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　Vision and strategy analysis

構想：機器人粗略構想為，足部必須擁有類似仿生獸的行走原理(四足或多足動物)來做為機器人足步行走之功能；手部則使用滑軌及夾爪機構做結合，來解決不同高度的娃娃，以較快速的抓取方式讓機器人抓取娃娃；最後則使用雙剪式升降機構，來解決 2m 高的纜車，讓籃子能順利的升降。

策略分析：策略分兩種，一種為能完全解決任務，另一種為放棄娃娃或是夾取較少娃娃，但機器人必趨走完全程。

A 計畫：機器人以順時針方先行走先通過便橋，再夾取淹水區的娃娃，之後夾取土石流區和山崩區的娃娃，最後再通過倒木將娃娃取下後放回救護站。

B 計畫：若娃娃夾取時出現錯誤時，會放棄夾娃娃的動作或是夾取較少量的娃娃走回救護區。

Vision: there are three rough ideas of the robot. First, the feet of robot must have walking principle which is similar to beasts (the quadruped or multi-legged animals) so that the robot can walk around. Second, the hands combine rails and jaws institutions in order to solve different heights location of dolls. Therefore, the robot can grab dolls in rapid way. Finally, the robot use double scissor lifting mechanism to solve about 2 meters heights' cable car so that the basket can rise and fall smoothly.

Strategy analysis: there are two strategies. One is robot is able to finish the task completely, the other is robot just catch less or abandon dolls in the whole route.

Plan A: first, the robot will walk in clockwise way to pass the bridge, and then grapping dolls which are located on flooded. mudslide, and landslide area. Finally, it will go through the fallen trees and remove dolls back into the ambulance

station.

Plan B: If there is an error to catch dolls, the robot will go back to station without grapping dolls

二、機構設計　The design of mechanism

足部：足部機構因規則限制，不能使用輪式和履帶的方式行走，所以我們參考兩種機構，第一種為 6 足 18 軸的足型機器人，另一種為曲柄搖桿，讓機器人的足部能像仿生獸那樣行走。

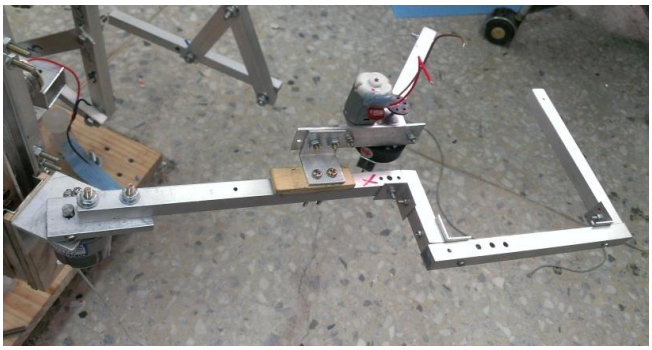
剛開始想使用 6 足 18 軸的機器人，但因 6 足 18 軸的機器人無法承受 25 公斤的機器人，另外金額也較高，所以我們最後採用”曲柄搖桿”機構來作為機器人行走之功能。

Foot: because of the rules and limits, the foot institutions of robot cannot be used wheeled and tracked way to walk. Therefore, we refer to two institutions which can make robot walks as a beast. The one is a robot with 6 feet and 18 axles. The other one is a cranked robot.

In the beginning, we try to use the robot with 6 feet and 18 axles; however, this design cannot bear over 25kg. Furthermore, the price is too high. As a result, we adopt the robot with crank institutions as a walking function to make it walk.

手部：抓取機構利用夾爪原理，是為了配合以上下做動的滑軌來抓取兩個不同高度的娃娃，另外在升降上裝置小馬達，使夾爪可以以 360 度的方向旋轉來夾取不同方向的娃娃；再將抓取完後的娃娃，放入籃子裡，再由升降機構將娃娃升至兩米高的纜車上。

Hand: In order to fit rails which act up and down to grab two different high dolls, the grabbing institutions is used of the principle of jaws. Furthermore, there’s a motor on the lifting device so that jaws can rotate 360 degrees to grab different direction dolls. Then, the robot’s hand put dolls into the basket after grabbing it. And then, the hands raise dolls up to a two-meter-high cable car by the lifting mechanism.



升降：升降機構必須上升至兩米的纜車，扣掉機身原本的高度，機器人大約要上升 1.5 米左右，我們原先設計滑軌，將滑軌分為三階段，但是滑軌升至兩米高後剛性較不好容易搖晃，所以經由我們討論後則使用機車店內的升降機構，因升降機構兩旁的X形狀，可以較穩定的將升降機構上方的物品穩定上升，較不會因外界因素而產生搖晃，所以我們將升降採取此機構。

Lifting: Lifting mechanism must be increased to two meters of the cable car. The robot is about to rise 1.5 meters that it doesn't account original body height. Originally, we designed rails, and divided into three phases. The rigidity was too bad to shake easily as the rails rose to two meters high. After discussing, we used lift mechanism which is from motorcycled store. Due to the X- shape device on the both sides of the lift mechanism, the top of the items on the lift mechanism can be more stably increase without shaking. Therefore, we adopt this lifting institution.

三、足部驅動設計　The design of foot- drive

曲柄搖桿：

機器人足部使用曲柄搖桿之機構，來做機器人行走之功能。

馬達回裝置於兩齒輪之中間較上方位置，利用鏈輪帶動兩齒輪後，會使 5 轉動，當 5 轉動後會帶動 3，使其他 1、2、4 桿件轉動。

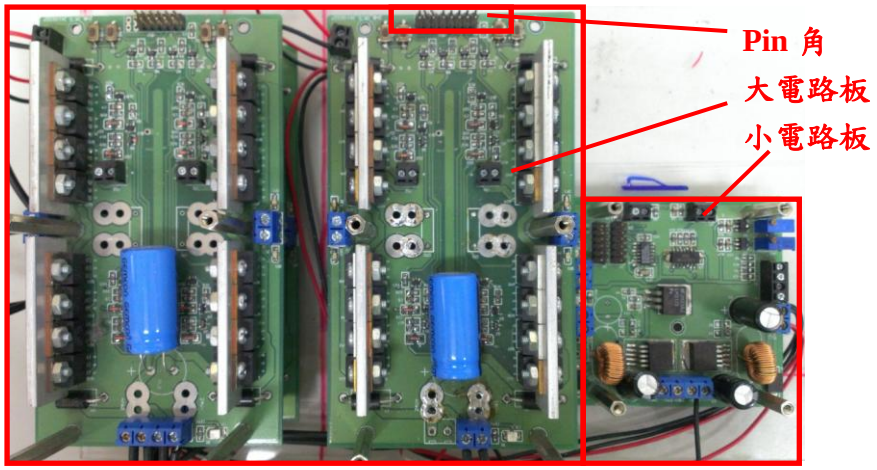
The robot is used crank institutions as a capability of walking around.

Motor rotary device is located on the upper position and in the middle of two gears. After two gears are driven by sprocket, it can turn device 5 around. Device 3 will be driven after device 5 rotates. In addition, device 1, 2,and 4 will rotate at the same time.

四、電路設計　The circuit design

下圖可以看出電路板有分至兩種形狀，左側較大電路板和右側較小的電路板，電路板大致原理為，先將２４Ｖ的電壓送至較小的電路板，進行分壓，分別為５Ｖ和１２Ｖ，１２Ｖ的我們在此沒用到，大部分都使用到５Ｖ和２４Ｖ，我們將５Ｖ電壓送給左側的大電路板，為基本電路電壓，另外並分接２４Ｖ則接給馬達；可以看到大電路板上方有兩排 pin 角，兩排 pin 角為輸入端，主要是與控制盒上的按鈕線相接並且傳送訊號，當我們按鈕按下時，分別控制對應到的馬達正反轉，來使機器人做前後移動以及升降和抓取的動作。

The following diagram can be seen that the board is divided into two shapes. The larger circuit board is on the left and the smaller one is on the other side. The following statement is the general principle of the circuit board. First, dividing the 24V voltage and sending to the small circuit board to divide. 5V and 12V is outcome, but 12V is useless. We usually use 5V and 24V to experiment. We send 5V voltage to the left side of the board as the basic circuit voltage. In addition, we use 24V to connect to the motor; there are two rows of pin angle on the circuit board that we can see. These two rows of pin angle are input in order to control buttons on the box and transmit signals. While pressing the button, we can separately control the corresponding motors to make them reversible. Therefore, the robot can move back and forth, and do lifting and gripping action.



五、感測器設計(遙控組無免填)

六、組裝、測試與修改　Assembly, test, and modify

足部：剛開始做出模型時不知道要放大多少才會有好比例的腳，所以我們再放大足部時花了很多的時間，從放大五倍、三倍和減重等等就花了一半的時間了。

手部：我們使用鋁當作手臂的材料，剛開始也使用了一些紙板等等來製做模型，也利用 Inventor 來繪製設計圖，**讓在製作完成品時較方便校整。**

升降：因為升降機構不是很重所以，目前是只做了一次後就直接使用沒遇到甚麼問題，在測試方面有很順暢。

Foot: In the beginning, we didn't know how big we should magnify to have a good proportion of feet. So, we spent a lot of time enlarging feet. From five and three times enlarging to weight decreasing takes us about a half of time.

Hands: We use aluminum as arms' material. In the beginning, we use some cardboard to make models .in addition, we use Inventor to paint design. Therefore, it's more convenient to check after we finish the product.

Lifting: because the lifting mechanism is not pretty weighty, we don't have any problems and use it directly. Furthermore, the testing is quite smooth.

七、機器人創意特色說明　Description of creative Features

我們的機器人整體類似蠍子，足部以仿生獸的概念作設計，所以走起路來會像很螃蟹或蠍子，再加上抓取機構的手臂放置機器人較後方，讓機器人的手臂更類似蠍子的毒尾巴。

The overall of our robot is similar to a scorpion. Due to the concept of beasts design, the robot's feet walk like a crab or scorpion. In addition, the grabbing

institutions placed higher than the robot, so it's quite similar to a scorpion's poison tail.

參、參賽心得

盧玟攸：經過這次 TDK 比賽讓我們成長了很多，雖然沒得名，但製作機器人的期間我們附出了所有心血，也讓我們了解團隊精神的重要性。

Lu Wen-You: I've learned a lot from the TDK competition. Although, we didn't win place in the contest, we did our best during the robot's making. Furthermore, I genuinely understand the importance of teamwork.

陳錦泉：在製作機器人的過程中，遇到了很多難題，不過我們也一一的突破了，雖然成果不理想，但在其中學習到的經驗，是課堂上所學不到的。

Chen Jin Chiuan: There're many problems we have in the process of making the robot, but we overcome all obstacles. Although, the outcome of the competition is not ideal, the experiences that we learned cannot receive from the class.

謝宏恩：製作機器人時所付出的心力與比賽結果相比，雖然成果不甚理想，不過我會利用此次參賽獲得的經驗，指導學弟妹，力求在下一屆比賽時能取得更好的成績。

Hsieh,Hung-En : Although, the results of the competition is not as good as I think, I will use the experience from the competition to guide juniors. In addition, strive to get much better achievement in the next competition.