

# 參賽隊伍人員及機器人簡介

## Team Member and Robot Introduction

組別： <input type="checkbox"/> 遙控組 <input checked="" type="checkbox"/> 自動組	指導老師：顏培仁 老師
學校名稱：明新科技大學	隊伍名：MUST-ME
(School：) Mingshin University of Science and Technology	
(Team name：) MUST-ME	

### 壹、參賽隊伍人員：

一、指導老師：顏培仁 老師 (YEN,PEI-JEN)

二、組員：劉達穎 同學 (LIOU,DA-YING)

鐘聖政 同學 (JHONG,SHENG-JHENG)

黃鈺展 同學 (HUANG,YU-CHAG)

徐豪謙 同學 (SYU,HAO-CIAN)

### 貳、機器人簡介(Robot Profile)

#### 一、構想與策略分析(Vision and strategy analysis)

機器人一開始先往山崩區，將落石移走然後到救援區救出麒麟娃娃，然後回到救護站，放下麒麟娃娃，然後直接穿越土石流區到救援區救出麒麟娃娃，再回到救護站，放下麒麟娃娃，最後則先上斷橋，然後到淹水區之救援區救出麒麟娃娃後，走土石流區穿越柱子返回救護站。

Robot the beginning of the first to the landslide area.

Falling rocks will be removed and then to rescue district

rescued kirin doll. And then back to the ambulance station.

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Put down the kirin doll. And directly across the mudslide area and then to rescue district rescued kirin doll. And then back to the ambulance station then put down the kirin doll. At last go on the broken bridge. Then to the flooded area to rescue district rescued kirin doll. Take the mudslide area across the pillars returns ambulance station.

### 二、機構設計(Mechanism Design)

我們依照本屆創思設計及製作競賽規則及場地需求，組員與指導老師討論後決定以”準確”來作為機器人製作的原則。速度、穩定這三項都是我們考量的因素。

首先，我們以直流馬達驅動主動輪，另外，以感測器來偵測以控制機器人行進之路線及方向，機器人前方則以萬向輪來設計，以達到靈活行進之目的。這樣機器人可以很快速的通過各種障礙。

而針對抓取麒麟寶寶以及擺放麒麟寶寶的設計，亦是以精準、確實為主，麒麟寶寶類似一隻暎寶(熊貓)的形狀來設計，在機器人行進間即可利用手臂一次抓取三隻麒麟寶寶，然後搭配伺服馬達將麒麟寶寶放置於手臂內，機器人則像媽媽帶著小孩一樣保護著麒麟寶寶。

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Creative thinking design contest rules and space demand. Crew and instructor decided to discuss the principle of "accurate" as the robot. Speed and stability, these three are the factors we consider. First of all, we drive a DC motor driving wheel to control the robot road routes and direction sensors to detect. The front of the robot by casters to design, in order to achieve the purpose of flexible traveling. So that the robot can very quickly through a variety of obstacles. And for the design crawling the kirin doll and placed the kirin doll. Accurate and indeed the main .Between the robot moving arm crawls three kirin doll. Then with a servo motor kirin doll is placed on the arm. Robot is like a mother with a child protection kirin doll.

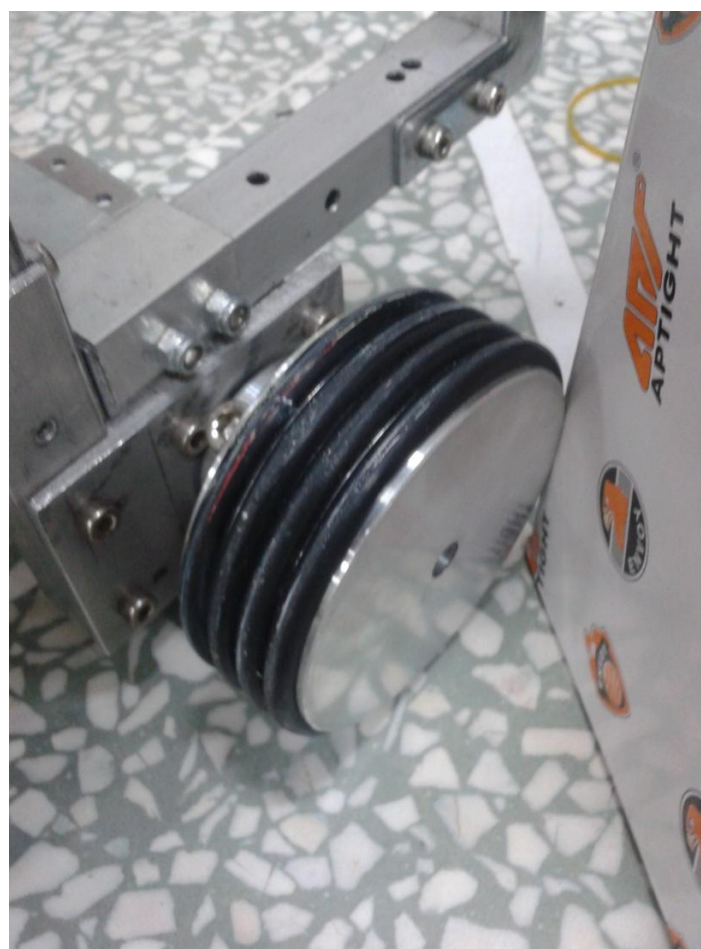
### 三、輪子驅動設計

前輪使用萬向滾輪，搭配後輪直流馬達驅動，使得摩擦力較低。讓機器人可以方便輕盈的轉彎。

Front wheel using the universal wheel. DC motor with rear wheel drive. Makes lower friction. Robot can facilitate turning of the lightweight.

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### 四、電路設計(Circuit design)

在整個控制電路裡面總共分為四個部份，下面就介紹每個電路的名稱與功能：

Total is divided into four parts in the entire control circuit.

The following describes the names and functions of each circuit.

#### 1. 電源電路(Power circuit)：

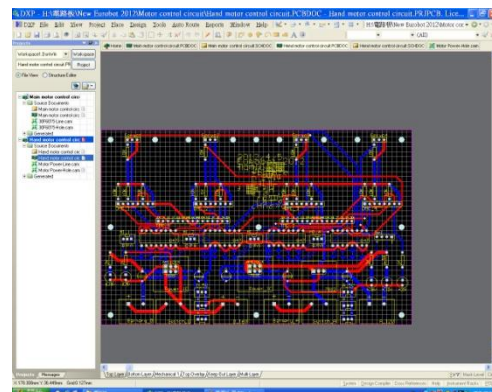
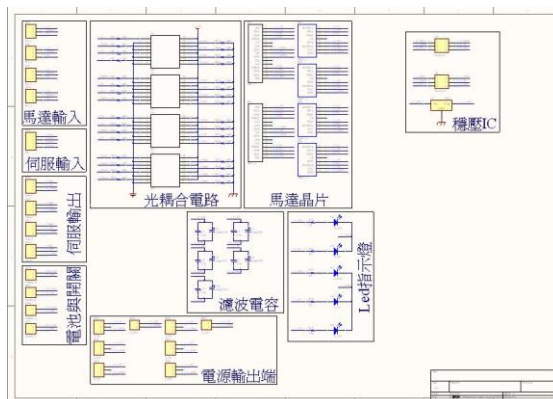
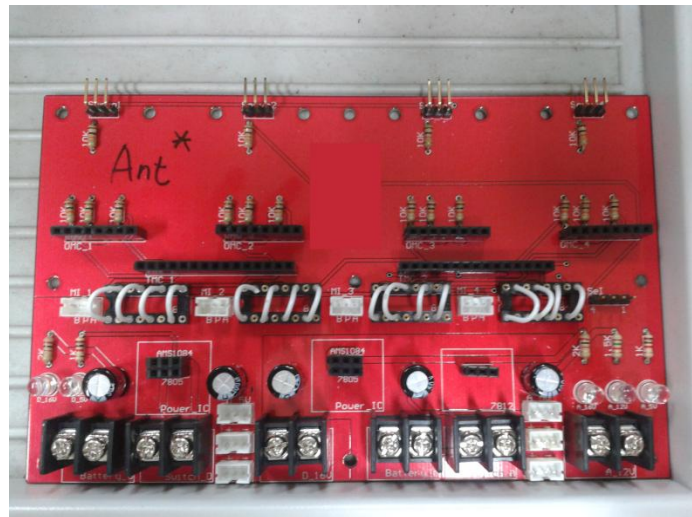
電源電路是供給每個電路工作的電力來源，包括 MCU 電路的 5V、馬達晶片電路的 16V 等等都是由電源電路來提供電力的，電源電路是使用 AMS1084 穩壓 IC，將電池的電力透過此電路就能穩定輸出固定的 5V 電壓供電路使用，其中穩壓 IC AMS1084 輸出 5V，而馬達驅動電路的供給電壓則是使用電池本身的電力以增加動力。

Power supply circuit is to supply a source of electricity for each circuit. Include MCU 5V, motor circuit chip circuit 16V by the power supply circuit to provide electricity. The power supply circuit is to use AMS1084 regulator IC. Battery power through this circuit will be able to secure stable output voltage of 5V power supply electric circuit use. Which regulator IC AMS1084 output 5V. A supply voltage of the motor

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drive circuit is to use the electric power of the battery itself in order to increase the power.



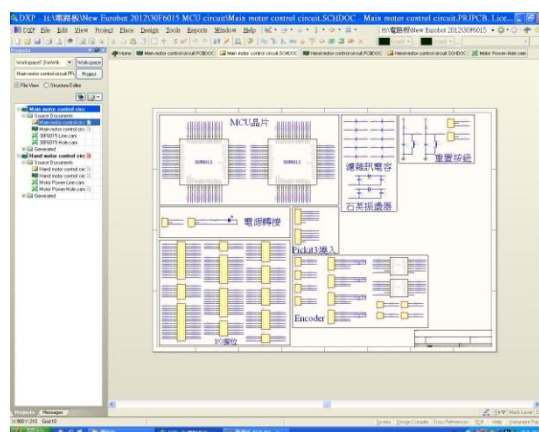
## 2. MCU 電路：

MCU 電路可說是整個控制電路的心臟，除了電源電路以外其餘電路的動作都是由 MCU 來控制的，不管是感測值的讀取、馬達的動力輸出都是由 MCU 來負責，而我們採用的 MCU 是 Microchip 公司的 dsPIC30F6015。

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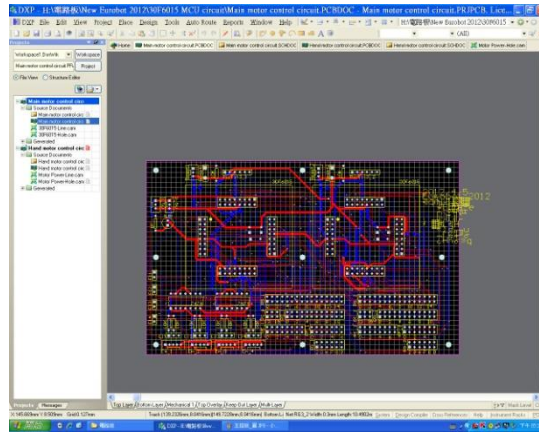
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MCU circuit can be said that the heart of the entire control circuit. The action of the rest of the circuit in addition to the power supply circuit are controlled by the MCU. Whether the sensing value of the reading, the power output of the motor is responsible by the MCU. And we use the MCU is Microchip's dsPIC30F6015.



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### 3. 感測器電路：

(1) 紅外線發光二極體：類似發光二極體 (LED) 的功能，當 PN 二端加上順向偏壓時可發出波長為 800nm 的紅外線不可見光。

(2) 當 CNY70 之發光二極體所發射的紅外線經白板反射至光電晶體，光電晶體飽合，射極電壓為高態，因此經樞密特 IC 4584 取反相後，輸出低態，指示燈(LED)不亮；而當 CNY70 在黑色電工膠帶所貼的導引道路上時，因電工膠帶為黑色會吸光，因此 CNY70 發光二極體所發射的紅外線無法反射至光電晶體，光電晶體幾近截止，射極電壓為低態，而電壓經 4584 取反相後，輸出為高態，LED 亮。

(1) Infrared light-emitting diodes: similar light-emitting diodes function. When the PN two-terminal plus the forward bias issue a wavelength of 800nm the infrared light is not visible .

(2) When a CNY70 of light-emitting diodes emitted by infrared whiteboard reflection to the phototransistor. The



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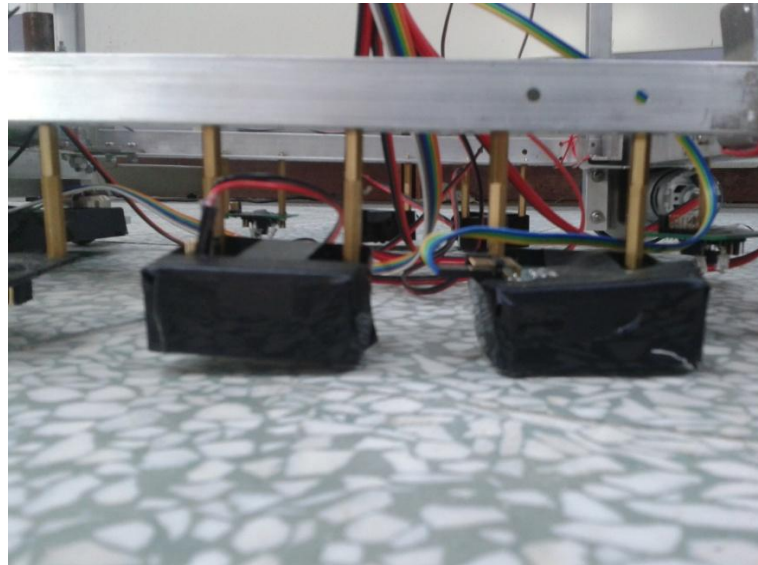
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phototransistor saturated emitter voltage for the high state. 4584 taken by the **Schmitt** IC inverting output low state indicator (LED) does not light. When CNY70 in black electrical tape affixed to the guide on the road, Because of black electrical tape absorbance, the infrared light emitted by the the CNY70 light emitting diode can not be reflected to the phototransistor. Phototransistor near deadline, the emitter voltage of the low state, the voltage through 4584 take inverting output high state, LED light.



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#### 4. 馬達驅動電路：(The motor drive circuit)

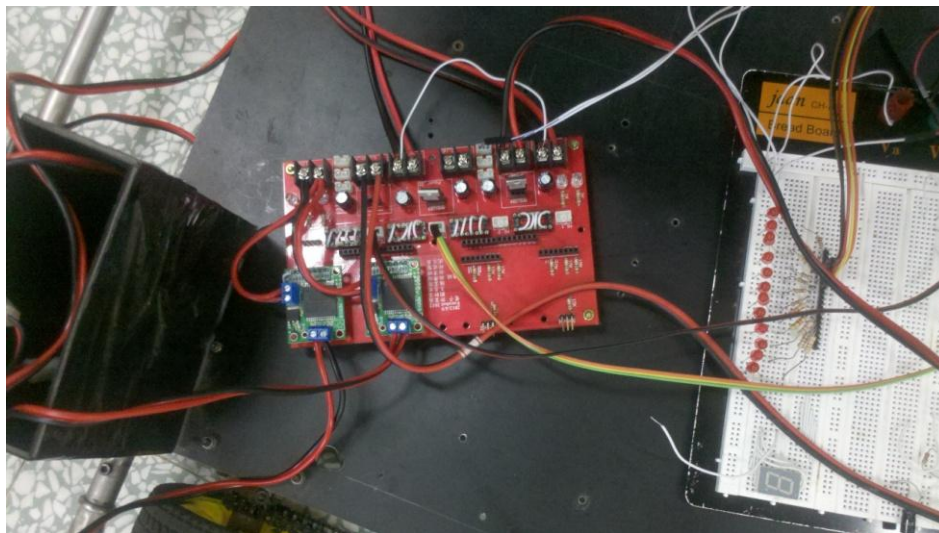
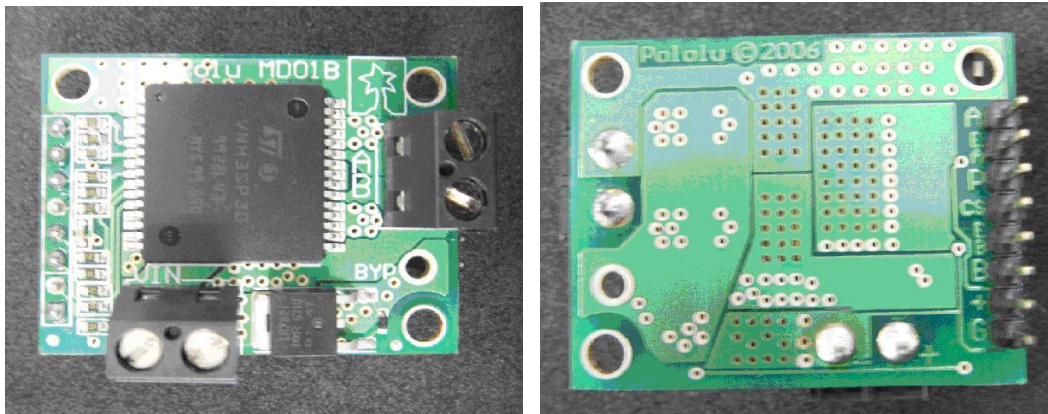
機器人要能行走、上升、轉彎都是由馬達驅動電路來提供動力的，在這電路中我們採用的馬達驅動 IC 是這個電路的主軸，它的好處在於只需將接腳按照電路圖焊接正確，就可以使用程式控制馬達的動作，不管是前進、後退、左轉、右轉等動作都可以藉由程式來控制，為了得知馬達動作的情形，我們使用 LED 將馬達動作轉換成燈號顯示出來以判斷程式是否正確，高功率馬達驅動 IC 雖然使用方便但是它的成本較為昂貴是唯一頭痛的地方。

The robot to be able to walk, rise and turn are powered by motor drive circuit. In this circuit, we adopt this circuit spindle motor driver IC. Its benefits is to simply pin correctly in accordance with the circuit diagram welding. And use the program-controlled motor movements. Whether the movement

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forward, backward, turn left, turn right by the program to control. To informed of the situation of the motor operation, we use the LED to the motor movement is converted into a light display to determine whether the program is correct, high power motor driver IC although easy to use, but it costs more expensive is the only place headache.



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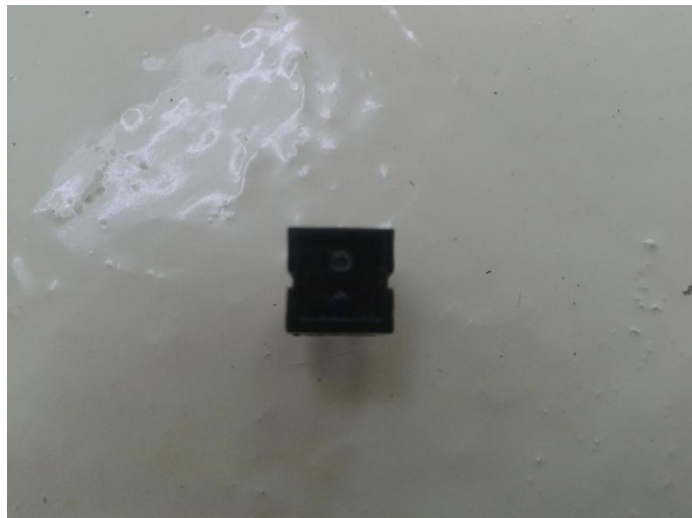
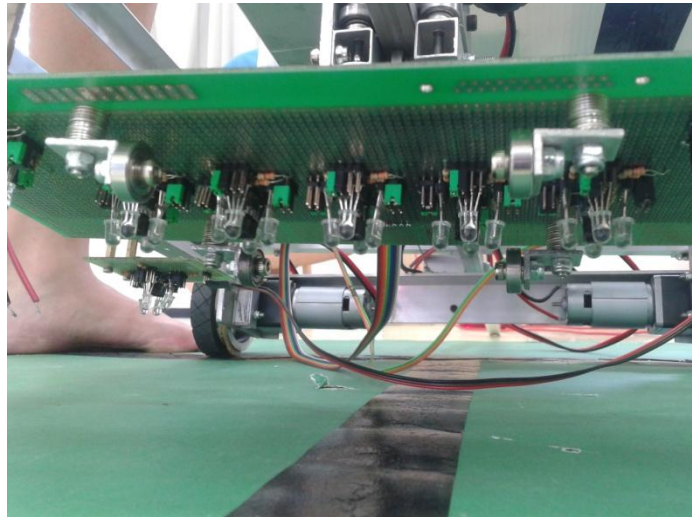
### 五、感測器設計(Sensor design)

感測電路是機器人行走的方向感測，機器人行走偏離黑線時需要靠著感測電路之感測值將其矯正回黑線上，還有抓取麒麟寶寶時分辨紅色或者綠色，感測電路分為感測器調整電路以及感測板電路兩部份，感測器電路負責接收感測訊號並將其轉送給 MCU，感測板電路架設於車體底盤下是要將感測路段的訊號回傳到感測器電路，提供黑、白線或紅、綠色的辨識。

Sensing direction sensing circuit is a guide. When guide to deviate from the black line, relying on sensing circuit sensing its correction back to the black line, as well as crawling unicorn baby to distinguish colors red or green. Sensing circuit is divided into two parts of the sensor adjustment circuit and the sensing circuit board. Sensor circuit is responsible for receiving sensing signals and relay signals to the MCU. The sensing circuit erection bodywork chassis. To sensing section of the signal back to the sensor circuit. Provided color recognition

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### 六、組裝、測試與修改(Assembly, test, and modify)

機台主要使用鋁合金搭配馬達帶動鋼線使機台可以上下升降，而前腳使用萬向滾珠達到全方位的移動，手臂部分使用套環式搭配伺服機來抓取娃娃。

測試方面則是先從顏色下手，一開始用高亮度紅光 LED 搭配 CNY70 去做顏色判斷，結果發現娃娃可以但是地板的顏色不太一樣所以測不出來，之後改用其他很多單色的 LED 發現也不太穩定，於是我們改用

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另一種 LED 去做顏色判斷，就可以分辨出每個重置點。

感測器循線時修正的角度有問題，會一直抖，所以後面改用類比訊號作修正，改善修正太多或太少的問題。

Machine uses aluminum alloy with a motor driven steel wire the machine up and down movements, while the front foot with the the universal ball to a full range of mobile, the arm part of the collar with servo to crawl doll.

First, we start from the color test, we use of high-brightness red LED with CNY70 do color judgment, results of the dolls can but the floor does not work. After change other monochrome LED is not stable, either. So we switched to the tri-color LED color judgment, that can distinguish each reset point.

The correction angle sensor through the line, would have been shaking so behind the switch to analog signals for correction to improve the corrected the problem of too much or too little.

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### 七、機器人創意特色說明(Robot creative Features Description)

本組機器人的設計以”準確”、”穩定”及”快速”來作為製作的原則，以PID做控制，分別以比例（P）控制、積分（I）控制、微分（D）控制，其中微分的控制最為重要，微分的參數影響其誤差變化率，使機器人精確且穩定。

針對抓取麒麟寶寶以及擺放麒麟寶寶的設計，亦是以精準、確實為主，機器人類似一隻暎寶(熊貓)的形狀來設計，在就援區時搭配伺

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服馬達可以一次救出三隻麒麟寶寶，並搭配顏色感測器分辨麒麟寶寶之顏色，以便回救護站將麒麟寶寶分類擺放，另外，針對上斷橋之機構，機器人利用兩組行走之直流馬達以及兩組滾輪配合升降馬達，可以很快速的上下斷橋，可以節省兩組4顆行走的馬達。

Robot design "accurate" and "stability" and "fast" as the production principles, with PID control, respectively, the proportional (P), integral (I), the differential (D), wherein the control of the differential is the most important, the differential parameters affect the error rate of change, so that the robot is accurate and stable.

Crawling the unicorn baby and placed unicorn baby design is based on precise, indeed mainly, with the servo motor in the rescue zone once rescued three unicorn baby, with a color sensor to distinguish the color of the unicorn baby and convenient back to the ambulance station the Kirin baby segregated, In addition, on the broken bridge of institutions, the robot two groups walk DC motor and two sets of rollers with the lift motor can be fast on the bridge and under the bridge, you can save two sets of four walking motor.



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### 參、參賽心得 (Competition experience)

(鍾聖政同學)這次 TDK 比賽，在漫長的摸索、失敗中成長，學會了獨立思考，偵錯的能力，雖然在設計機構上很多的天馬行空，但經過實際的測試，發現了不可行的地方，經過不斷的改進，也都一一解決，在程式碼的部分，也從懵懵懂懂，不斷的翻書及上網查資料，累積了很多很多的經驗，比賽的名次並不是重點，重點是我很高興能在比賽中獲得的寶貴經驗。

(Zhongsheng Zheng classmates) The TDK game, to grow in the long fumble, fail, learn to think independently and debugging capabilities in design agencies a lot of these ideas are, but actual tested and found not feasible place has been continuous improvement also solve them, in the part of the code from the muddle, constantly open book and check the internet, accumulated a lot of experience in the race, is not the focus, focus, I am delighted to be in the game obtained valuable experience.

(黃鈺展同學)剛開始參與時，覺得做機器人是一件很難的工程，時間久了才發現，真的是非常的困難，不只是機器人結構，連程式、硬體

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等方面都要下功夫去研究，但是經過這次體驗後真的學習到很多東西，如果還有機會，我相信我們會做得更完美。

(Huang Yu Chag classmates) Beginning to participate, feel the robot to do a difficult project, a long time, it's really hard, not only the robot structure, even the program, hardware must work hard to study, but after this experience really learn a lot of things, if we have the opportunity next time, I believe we will do more perfect.

(劉達穎同學) 本次比賽真的是很趕，機構和程式碼溝通有些困難，一個很簡單的動作卻要寫很多程式碼，再硬體方面還要注意是否短路，所以經過這次比賽後也成長許多。

(Liou Da-Ying classmates) The game really in a hurry, some difficulties in communication between the agencies and the code, a very simple action to write a lot of code, and then the hardware, but also pay attention to whether the short circuit, so after this competition also grow many.

(徐豪謙同學) 5月時決定要參加這次的TDK比賽後，我們每天都跑圖書館，尋找有關機器人方面的書籍，研究程式碼、機構與美化加工，一切都從無到有，起初我們遇到了許多瓶頸，有很多問題都要問老

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師，到後來的自己解決問題，其實得不得名已經不重要了，重要的是在其中學習到團隊默契與精神，也把自己的除錯問題的能力提身許多，在未來有機會能再做相關的比賽的話一定能做的更好。

(Xu Hao Qian classmates) May decided to participate in this TDK game every day to run the library, looking for books about robots, code institutions and beautify processing everything from scratch, at first we encounter many bottleneck , a lot of questions have to be asked the teacher to later solve the problem, in fact, the Debu named after important, important to learn teamwork spirit, but also the ability to debug problems mentioned body many opportunity again to do the game, then we must do better in the future.