

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

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貳、機器人簡介

一、構想與策略分析

構想：

因為這次場地範圍廣大，可能無法全部關卡都跑完，所以考慮了可行時間內所能通過之關卡，使用策略 1，不抓取娃娃，但確定確保得到保險分數，使用策略 2、3 能確保至少能夠獲得枕木或是便橋區之分數，夾取娃娃有一定危險，但有時間回到救護站，使用策略 4，有極大可能無法走回救護站時間就結束了，使用策略 5 能確保能完整走完全程，但夾取娃娃只能夾取一區，確保能夠保住基本分數以及夾取三隻娃娃之分數，因此經過討論考慮之

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後，決定採行 2、3 策略或策略 5。

Ideas:

Because the majority of the venues range, you may not be able to all the checkpoints finish, so consider a feasible time through the checkpoints, using strategy 1, does not crawl doll, but determined to ensure that insurance scores, using the strategy of 2, 3 to ensure that at least District of scores of sleepers or temporary bridge, gripping dolls have some dangerous, but back in time to the ambulance station, using strategies 4 great time may not be able to walk back to the ambulance station end Strategy 5 can ensure complete walk completely away, but the gripping doll only gripping one district to ensure to keep basic scores and gripping the scores of three dolls, therefore, decided to adopt after discussion considered 2, 3 strategy or strategy 5.

策略分析：

1. 只過便橋枕木不抓取娃娃

- (1) 通過便橋

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(2) 通過枕木

2. 便橋路線

(1) 通過便橋

(2) 到達淹水區夾取娃娃並掛上纜車

(3) 到達土石流區夾取娃娃

(4) 通過枕木回到救護站

3. 枕木路線

(1) 通過枕木

(2) 到達山崩區夾取娃娃並掛上纜車

(3) 到達土石流區夾取娃娃

(4) 通過便橋回到救護站

4. 全抓路線

(1) 通過便橋

(2) 到達淹水區夾取娃娃並掛上纜車

(3) 到達土石流區夾取娃娃

(4) 到達山崩區夾取娃娃並掛上纜車

(5) 通過枕木回到救護站接取娃娃

5. 全抓路線

(1) 通過便橋

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(2) 到達淹水區夾取娃娃並掛上纜車

(3) 回到救護站

Policy Analysis:

Only over Bianqiao sleepers not crawl doll

(1) Through temporary bridge

(2) By sleepers

2. Temporary bridge route

(1) Through temporary bridge

(2) Reach the flooded area gripping doll and hung up the cable car

(3) Reach the the mudslide District gripping doll

(4) Back to the ambulance station through sleepers

3. Sleepers route

(1) By sleepers

(2) Reach the landslide area gripping doll and hung up the cable car

(3) Reach the the mudslide District gripping doll

(4) Temporary bridge back to the ambulance station

Full grasp routes.

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- (1) Through temporary bridge
 - (2) Reach the flooded area gripping doll and hung up the cable car
 - (3) Reach the the mudslide District gripping doll
 - (4) Reach the landslide area gripping doll and hung up the cable car
 - (5) Sleepers back to the ambulance station access dolls
- Full grasp Route 5.

- (1) Through temporary bridge
- (2) Reach the flooded area gripping doll and hung up the cable car
- (3) Back to the ambulance depot

二、機構設計

本次為了能增加腳步機構能夠跨越枕木，所以在腳底加裝比較大的圓形橡膠。(圖 1)



圖 1

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Second, the mechanism design

This time in order to be able to increase the pace of institutions across the sleepers, and the installation of a large circular rubber in the soles of the feet. (Figure 1)

機構設計

本次腳步機構採用曲柄搖桿機構（圖 2）來進行步行動作，利用各桿件的帶動使得機構能夠有固定式的運動曲線，使之機構能夠順利進行步行，而手部機構則採用軸節式設計（圖 3），而非採用直角坐標式，採用軸節式雖然程式上相對於困難，但是空間上相對於直角坐標式節省不少，靈活性也相對提高，並且手部結合了齒數不同的齒輪（圖 4），藉此達到所要求之速度，並且確保馬達所傳達之動力能夠有準確的速比。

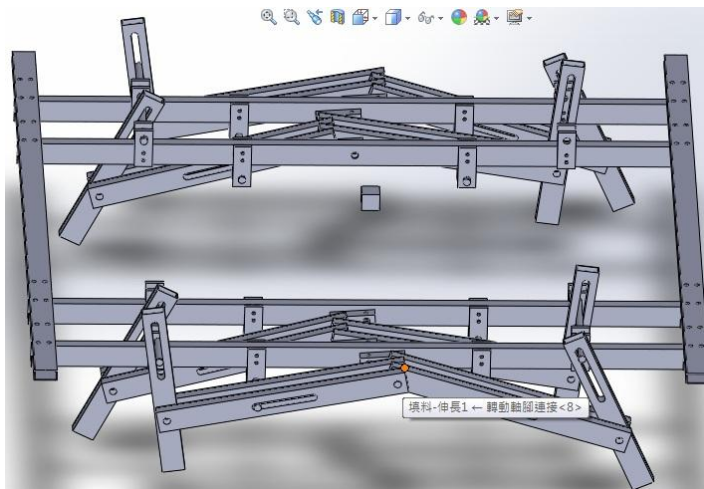


圖 2

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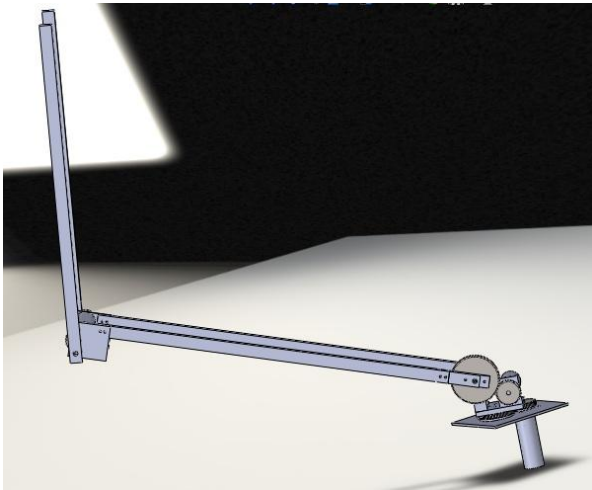


圖 3

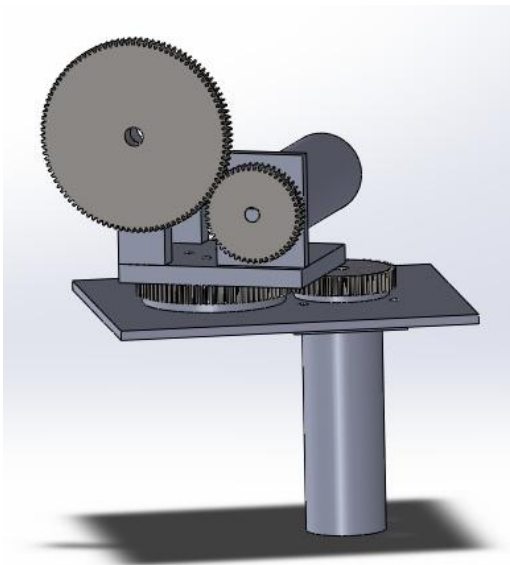


圖 4

Mechanism Design

The footsteps of institutions using the crank rocker mechanism (Figure 2) walking action rod driven agencies to fixed motion curve, so that agencies can be carried out smoothly walk hand institutions shaft section design (Figure 3), rather than using

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the Cartesian coordinates of formula, using shaft section the formula although the programs relative to the difficulties, but the space relative to the Cartesian coordinate formula save a lot of flexibility are also improved, and the hand portion combines Teeth different gear (Figure 4), so as to achieve the requirements of speed, and to ensure that the motor power can be conveyed by accurate ratio.

三、輪子驅動設計

這次輪子設計利用圓形橡膠來當作腳底，運用圓形表面可使在任
何地形皆能夠有良好的接觸面點。

Three wheel drive design

The wheel design the round rubber as the soles of the feet, use a circular surface allows are able to have a good point of contact surface in any terrain.

四、電路設計

1. arduino 控制板(左下圖)

運用 arduino 控制板來進行所有輸入及輸出訊號處理，並
利用寫入的程式來進行馬達的控制，及搭配馬達驅動器來進行
各種馬達的速度調整。

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2. 馬達驅動器(右上圖)

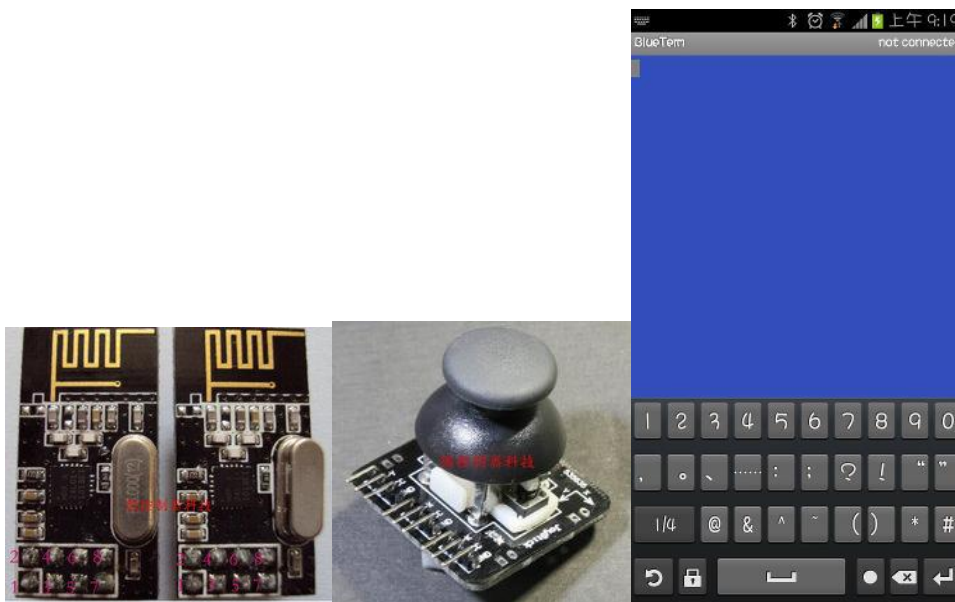
使用馬達控制器 PWM 來進行馬達的轉速控制，藉此讓腳部的馬達能夠有相同的一致性，不至於轉速不同而造成速差。

3. 藍芽無線發射接收模組(左下圖)

利用兩塊 arduino 控制板搭配無線發射模組來進行無線控制，兩塊控制板個利用一塊無線發設接收模組來進行通訊，藉由兩塊控制板內的協定使得訊號可不受干擾，也因為為無線控制，讓作動時可不被電線所影響，也可讓控制範圍更加廣闊，此控制方式也能直接利用手機 App（圖 13）來進行操控，並且兩種操控隨時互換不會產生問題。

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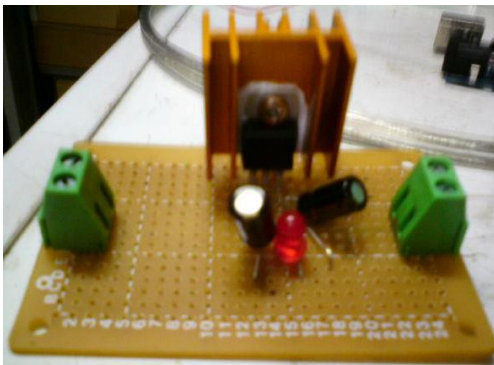


4. 搖桿(右上圖)

搖桿搭配控制板，可大大減少按鈕的使用，也節省了搖控器的空間，運用幾顆搖桿搭配程式，讓操控更具靈活性。

5. 穩壓電路(下圖)

使用穩壓電路，讓輸入電壓能有穩定的電壓，不會因為瞬間脈衝而把電路燒毀，也能做電路保護作用。



Fourth, the circuit design

1. Arduino control panel (below left)

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Use of the the arduino control board to carry out all of the input and output signal processing, and write programs to control motor, and with the motor drive to adjust to a variety of motor speed.

PWM motor speed control motor controller foot motor to be able to have the same consistency, will not speed the speed difference.

Bluetooth wireless transmitter receiver module (below left)

The two arduino control panel with wireless transmitter module wireless control, two control board use of a radio set receiver module to communicate, by agreement within the two control panel so that the signal can be undisturbed, but also because wire wireless control actuation from time affected, but also allows the control of a broader range of this control method can directly manipulate Mobile App (Figure 13), and two control swap is not a problem at any time.4. Rocker (above right)

Rocker with the control panel, and can greatly reduce the use of the button, the remote control also saves space, use many pieces rocker with program, gives you more flexibility.

5 regulator circuit (below)

Using a voltage regulator circuit, stable voltage to the input

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voltage, will not be an instant pulse circuit burned, also do circuit protection role.

五、組裝、測試與修改

剛開始利用 Theo Jansen 機構來製作腳部的機構，製作完成後，測試成果不如預期，腳抵台的高度不佳，於是調整連桿，各個連桿機構互相帶動，稍改尺寸，運動曲線就會大大不同，也因連桿數量很多，重量也相對提高，因此後來決議待審查過後更改足部機構，修改後的機構大大減少了連桿數量，重量也減輕了，而手部運用多顆的齒輪搭配，使各關節有更好的靈活性，也會有精確的傳動，並且利用個齒輪減速，使馬達轉速可達到所需之要求。

Assembly, test and modify

Beginning to use the the Theo Jansen agency to make the institutions of the foot, the production is completed, the test results did not meet expectations, poor the height of the foot arrived in Taiwan, so adjusting link the various linkage mechanism with each other to drive slightly change the size, motion curve will is greatly different due to the link number, the weight is relatively increased, therefore later changed resolution Unexamined after foot bodies,

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modified bodies greatly reducing the link number, and also to reduce the weight, while the hand use multiple satellites gear with better joint flexibility, there will be an accurate drive, and a gear reducer, the motor speed can meet requirements.

六、機器人創意特色說明

此次製作的機器人，運用輕巧的足部機構以及具有高靈活性的手部機構，使之機器人有更好的敏捷性，也讓馬達負擔盡量減少。

robotics creative Feature

The production of the robot, the use of lightweight foot institutions and high flexibility hand institutions to make robots better agility, but also allow the motor to minimize the burden.

參、參賽心得

本次的競賽終於圓滿落幕了很榮幸參第十六屆 TDK 全國大專院校創思設計與製作競賽，是很榮幸的一件事，從開始報名到比賽當天，每天所過的日子都非常充實，且每天所遭遇的狀況都是無法預測的，在比賽當天所看的其他參賽選手所製作的機器人中有許多不一樣的設計，同時也學到了不少好用的機構。在參加這種團隊的競賽，所要學習的似乎才是最重要的，在隊員中可以互相體諒以及達成共識，是

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需要花一點時間的，或許在現代社會中團隊合作才是獲勝的關鍵，不過在這漫長的過程中確實學習到許多見識，同時耐心也增加了許多，還有了解到人際關係即要有責任感。比賽的過程是在於享受比賽，所以這次也得到了很好的結果。

在這專題中讓我了解到團隊合作比孤軍奮戰還要更加的擁有展望性，在三個人的討論中，可以發現每個人的想法會有相當多的不同，再結合每個人的意見後，會形成另一種新的創意出來。這次競賽也相當感謝老師在花費這麼多資金與許多癥結點的狀況下，還相當的鼓勵我們將成品做出來讓我們擁有最完美的結果。

在這一年的製作過程中，經歷了很多辛苦過程，從最初的步行機構設計，過程不斷修改，修改完進行實體製作，製作完成後經過測試發現不符合比賽要求，所以重新設計，在電路部分，一開始時很天真的以為運用繼電器幾個簡單的按鈕就能達成所要成果，但是在經過測試之後，發現每顆馬達所輸出的轉速與規格上都略有差異，因此為了達成再行進間馬達能夠不因為轉速問題而造成操控手的麻煩，並且在控制手臂部分能夠有效控制每顆馬達的速度達到所需之靈活性，於是決定改加裝控制板與馬達驅動器，修正操縱不易之問題，也運用了無線控制，使得機器人更賦予有獨特性。

Parameters, participating experience

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The contest has finally come to an end very honored to participate in the Sixteenth the TDK National College Creativity Design Contest is an honorable thing, sign up from the start to the race day, a day-off days are very enrich encounter every day the situation is unpredictable, robot produced by the other contestants look on race day is not the same design, but also learned a lot of useful institutions. To learn to participate in the contest of this team, seems to be the most important, the team members can be mutual understanding and to reach a consensus, is the need to spend a little time, perhaps in modern society, teamwork is the key to winning, but really learning a lot of insight in this long process, at the same time the patience also increased a lot, there are learned interpersonal relationships that have a sense. The process of the game is to enjoy the game, so this has been a good result.

I learned that teamwork is much more than alone has a forward-looking discussion of the three people, you can find the idea of everyone there will be quite a bit different, and then combined with the views of everyone in this topic, form another new creative. The competition is also very grateful to the teachers spend so much money and many sticking points situation, but also quite encouraged us to do it

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will be finished so that we have the most perfect results.

In this year's production process, through a lot of hard work process the walking mechanism from the first design, the process of constantly modify, modify complete entity making complete production has been tested and found not to meet the competition requirements, so re-design, the circuit part beginning very naive to think that a few simple button to use the relay to be able to reach the desired results, but has been tested and found every single motor speed and output specifications are slightly different, so in order to reach a longer road between the motor can not because of the speed problem caused by the trouble of hand manipulation and control arm part of the effective control of every single motor speed to achieve the required flexibility, decided to change the installation of the control board and the motor drive, correct manipulation unchangeable also use a wireless control, given the unique nature makes the robot.