

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：蕭俊祥 老師

學校名稱：國立臺北科技大學 隊伍名：北科機動

(School :) National Taipei University of Technology

(Team name :) TT maneuvering

※內容需中、英對照※

壹、參賽隊伍人員：

一、指導老師：

蕭俊祥 教授 美國 Michigan State University 機械所博士

專長領域：智慧型機器人、機電整合、控制、振動、噪音、視覺與影像處理。

二、組員：

孫偉恆 組長

足型機構設計，操作手。

江柏霖 組員

負責平台機構設計製作。

黃維民 組員

遙控器及電路設計製作，夾爪設計及製作。

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

Instructor:

Xiao,jun-Xiang Professor American Michigan State University

Mechanical Ph.D.

Intelligent robotics, mechatronics, control, vibration, noise, visual and image processing.

Members:

SUN,WEI-HENG Leader

Sufficient type of mechanism design, operator.

CHIANG,PO-LIN Member

Responsible for the platform mechanism design.

HUANG,WEI-MING Member

Remote control and circuit design, gripper design and production.

貳、機器人簡介

一、構想與策略分析

A. 構想：

我們這組的機器人，經過考慮後我們決定以仿生獸為足部機構，選擇的原因是其機構能夠快速行走且穩定。然後以足部機構為底座，在其上方搭一個平台，在平台的前方裝手臂來夾娃娃用的，手臂是採用掃的掃到中間，在夾緊往機身內送，在平台後方架設雲梯機構，中間放置籃子，設置滑道讓娃娃滑入籃子。

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

Our robot, after consideration, we have decided to the bionic beast foot institutions, selected because of its agencies to quickly walk and stable. Then to the institutions of the foot for the base, put up a platform above the loading arm to the folder with the doll in the front of the platform, the arm is used to sweep the sweep to the middle, the clamping sent to the fuselage behind the platform erected tower ladders bodies, placed in the middle basket the setting chute doll to slide into the basket.

B、策略分析：

1. 仿生獸的足部機構

(1) 由於考慮場地大小與比賽的時間限制，我們需要一個能夠

平穩快速行走，並且能夠負載相當重量的腳步機構。

A. 在行走斜坡時，仿生獸平穩腳部機構能快速且輕鬆的越過。

B. 與地板接觸時，我們的策略是在腳的底部加裝圓弧型腳墊，減少摩擦力，不是以尖點碰觸進而能平滑的行走。

Considering the size of the venue and the time limit of the game, we need a smooth fast walking, and be able to load the the considerable weight footsteps institutions. n walking the ramp, smooth bionic beast foot institutions quickly and easily to crossed.

. contact with the floor, our strategy is the installation of arc in the bottom of the foot

Type mats, reduce friction, not turn cusp touch, smooth walking.

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

2. 剪叉機構的平台

- (1) 由於機器人限高 1 米，但是纜車軌道最高處是 2 米，所以選用變形量大的機構，將籃子放在平台上，由剪叉式的平台送上纜車軌道。

Due to the robot maximum height of 1 meter, the highest point of the tramway is 2 meters, so the selection of the large deformation institutions, the basket on the platform, tramway sent by Scissor platform.

3. 怪手手臂及夾爪

- (1) 為了將麒麟娃娃放入籃子，所以需要一個手臂及夾爪，最後決定用滑槽的機械手臂，以及兩支長型的夾爪，用掃的方式將娃娃夾緊，這樣手臂不用對很準就能把娃娃夾住，再用滑槽將夾爪送到機身。

Unicorn doll into the basket, so they need an arm and jaw, the final decision on the use the chute of mechanical arm, as well as two long jaws Esau doll clamping, so that the arms do not have very accurate can the doll grip, then chute the jaw sent fuselage.

4. 籃子的滑道設計

- (1) 為了解省時間上的浪費，我們在車身上架了一個滑道，讓手臂只需把娃娃丟到滑道上，娃娃就會順著滑道滑進籃子中，這

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

樣的機溝可以省去我們操作手瞄準籃子的時間。

In order to understand the Province's a waste of time, we have a chute in the body shelves arm simply thrown into the doll skirts dolly down the chute slid into the basket, so ditch the machine can save our operatinghand aimed at the time of the basket.

5. 底部的斜板設計

(1)此設計的原因是經過嚴密的計算後發現我們仿生獸的足型

機構，無法直接跨過倒木區的障礙，所以為了越過倒木障礙，

我們在機器人接近底部的地方設置一個斜板，讓機器人翹起前

端，用後腳的力量讓它翻過去。

The reasons for this design is found after rigorous calculations bionic beast foot institutions, not directly across the the fallen trees District of obstacles, so in order over the fallen trees obstacles, we set up a ramp where robot close to the bottom of the board, so thatrobot tilt front end, it turned over with the power of the rear foot.

二、機構設計

足部：

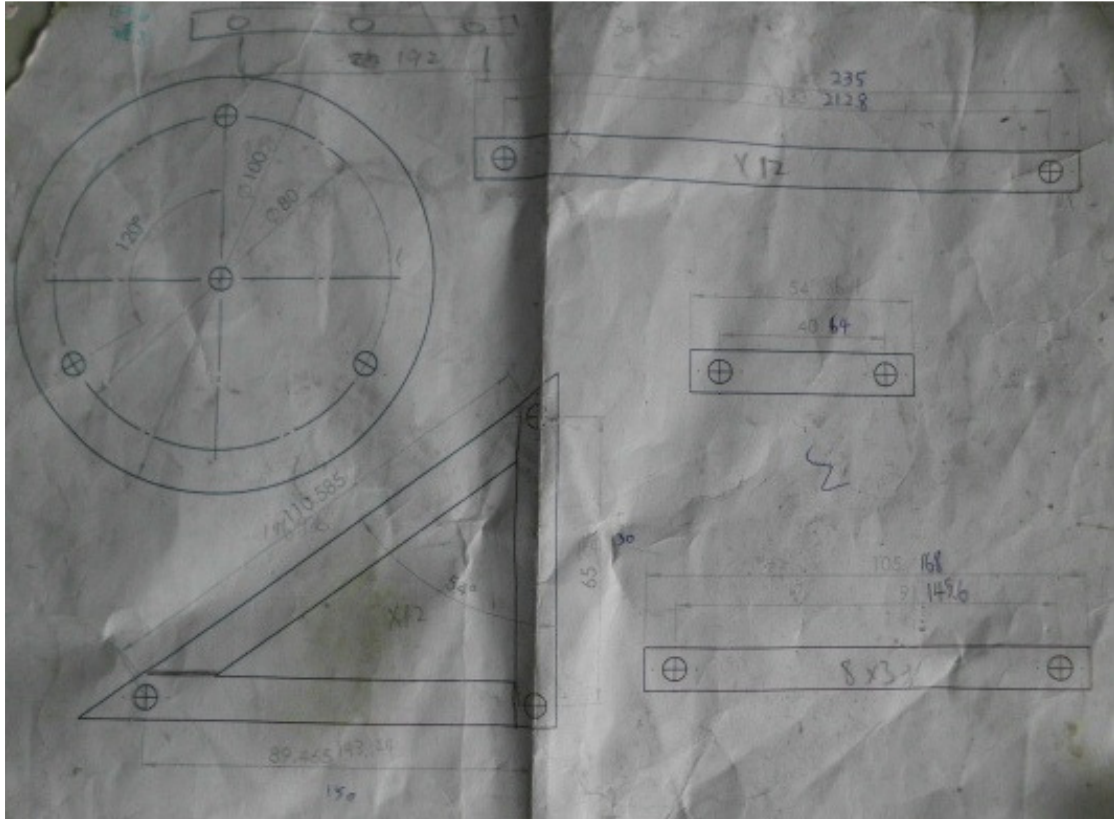
仿生獸的設計，單邊三組腳，共六組藉由其中各一組與馬達連接而帶動另外兩組。其中每組傳動柄皆相差 120° ，只需稍微給予些微動力即可帶動。

The design of the bionic beast, unilateral three groups of six feet, group driven by each group connected with the motor and the other two groups. Each of which is the transmission handle all

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

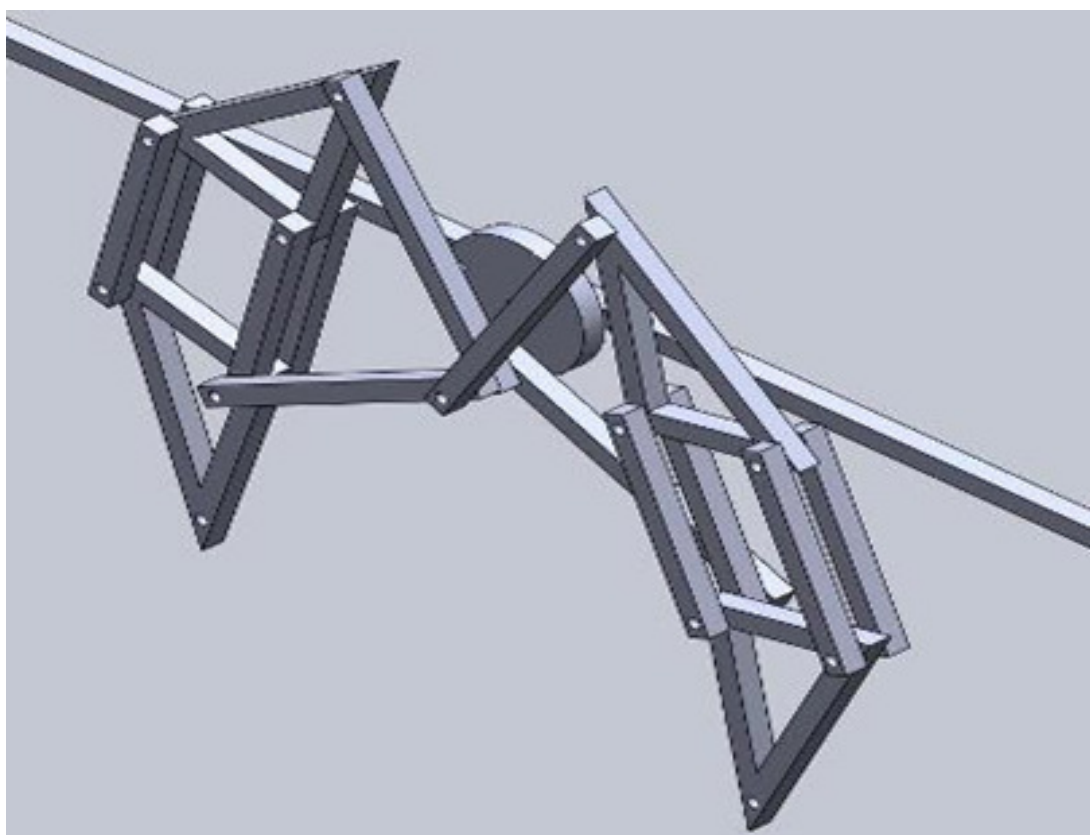
difference of 120° , just slightly to give a slight power can stimulate.



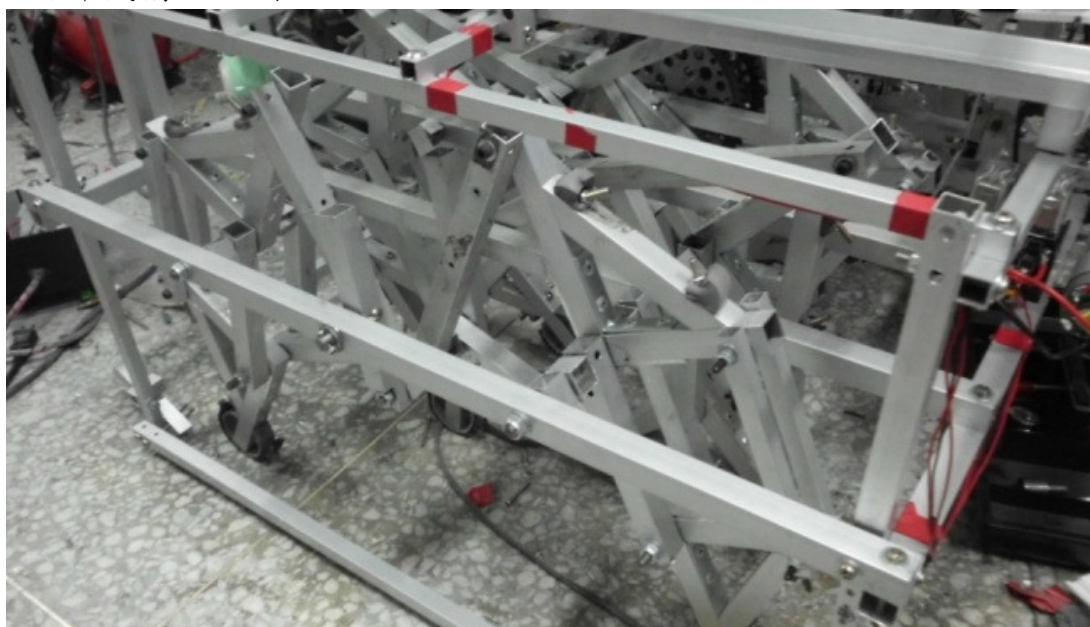
足部機件工作圖

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction



足部機構組合圖



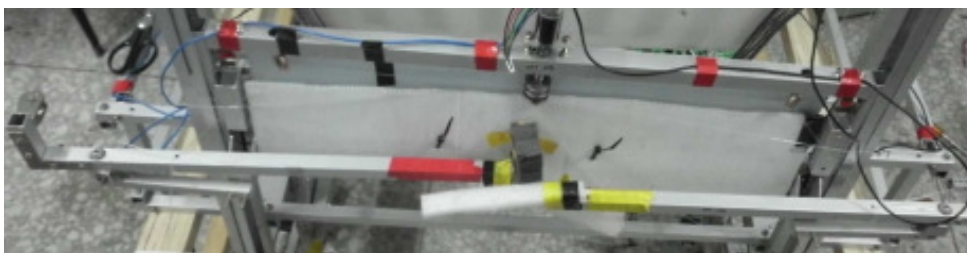
參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

夾爪：

滑槽的機械手臂，以及兩支長型的夾爪，用掃的方式將娃娃夾緊。

The mechanical arm of the chute, as well as two long jaws and sweeping manner the doll clamping.



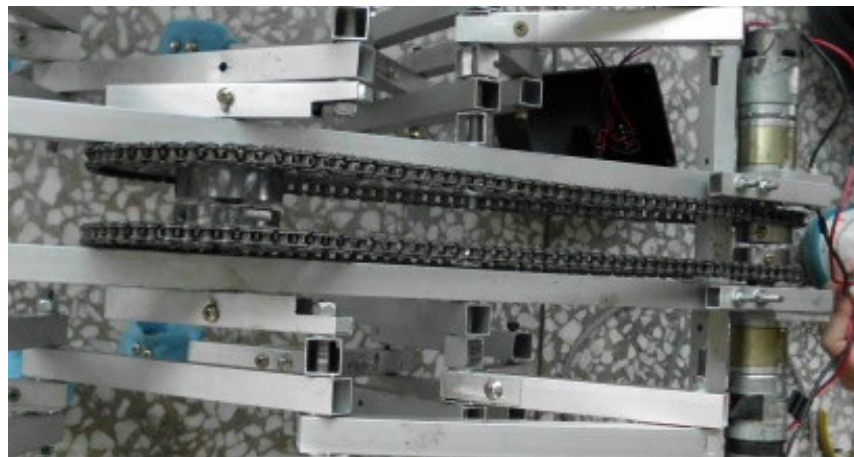
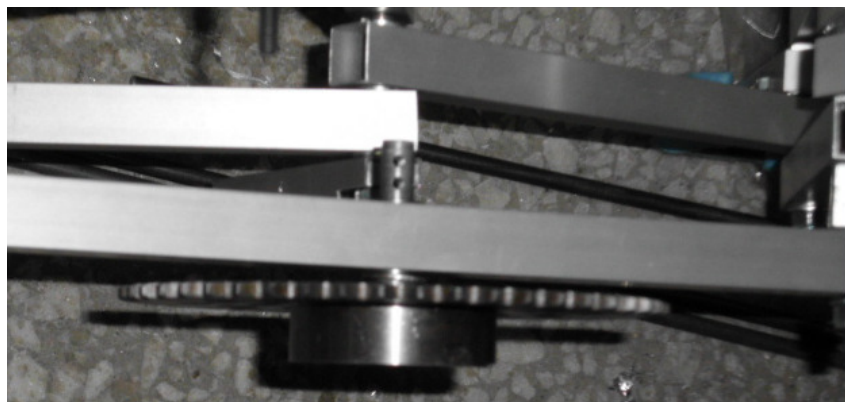
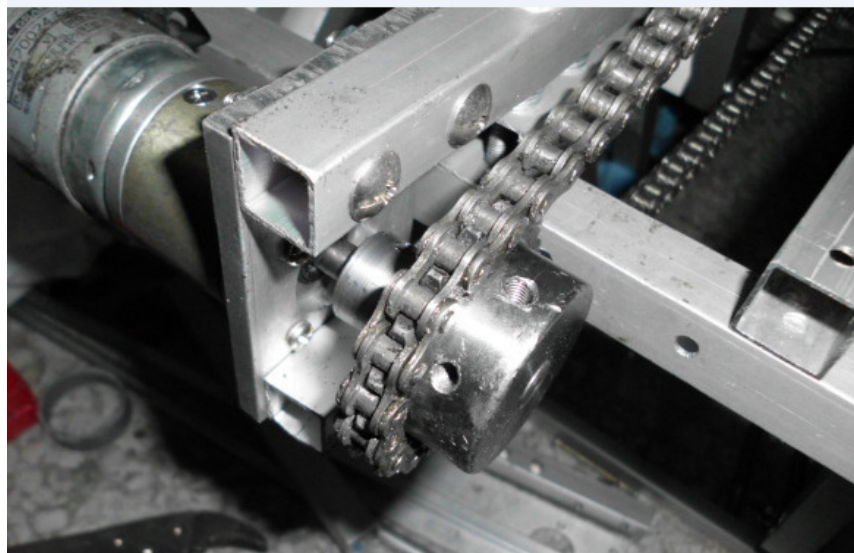
參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

三、輪子驅動設計

馬達接 17 齒的鏈輪帶動套於傳動軸的 50 齒鏈輪。

Motor connected to a 17-tooth sprocket on the drive shaft 50 tooth sprocket driven sets.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

四、電路設計

利用繼電器製作簡單的電路控制系統，搭配自製的電路板來驅動馬達使機構運作。

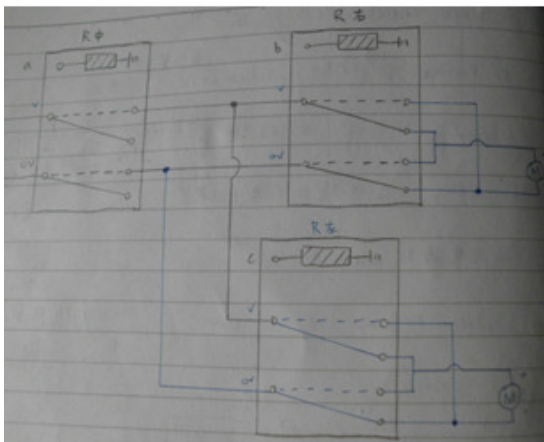
底盤傳動為大型繼電器與工配電路，能夠承受較大負載，使底盤具有足夠的穩定性。

由於機構的優化，電源的部分只需四顆 12V 鋰電池即可帶動整台機器。

Create a simple relay circuit control system, with a homemade board to drive the motor so that the operation of the organizations.

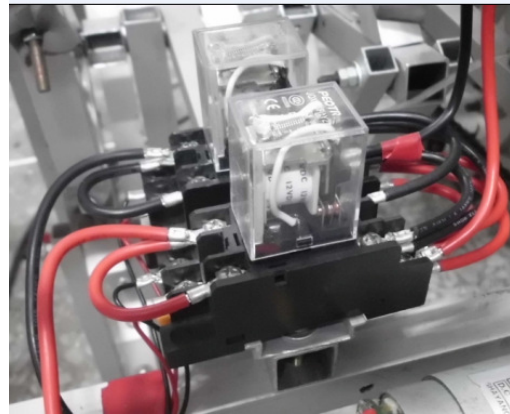
The chassis transmission circuit for large relay work with, able to withstand the heavy load, the chassis has enough stability.

Just four 12V lithium battery institutions optimization, power section to drive the whole machine.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction



五、感測器設計(遙控組無免填)

六、組裝、測試與修改

足部:



將連接軸之 M5 螺條改成 $\varnothing 8$ 之彈簧鋼，彈簧鋼具有極大剛度與韌度，能夠承受衝擊撓曲，但反而不易加工，絲模容易崩掉，鉸削之螺紋無法使用。後改用中碳鋼，中碳鋼具有一定的強度，且較易加工。

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

M5 ribbon connecting shaft changed a $\text{Ø}8$ the spring steel, spring steel has great rigidity and toughness, and able to withstand the impact of deflection, but the contrary is not easy processing, easy to collapse out wire mold, reaming thread can not use. After the switch to carbon steel, medium carbon steel has a certain strength, and easier processing.



L 型部份多鎖一螺絲以承受側向力。

L-shaped part of the multi-lock screw to withstand lateral forces.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

足部承接處以水管做為承接面增加與地板接觸面積，加上不織布止滑，後來有嘗試用腳踏車的外胎做腳底，但由於會卡到腳的運行，導致機器人行走不順，所以後來放棄用這個方法。

Foot undertake to impose a water pipe as a receiving surface to increase the contact area with the floor, non-slip and non-woven, then try to do the soles of the feet with a bicycle tire, but stuck to the running of the foot, leading to the robot walking ring true, so later abandoned this method.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

足部 L 型部分之 L 型鋁板不夠厚，無法承受運轉中的力與衝擊而斷裂。因而改換成較厚的 L 型鋁板增加強度，並加裝一個鋁桿在 L 型鋁板中，讓它變成三角型結構會比較強。

Foot L-shaped portion of the L-shaped aluminum plate is not thick enough, can not afford the operation force of the impact and fracture. Thus a switch from thick L-shaped aluminum plate to increase strength, and the installation of an aluminum pole in the L-shaped aluminum, it becomes strong triangular structure.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

手臂、夾爪：

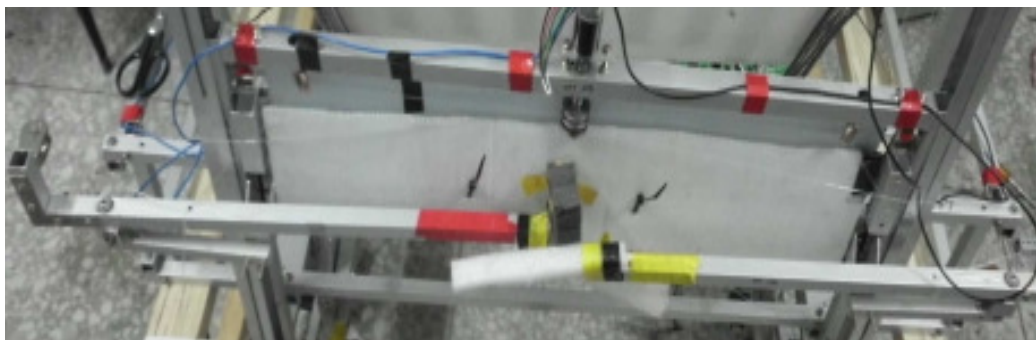
為了避免拉繩鬆掉、斷掉或卡到，夾爪、手臂、平板必須相互配合。

The order avoid La Shengsong out, broken or card to the jaws, arm, tablet must cooperate with each other.



夾爪負責夾娃娃及取籃，必須要有一定的強度與穩定性。

Gripper folder doll and take basket must have a certain strength and stability.



參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

平台：

在將平台組裝好後測試，由於平台在縮到最底時，會發生卡在死點的地方，發現馬達沒辦法帶動平台，讓平台直接升起來，除非讓平台一開始就向上升一點，避開死點的位子，但是這又會發生另一個問題，就是把基座上方的空間用完，無空間讓我們放置斜面，最後改用斜拉平台的方式，解決這個問題。

Platform assembly and testing, the platform will be reduced to the lowest card in the dead center of the place occurs, the motor is not driven platform, the platform directly rose, unless the platform beginning to rise a little, to avoid open dead point seat, but it will happen to another question, is above the base runs out of space, no space for us to place the bevel, the last to switch to cable-stayed platform way to solve this problem.



參賽隊伍人員及機器人簡介

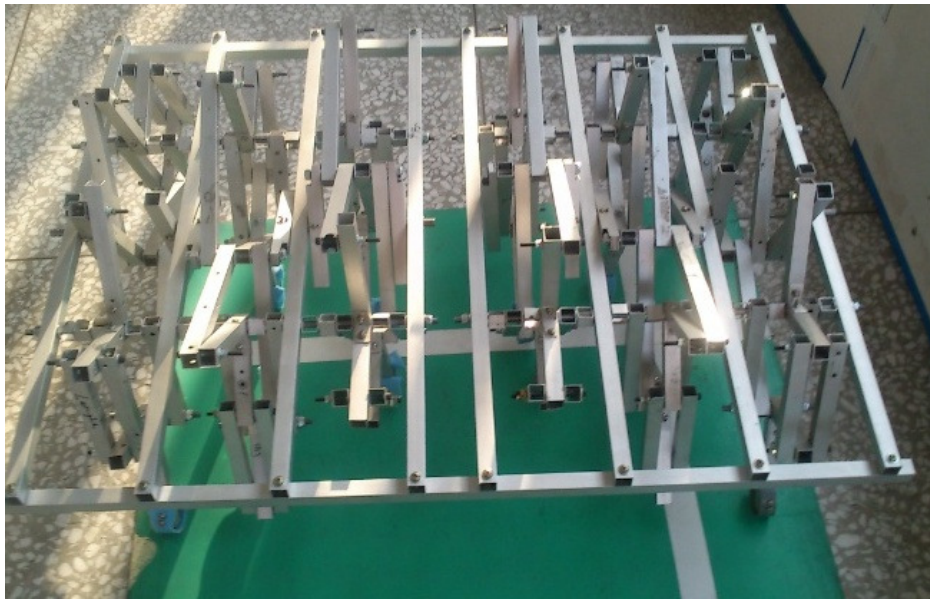
Team Member and Robot Introduction



七、機器人創意特色說明

足部為參考風吹就能動的仿生獸加以改變設計。

Foot reference wind the bionic beast will be able to move them to change the design.



手臂、吊籃與平台一同設計，相互配合。

運用滑道的方式讓娃娃更快送進籃子中，增加工作效率。

Arm, hanging baskets and platform design, together with each other.

The way to make use of the slide dolls faster and sent to the basket to increase work efficiency.

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction



參、參賽心得

參加這次比賽讓我們學到很多，因為是第一次參加這類的比賽，一開始為做腳的部分花了不少時間，當初想說做就對了，完全沒有想到重量會過重。所以到最後修改時，遇到許多問題，造成最後練習時間不足，明年如果可以再參加比賽，會從一開始就好好規劃，希望可以有更多時間再優化部分。

這一次參賽也讓我們了解到，臨場反應的重要性，比賽時會發生許多無法預期的事情，需要及時的反應，把事情處理好，也感謝很多人的支持與幫助，希望下一次可以得到出國的機會。

Participate in this competition so we learned a lot, because this is the first time to participate in this type of game, beginning to do part of the foot to spend a lot of time, had to say just do it totally did not think the weight will be too heavy. So last modified encountered many problems caused by the lack of final practice time next year if you can race from the outset, a good plan, hope can have more time to optimize the part.

This time the competition is also so we learned to spot reaction of the importance of the game when many unexpected things will happen, the need for timely response to handle things, and also thanks to the

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

support and help of many people hope that the next time you can get abroad opportunities.