升降機構的重量,我們第一個想到的就是如動物般的六足機器人,不僅重心穩固、移動快速…。

First of all, we have to design a motion that can rise up the robot without using wheels and can hold up the weight of robot arm, rising mechanism at the same time. The first thing we thought, is a robot with six legs, like insect. It's not only steady but also moving fast.

(2)機械手臂,我們一開始都把它想得太複雜,後來想要發揮自己的創意,我們把手臂改成像掃把一樣,接近麒麟娃娃時,把它掃進管子內,再舉起手臂,讓麒麟娃娃順勢往下掉,而管子的盡頭就是籃子,如此一來就達成目標。

Arm. We are thinking too complicate at the beginning, so we change it to a mechanism like broom. When it reach the doll, it can sweep the doll into tube, then lift the tube up to let the doll fall into the basket at the end of the tube to reach our target.

(3)升降機構讓我們思考了很久,因為機器人並不高,所以要升高到二米一的高度相當困難,但我們使用螺桿推動像關節般的機構,能讓籃子順利推到我們所想要的高度。

We have been thinking very long time with rising mechanism. Because our robot is not tall, it is difficult to reach 2 meters height. We use a mechanism like screw to push the basket to the height we want.

二、策略分析:(1)先求有,再要求更好!考慮到機器人要伸長到兩公尺高,困難度真的很高,所以我們的目標,先做出一台機器人可以跨越障礙、走完全程為第一的目標,我們認為六十分為這次比賽的基礎,,可以走完全程包含跨越倒木區的障礙以及上下坡,就達到我們要求自己的最低目標。而要能穩定快速走完全程,我們的參考的設計是仿生六足機器人,我們使用十二顆馬達控制六隻腳,使它能快速跨越障礙、行走,都能保持穩定、不摔跤。

Create it, then improve it. Thinking about reach 2 meters height is not so easy, so we aim at create a robot can cross all the obstacles and finish the path to get the basic 60 points. It has to finish the path with fallen trees obstacle and the slope to reach our target. We design a robot with 12 motors to control 6 legs so that it can cross obstacle and walk steady without falling down.

(2)因為比賽時分為三個救難區,共有九隻麒麟娃娃,但一個籃子只能放進六隻麒麟娃娃,也考慮到機器人的重心問題,我們只放一個籃子在機器人身上。In the competition, there is 3 area with 9 dolls, but each basket can only put 6 dolls at the limit. Consider abupt balance, we only put one basket on the robot.

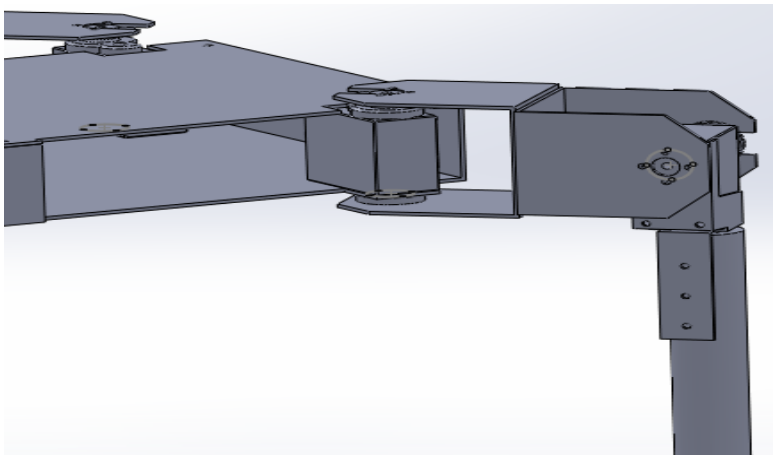
(3)六隻麒麟娃娃都放進籃子後,籃子下方就是升降機構,等待機器人走到纜車正下方,讓升降機構把籃子升上去,掛住後,放下升降機構,讓機器人走至籃子滑落處,再將籃子取下放回原點。

When all the dolls are put into the basket then walk to the area under the tram and use rising mechanism to rise the basket up and hang it on tram. Then robot walk back to the start area and put the basket bake.

(4)我們預估走完全程不包含抓取麒麟娃娃和纜車關卡約兩分半鐘,因為比賽有三場,所以我們第一場比賽,穩扎穩打先走完全程,第二場比賽再開始夾取麒麟娃娃,是時間而增加麒麟娃娃數量與升降機構。先搶下基本分數後,再進階得分。

We forecast that we need 2 minutes 30 seconds to finish it without grab any doll. There is 3 sence in the competition, we plan to finish first sence with out grab any doll and start grab dolls at the second sence depending on the time we left. Get the basic points first, then the rest.

二、機構設計



圖(1)

機身由上下兩片板金件組成,在四個角及側面分別是六個控制水平運動的馬達。再透過一連接器(大腿)連接另一組六個控制各腳舉起動作的馬達。

The body is made by two sheet of metal. 6 motors at the corner and the side to control horizontal motion and connect with other 6 motors controlling vertical motion to rise up each leg.

夾取娃娃與升起吊籃以同一機構作動，由一個可以 360 度旋轉的平面連接三支長約 50 公分的桿子，並在前端加上夾爪。有很大的自由度與工作範圍。

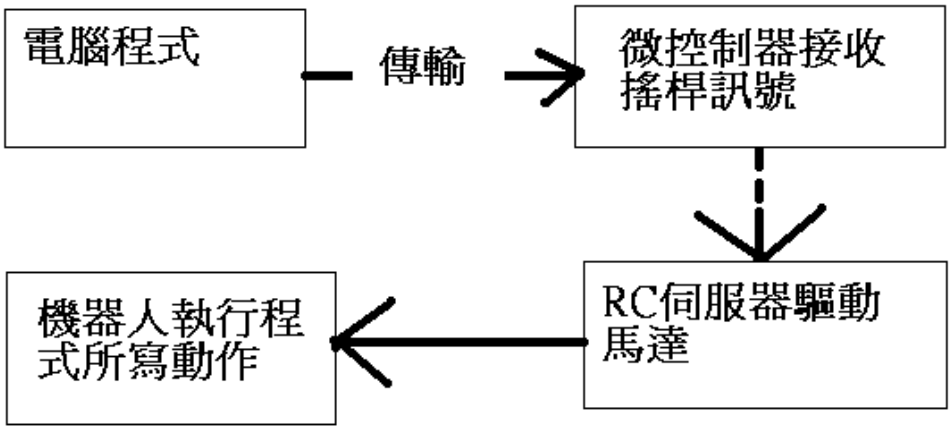
Grabbing and rising motion is using the same mechanism. A plate which can rotate 360 drgrees connect 3 pole about 50 cm one by one and claw at the end of it. It has great degrees of freedom and large scope of work.

三、輪子驅動設計

這次大會規定不能使用輪子類,而我們的機器人是足類機器人,所以沒有使用到輪子驅動。

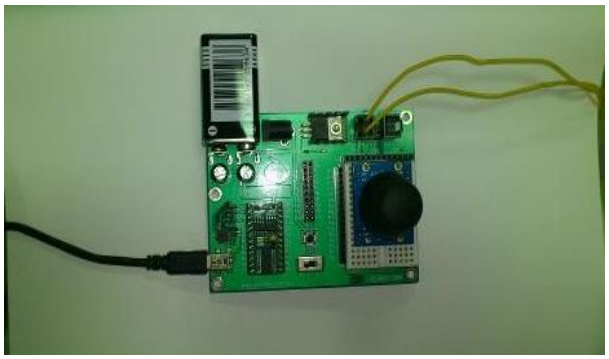
This time the provision is not to use wheels. Our cephalopod robot is not using any wheel.

四、電路設計

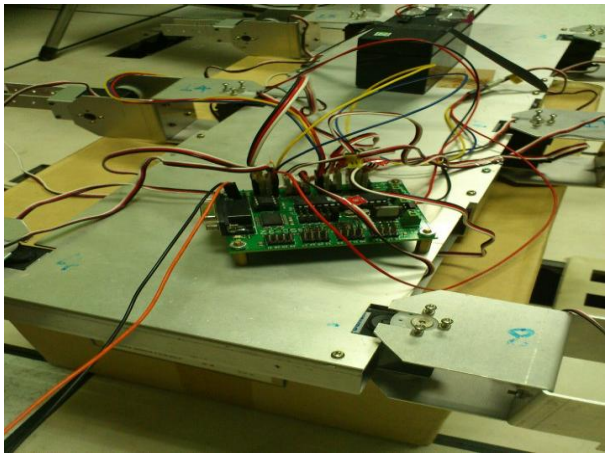


電腦輸入程式至微控制器後，再由微控制器接收來自搖桿、按鈕等的訊號後，傳達指令給 RC 伺服器驅動器命令馬達做出各種動作。

PC input program into controller, controller receives signal from joystick or button and send commads to RC server to command motors to do motions.



圖(2)微控制器加上搖桿(Micro controller and joystick)


圖(3)RC 伺服控制器
(RC server)

伍、組裝、測試與修改

初步組裝時因為腳只以少量螺絲固定，所以出現搖晃、彎曲等情形。而在多鎖上幾支螺絲後”症狀”也跟著痊癒。

We only used few screws to fixed it, so it was shaking and bending. After we put more screws on it, it's "cure" as well.

一開始也因為足部太長而有重心不穩、晃動等情形，在除去約 5 公分的長度後也有所改善。

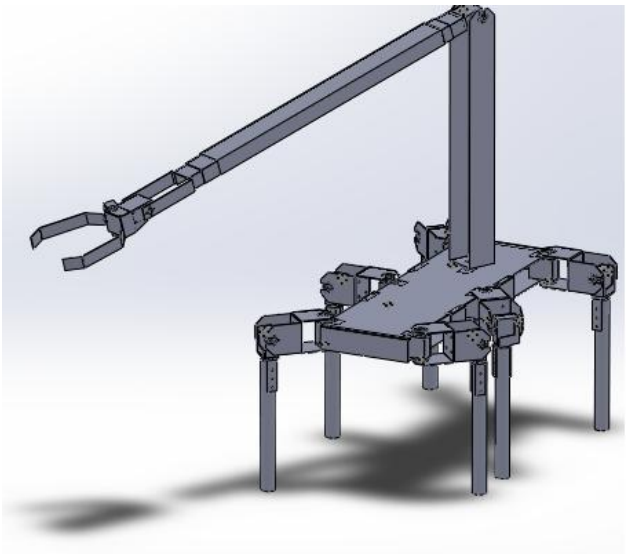
And the instability and shaking cause by the legs which are too long, has become better after we cut 5cm off.

障礙測試是以瓦楞紙摺成類似 5x6x100 的長條狀，仿製比賽場地的木條障礙。斜坡則是以現有材料一塊 70x100 的木板以及學校教室現有的斜坡來進行測試。

Obstacle testing we fold corrugated papers to become a 5x6x100

stick as the wooden stick. About the slope we use a existing material 70x100 wooden plate and the slope we have is classroom to test.

五、機器人創意特色說明



不僅擁有自然動物之美,也有像動物般強刃的武器,可以對目標進行捕捉,更有高科技的伸縮,還能將物體抬高到兩公尺高。

Looks like nature animals with a claw can catch target and stretch can lift things to 2 meters height.

參、參賽心得

果然參加比賽是學習最有效的方法之一。

Competition is a faster way to learn as well.

經過這次比賽，我們學到了如何使用程式語言控制機器人運動，以及面對問題時的應對方法等等。當然還有在結構設計上的考量，如

加工方式、組裝、整體強度…等等。設計出再優良的結構，加工困難或是難以組裝也是枉然。

After this competition, we learned how to control a robot with programming language and solving problems. Considerations on structural design like machining, assembly, strength overall... Even we design a very nice structure, if it can not be create out it is useless.

其他還有很多，小如接線大如運用工作母機加工，當一切從零開始時，才能學習到更多設計與製造上的知識。有很多東西不是課本所能用文字與圖片表達的，只有親身參與整個製造與設計的過程，才能完全了解每個尺寸的意義。

There still much things we have learn, from wiring to using workhorses. When everything start from zero we can learn more about design and manufacture. There is many things that books can't tell us with words and pictures. Only when we participate the process with ourself, we can complely understand every meanning of dimension.

而提到「從零開始」，也難免會提到對比賽的一些質疑。Saying about "Start from zero" inevitably we will talk about some

question of this competition.

有很多隊伍都是使用「前輩們」所傳承下來的機器人上場，現任隊伍所要做的僅僅是改造部分機構，或是加上一兩個機構而已。站在成本的立場來看，這樣是可以省下一筆經費，也讓學生有學習的機會。但是我們認為那樣會在某種程度上拘限學生的創意與思考。簡單的說，先人種樹後人乘涼，後人有樹可以乘涼，自然不會去想要種樹。要是只針對前輩的機體進行改良，那學生會去思考創新機構的可能性也就跟著大幅降低。是不是改成「可以參考前人機器，但不可以用前屆機器人參賽」會比較符合比賽「創意與思考」的宗旨？

Many teams are just using the robot which seniors left. All they have to do is just change some part of it or add something on it. It is ture that saves money and students still have a chance to learn, but we think that it will limit the creative of the students. If they just thinking about improve the robot seniors left, the possibility of them to think a new mechanism is become lower at the same time. Would it be better if we change the rule to "Can only reference to the senior's robot, but cannot use it on the competition" ? It is more in line with the purpose of the competition: Creative and Thinking.

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

經過這次比賽，不只是把以前所學活用到實物上，也還因為這次比賽學習到了不少在課堂上學不到的東西。包括比賽當天觀察教授學者們看待其他學生的態度，也讓我們更了解大人的世界不少。總之耕耘是辛苦的，收穫也是滿滿的。比賽，果然是學習與成長最有效的方法之一。

After this competition, we are not only put knowledge we learn in school to a real thing, but also learn many thing we can't learn in the class room. Something like observing the way those professors and academics treat the students, it make us know more about the world if adult too. Whatever, cultivation is hard and gain is full. Competition is turly a faster way to learn.