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：蔡錦山
學校名稱：南榮技術學院	隊伍名：台灣黑熊
(School：) Nan Jeon Institute of Technology	(Team name：) Formosa black bear

※內容需中、英對照※

壹、參賽隊伍人員：

一、指導老師

蔡錦山老師，成功大學機械工程博士，主要研究方向為微觀熱傳及能源工程。目前服務於南榮技術學院工程科技研究所暨機械工程系，任教科目為工程科技論文寫作、熱力學、熱工實驗、流體力學及電腦繪圖。除擔任教學工作外，並兼任學生輔導中心義輔老師及教育部技職校院南區區域教學資源中心專業領域教學諮詢與學習輔導教師。

I am Dr. Tsai Chin-Shan, who got the Ph.D. degree from National Cheng Kung University and had made a study of microscopic heat transfer and energy science. I am now a teacher of the Graduate School of Engineering Science and Technology and Department of Mechanical Engineering in Nan Jeon Institute of Technology and lecture Technical Paper Writing, Thermodynamics, Thermal Engineering Experiment, Fluid Mechanics, Computer Drawings, etc. Besides, I am also a voluntary counselor of the Student Counseling Center.

二、組員

(1st team member)

林均翰

組員：

⊙主要負責項目：擔任操作手、機器人各機構之設計、製作、組裝及測試。

⊙工作內容：設計機器人各部位機構、規劃每日進度、機構加工及購買材料，還有上網查詢相關機構材料及打電話詢問廠商。

⊙得意之作：製作出此次比賽重要機構，設計出與其他學校截然不同的足部機構，並且熟練機器人之操作。看機器人慢慢成形，每當製作出一個機構時，心情就難以形容的愉悅。

I am Lin Chun-Han, the team member of the Formosa Black Bear and the robot operator of the Bug's Crisis. I am responsible for the design, manufacture, assembly, and test of the robot mechanisms. My work includes planning the scheduled progress and purchasing the materials of the robot mechanism. Completing the foot mechanism of the Bug's Crisis is my favorite. I really pleasure while making all the mechanism of the robot.

(2nd team member)

王崇任

組長:

⊙主要負責項目：撰寫文書報告及協助加工。

⊙工作內容：製作報告書及所有文書資料，負責輔助整個小組的需求，並供應團隊所需要之物品。

⊙得意之作：一開始製作升降機構時完全沒有頭緒，是一邊看著關卡一邊想著怎麼作才能以最有效率的方式達成取「麒麟娃娃」之需求，當跟同學一起努力討論並完成製作後，覺得自己動手做感覺就是不一樣，所有的辛苦與努力都是值得的。

I am Wang Chung-Jen, the team member of the Formosa Black Bear. I am responsible for the paper report of the Bug's Crisis and manufacturing the robot mechanisms. My work includes writing the report and purchasing the materials of the robot mechanism. Completing the taking the kylin babies mechanism of the Bug's Crisis is my favorite. I really pleasure while making all the mechanism of the robot.

(3rd team member)

楊勝雄

組員:

⊙主要負責項目：機器人各機構之加工。

⊙工作內容：參與機器人各機構之設計，利用車床、鑽床、銑床、鉗工進行加工，並模擬、組裝、測試及檢查機器人之動作是否符合比賽需求。

⊙得意之作：在經過多次的加工中，學習到很多加工方法及加工技巧，有成功也有失敗，當然失敗後會從機構中找出問題並加以修改，達到所需功能為止，這期間也是絞盡腦汁嘗試各種可能性，一一測試直到達到目的為止。

I am Yang Sheng-Hsiung, the team member of the Formosa Black Bear. I am responsible for manufacturing all the mechanism of the Bug's Crisis. My work includes simulating, manufacturing, assembling, and testing the robot mechanisms. Completing all the mechanisms of the Bug's Crisis is my favorite.

貳、機器人簡介

一、構想與策略分析

針對 TDK 第 16 屆全國大專院校創思與製作競賽之每一關卡，設計出最簡單、且最有效率的機器人機構，原因是簡單機構方便維修及更換，且容易操作，因為機器人的速度及穩定性將是贏得這場比賽的關鍵勝負所在。

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According to all the barriers of TDK 16th National College Creative Design and Invention Contest, the most simple and effective mechanisms are designed to win the competition. The speed and stability of the robot are the main factors of the games.

二、機構設計

TDK 盃第 16 屆全國大專院校創思設計與製作競賽之關卡，主要包括「障礙區」、「救援區」及「救護站」。為了通過「障礙區」之「倒木」障礙及「便橋」障礙，「蟲蟲危機」足部機構採用 Chebyshev 連桿機構，其作動方式是由馬達帶動齒輪，再由齒輪轉動圓盤，機器人兩側圓盤之角度相差 180°，可使其達到上下移動、左右前進的效果，來通過各個關卡；利用雙交叉桿組成升降機構，並與夾爪機構及旋轉機構組合運用，可夾取「麒麟娃娃」，並將吊籃掛上「纜車軌道」，以完成救援任務。利用馬達可控制夾爪機構之抓取及縮放、雙交叉桿之升降及旋轉機構之轉動，以通過所有競賽關卡。

There are three barriers in the TDK 16th National College Creative Design and Invention Contest. The barriers are obstacle area, rescue area, and first-aid station:

1st barrier obstacle area: The foot mechanism of the Bug's Crisis is Chebyshev's linkage. The robot moves stably and fast to pass the falling tree and temporary bridge obstacles.

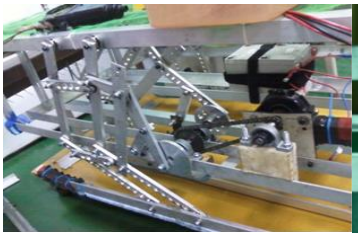
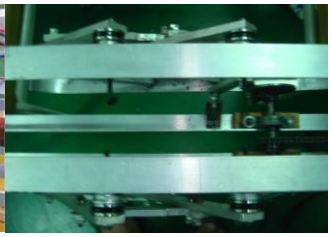
2nd barrier rescue area: The lift mechanism using crossed rods, clamp mechanism, and rotary mechanism are combined together to taking the kylin babies.

3rd barrier first-aid station: The lift mechanism and clamp mechanism are used to put the hanging basket on the ropeway to deliver the kylin babies.

三、輪子驅動設計

「蟲蟲危機」之足部機構是採用 Chebyshev 連桿機構，其作動方式是由馬達帶動齒輪，再由齒輪轉動圓盤，機器人兩側圓盤之角度相差 180°，可使其達到上下移動、左右前進的效果。

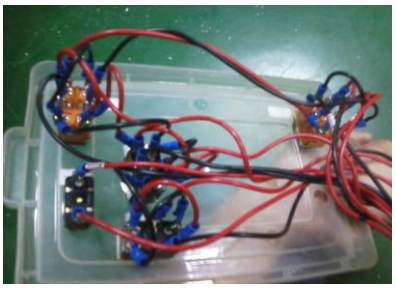
The foot mechanism of the Bug's Crisis is Chebyshev's linkage mechanism. The robot moves stably and fast. The motors, gears, and disks are used to drive the robot. The phase angle difference of the disks is 180°.

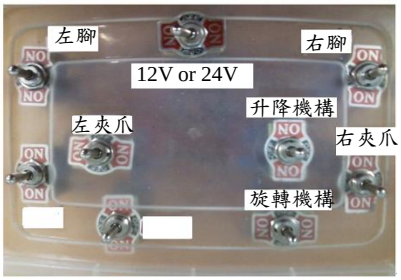




四、電路設計

「蟲蟲危機」之機電控制系統，以簡單化且有效率的概念來做為機電控制之首要目標，而動力傳輸電力系統，依照控制者的手感、操作輕便等需求來選擇適當大小的控制箱以及方向控制器，利用 2 顆 12V（伏特）之鉛酸電瓶串聯輸出電力。經由配線與開關，再直接連上動力馬達作為輸出，達到效率及簡單化的目標，分別用來控制足部機構、升降機構、旋轉機構及夾爪機構。「蟲蟲危機」在控制盒上多製作一個開關，此開關可用來切換控制電力輸出為 12V 或 24V，以調整各機構之作動速度及力量，減少不必要的電力損耗。

The mechatronics of the Bug's Crisis is very simple and efficient to power all the mechanisms. Two 12V lead-acid storage batteries are in series connection to supply the power. The foot mechanism, lift mechanism, rotary mechanism, and clamp mechanism are driven by the motors. A switch in the controlled box can be used to change the output voltage of the batteries, 12V or 24V.





五、感測器設計(遙控組無免填)

六、組裝、測試與修改

「蟲蟲危機」之足部機構是利用 Chebyshev 連桿機構來跨越「倒木」障礙及「便橋」障礙，此種連桿機構當安裝升降機構及夾爪機構時，極易造成機器人整體穩定性不佳以及施工製作的困難度。且利用交叉桿所製成之升降機構，若加工精度、機構組裝不佳，將引起無法順利升降。因此經過機構減重、改善加工精度及反覆測試，可解決上述問題。

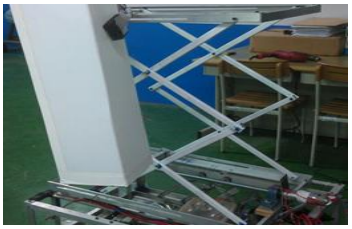
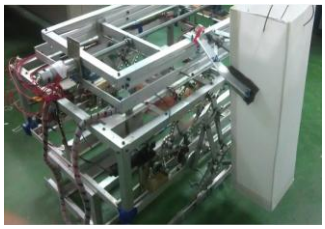
The foot mechanism of the Bug's Crisis is Chebyshev's linkage mechanism to pass the falling tree and temporary bridge obstacles. While the lift mechanism and the clamp mechanism are installed on the chassis, the robot moves unstably and slowly probably. The lift mechanism is composed of the crossed rods. If the manufacturing precision and assembly of the lift mechanism are not well, the lift mechanism will be operated unsuccessfully. The above problems can be solved by reducing the weight of the mechanisms, improving the manufacturing precision, and repeating the test work.

七、機器人創意特色說明

「蟲蟲危機」從最初之設計，即設定將吊籃及夾取「麒麟娃娃」機構合而為一，而利用夾爪機構控制吊籃進行夾取「麒麟娃娃」及掛上高空纜線，此為與其他參賽機器人最大不同之處。此設計概念，不僅可節省機構、亦可減少大量比賽時間。

The hanging basket of the Bug's Crisis can be used to taking the kylin babies. The clamp mechanism is used to control the hanging basket to grab the kylin babies and put the hanging basket on the ropeway. The hanging basket mechanism is very efficient to complete the rescue work.



參、參賽心得

這次參加比賽，有機會研究、參考其他組別製作的機器人，發現有很多機構是我們在學校有討論過的，也有很多設計是我們沒想過的，所以在看到別人做出來的時候，覺得很厲害。參加 TDK 創思設計比賽真的是來對了，只能用臥虎藏龍來形容，比賽過程也很激烈，大家都使出渾身解數拼個高下。最後要感謝學校裡的「指導老師」們及「同學」，在我們需要幫助的時候，即時的給予意見並協助我們。

There are a lot of different types of designs and mechanisms of the robots to appear in the TDK 16th National College Creative Design and Invention Contest. Some mechanisms we have ever discussed, but others we have never considered. The matches are very furious. We are very grateful to the teachers and classmates for all that they had helped us to solve the problems of the robots.