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

(1)構想:

將機器人設計成四輪自走車,以四輪車的概念再加上平行四連桿的機構通過關卡，並將車身精簡化，盡量地減輕車身尺寸與重量，並且利用夾取娃娃的機構同時抬起山崩區的落石障礙物，如此輕巧且機動性高，在自動控制上較易精準，並且將機構達到最有效率的運用。

The robot designs four turn self-propelled vehicle, adds on the parallel four connecting rods again by the four wheeler concept the organization through the checkpoint,

and the automobile body fine simplification, reduces as far as possible the automobile body size and the weight, and uses clamps takes dolls organization simultaneously to lift the landslide area to fall the stone obstacle, so dexterous also the mobility is high, compares Yi Jing in the automatic control, and achieves the organization the most effective utilization.

(二)策略:

1. 出發:

(1)障礙區:

A. 山崩區:

出發時先往山崩區出發，偵測到落石後，車身中間的平行四連桿會伸入木箱將落石抬起，再依格數往右行走至白色區塊放下。

Embarks when embarks first toward the landslide area, after detects falls the stone, the automobile body middle parallel four connecting rods will be able to enter the wooden

crate to fall the stone to lift, then will depend on the standard number to walk toward the right side to the white sub-area lays down.

B.土石流區:

將車身縮小，使轉彎時的迴轉半徑小於路障間的距離，在偵測到路障後，馬達會變換速度，達到閃避路障的效果。

Reduces, causes when the curve the radius of gyration the automobile body is smaller than distance between the roadblock, after detects the roadblock, the motor can transform the speed, achieved fends the roadblock the effect.

C.淹水區:

起初的構想是在車身的左右兩側各裝置平行四連桿，在偵測到 40cm 高之階梯時，兩邊的平行四連桿會往前旋轉 360 度，使車身抬起，並往前登上階梯，但由於力矩過大，一般馬達扭力不夠，必須使用較大顆的馬達，但是這類的馬達重量不輕，也很佔空間，所以我們選擇不爬上階梯，從旁邊繞過，如此能夠減輕車身的重

量與尺寸，並且在控制上不會因為過重而變慢或偏移，在這區捨棄闖關的分數，把握救援娃娃。

The initial conception is in the automobile body about both sides each installment parallel four connecting rods, when detects the 40cm high steps and ladders, two side parallel four connecting rods can proceed to revolve 360 degrees, causes the automobile body to lift, and proceeds to mount the steps and ladders, but because moment of force oversized, the common motor torsion 夠, does not have to use the big motor, but this kind of motor weight is heavy, also occupies the space very much, therefore we choose do not climb up the steps and ladders, bypassed from side, so can 夠 reduce the automobile body the weight and the size, and cannot because of overweight slow down or the displacement in the control, discards the score in this area which overcomes an obstacle, the assurance Rescues the baby.

(2)救援區:

到達山崩區、土石流區、淹水區的救援區時，因為這三區離地板的高度有所不同，所以爪子的高度也要有所改變，我們的策略是機器人先倒退，然後分別再依 30 度、90 度、120 度放下平行四連桿，承接在平行四連桿的爪子會先抓取左右兩隻麒麟娃娃，再往中間併攏救援中間的娃娃。

Arrives the landslide area, earth Shi Liuqu, is flooded the area the rescue zone time, because these three areas differ from highly to the floor, therefore the claw highly also must have the change, our strategy is the robot backs up first, then the distinction depends on 30 degree, 90 degree, 120 degrees again lays down the parallel four connecting rods about, continues can capture two unicorn dolls first in the parallel four connecting rod claw, then gathers the rescue middle dolls toward among.

2.回程:

(1)障礙區:

A.山崩區:

因落石已搬離到白色的區塊，所以路線沿著直線回到救護站放置娃娃。

Because falls Shi Yi to move to the white sub-area, therefore the route returns to the emergency station along the straight line to lay aside the dolls.

B.土石流區:

夾取娃娃之後，如同出發路線，回程路上在偵測到路障時，馬達會變換轉速，避開路障後到達救護站。

After clamps takes the dolls, the like embarks the route, on the return trip road when detects the roadblock, the motor can transform the rotational speed, after avoids the roadblock to arrive the emergency station.

C.淹水區:

救援到娃娃後，直接從旁邊行走至土石流區，如有路障則避開，而後行走到山崩區，從已被移走的落石地方直線回到救護站。

After rescues the dolls, walks directly from side

to earth Shi Liuqu, if has the roadblock to avoid, but next arrives the landslide area, from moved away to fall the stone place straight line to return the emergency station.

(2)救護站:

到達救護站，辨色模組會啟動，爪子上感應到救護站與我方同色時就會放開，如果不同色，滑軌會滑動到同色時才會放開。

Arrives the emergency station, distinguishes the color mold train to be able to start, on the claw induces to the emergency station with our homochromy when can let loose, if the homochromy, the rail track cannot skid to the homochromy time only then can let loose.

二、機構設計

(一)山崩區:

1.機構運作 Organization operation:

(1)機器人中間有一平行四連桿機構。

Among the robot has a parallel four link motion

gear.

(2)偵測到落石後下降離地約四公分。

After detects falls the stone to drop the lift-off approximately four centimeters.

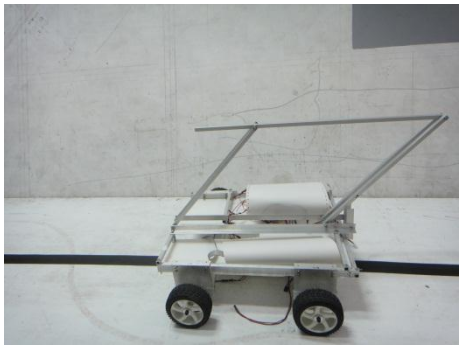
(3)機器人往前行走，平行四連桿前突出 25cm 伸入木箱。

The robot proceeds to walk, in front of the parallel four connecting rods prominent 25cm enters the wooden crate.

(4)上昇抬起，搬離至白色區塊。

The rise lifts, moves to the white sub-area.

2. 示意圖:

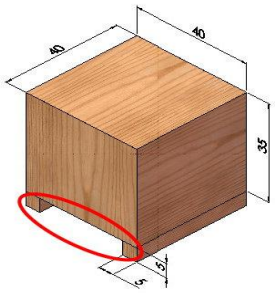


↑車身中間之平行四連桿

↑Fourth Links

↑下降離地四公分

↑Drop takeoffs four centimeters



↑伸入木箱底部 Enters the wooden crate base.

(二)、土石流區:

1.機構運作:

(1)將車身設計長 50cm*寬 40cm，使迴轉半徑小於 70cm。

Extends 40cm body design long 50cm, causes the radius of gyration to be smaller than 70cm.

(2)偵測到路障後，左右輪馬達變速，使車身轉彎。

After detects the roadblock, about the turn motor speed change, causes the automobile body curve.

(3)待完全避開路障，再找到地上之黑線，繼續循線行走。

Treats avoids the roadblock completely, again found the ground heavy line, continues to follow the line to walk.

2.示意圖:

↑偵測到路障

↑馬達變換速度

↑轉彎避開

↑繼續循線

(三)、淹水區:

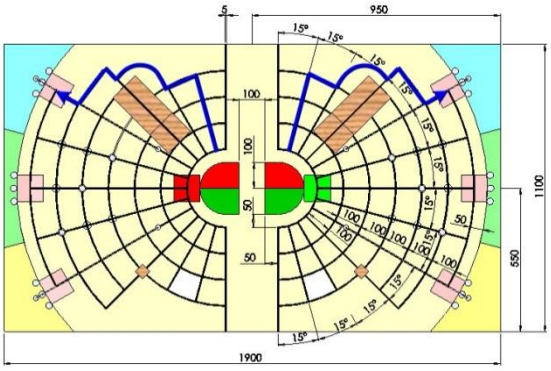
1.機構運作:

省略爬階梯機構，讓機器人穩定通過其他關卡區，把握其他區與救援娃娃的分數。

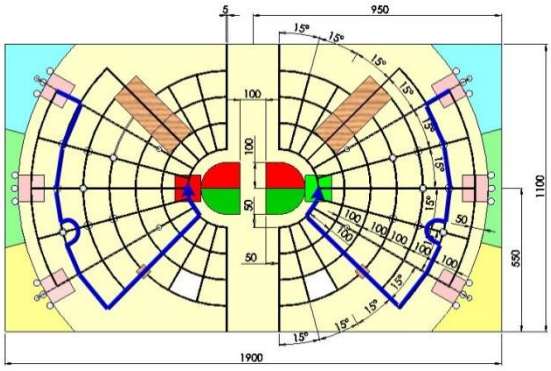
The abbreviation crawls the steps and ladders organization, lets the robot stabilize through other checkpoint area, grasps other areas with to rescue

baby's score.

2.示意圖



↑出發路線(繞過階梯)



↑回程路線(經土石流、山崩區)

(四)、救援區:

1.機構運作:

(1)承接平行四連桿上有 75cm 長之滑軌 。

Continues on the parallel four connecting rods to have the 75cm long rail track.

(2)滑軌接有左右滑動的爪子。

About the rail track meets the claw which has skids.

(3)偵測娃娃,平行四連桿依高度往前下降 30、90、120 度。

The detection dolls, the parallel four connecting rods according to proceed to drop 30 highly, 90, 120 degrees.

(4)爪子滑至左右兩側，抓取左右兩隻，再滑至中間夾住中間娃娃。

The claw slides to about both sides, about the capture two, again slides to among grips the middle dolls.

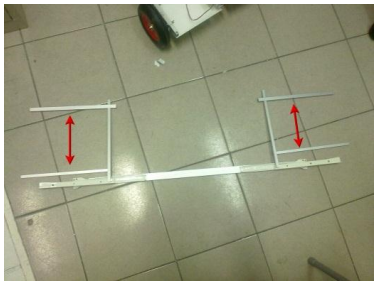
(5)到達救護站，假如同色則爪子鬆開，不同色則滑至同色區域時鬆開。

Arrives the emergency station, if homochromy then the claw loosens, the homochromy does not slide to the homochromy region when loosens.

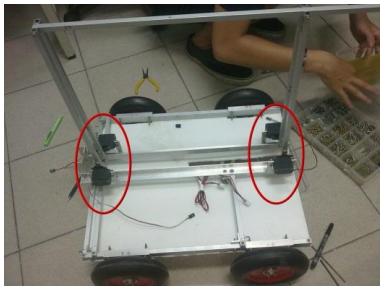
2.示意圖:

↑平行四連桿上之滑軌

↑滑軌上左右移動的爪子



↑爪子運動方向



↑控制平行四連桿的伺服馬達

三、輪子驅動設計

(一)輪子機構:

運用四輪車的概念，將機器人裝上四顆輪子，而不同於一般傳動的車輪，我們將左右兩邊控制車輪的馬達分別接上不同的電路板，如此左右各邊的兩顆輪子在轉彎時，會因馬達的轉速改變，產生小轉彎或是大轉彎的效果，小轉彎時，一邊的車輪會轉動，另一邊的車輪會停止；則大轉彎時，一邊的車輪會加速，另一邊的車輪則會逆轉。

Using the four wheeler concept, installs the robot four wheels, but is different with the general transmission wheel, we about two will control the wheel the motor to join the different electric circuit board separately, so about each side two wheels when curve, will be able because of the motor rotational speed change, when will produce the steep bank perhaps the shallowturn effect, the steep bank, at the same time rotating dinner party rotation, in addition one side rotating dinner party stop; Then time shallowturn, at the same time rotating dinner party acceleration, one side wheel can reverse in

addition.

(二)驅動程式:

利用程式發出 PWM 波，控制馬達轉速，循線是利用兩邊馬達的轉速差，進行左轉跟右轉，以利機器人回到直線的軌道。

驅動馬達的電路板，可以進行馬達正轉、反轉、剎車，反轉用來讓機器人原地自旋，讓機器人可以轉彎，剎車可以讓機器人迅速停下來，避免慣性力，以利更精準地控制。

Sends out the PWM wave using the formula, controls the motor rotational speed, follows the line is uses two side motors the rotational speed difference, carries on counterclockwise with the right-turn, returns to the straight line in order to help the robot the track.

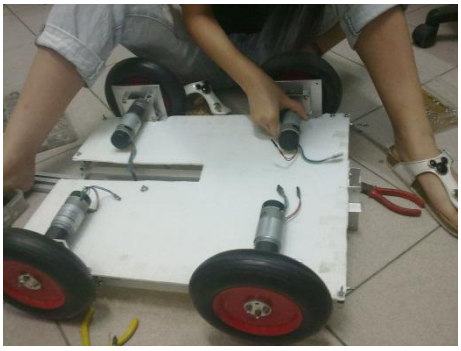
Actuates the motor the electric circuit board, may carry on the motor clockwise, the reverse, 剎 the vehicle, the reverse uses for to let robot in-situ spinning, enables the robot to be possible to make a turn, 剎 the vehicle may let the robot stop rapidly down, avoids the force of inertia, in order to help finer controls.

（三）、車輪圖片：

↑固定車輪的 L 型鋁板

↑驅動車輪的馬達裝置

↑承接車輪的培林軸承(減小摩擦力)



↑機器人的四顆輪子

四、電路設計

（一）、以 8051 為晶片端:

1. 腳位運用如下:

(1)使用 LM324 為比較器，循線板部分用 7 顆 CNY70 來進行循線。

Use the LM324 for Comparator and 7 CNY70 to identify the line to send the 1/0 back to the 8051 to help it walk through the line.

(2)超音波腳位。

Ultrasound to Sense the obstacle.

(3)辨色腳位。

Color vision for identifying the color.

(4)利用 7805，晶片端得到穩定電壓 5V。

Use 7805 to offer the stable voltage 5V to the chip side.

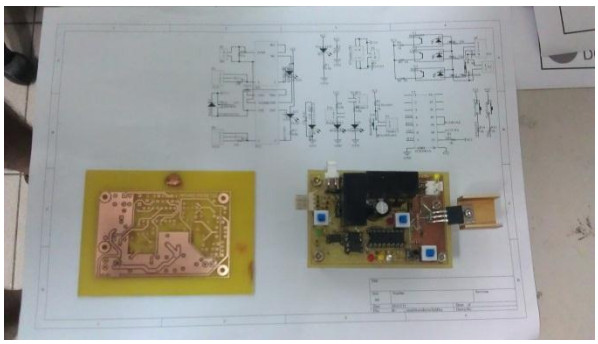
(5)輪子、爪子、滑軌馬達驅動接腳(包含 encoder 腳位)。

Wheels、Paws、Rails motor drive pin(include encoder)

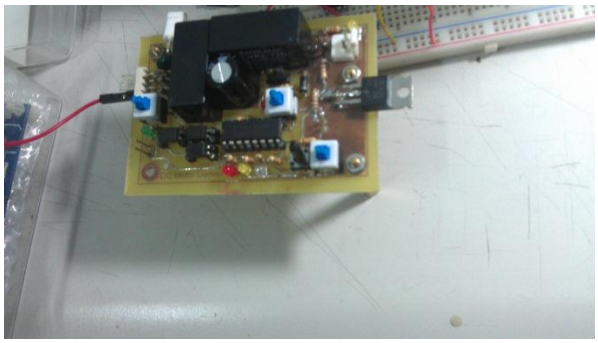
(6)伺服馬達。

Servo motor

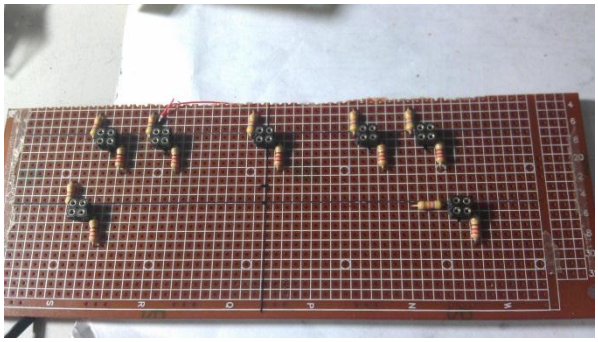
二、電路板圖片:



↑驅動馬達電路圖



↑完成後的馬達電路板



↑CNY70 接上循線電路版

↑8051 晶片端

五、感測器設計

(一)循線:

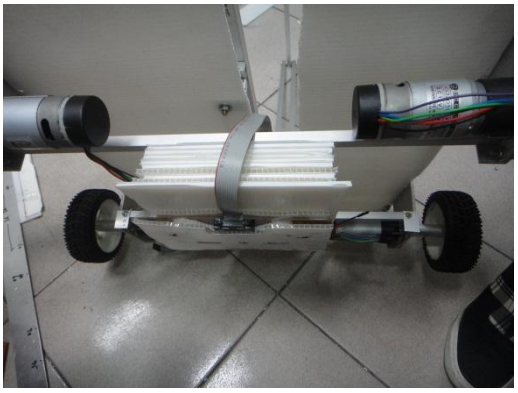
1. 方法:

利用 7 顆 CNY70 元件，設計類似 U 字型方式循線，進行黑白的感測，使機器人能夠直走與轉彎，其中間五顆 CNY70 是用來讓機器人可以行走直線；左前和右前的兩顆 CNY70，可以用來偵測經過幾個路口，用來讓機器人判斷自己在場地的哪個位置，在哪個位置該做那些動作。

Using 7 CNY70 parts, the design similar U font way follows the line, carries on the black and white feeling to measure, enables the robot 夠 to go straight with the curve, in which five CNY70 is uses for to enable the robot to be possible to walk the

straight line; Left front and right front two CNY70, may use for to detect passes through several street intersections, which position uses for to let the robot judge oneself in location, which position should make these movements in.

2.循線版圖片:



↑機器人下方的循線板

↑7 顆 CNY70 元件

(二)超音波:

用於感測山崩區的落石、土石流區的路障，與分辨娃娃的位置，使平行四連桿能夠正確地依角度轉動。

Uses in the feeling measuring the landslide area falls the stone, the earth Shi Liuqu roadblock, with distinguishes baby's position, enables the parallel

four connecting rods to depend on the angle rotation correctly.

(三)辨色模組:

裝置於爪子與機器人下方，在機器人到達救護站時，辨色模組會啟動，如果機器人下方與爪子的辨色模組一致，則爪子會鬆開。

The installment underneath the claw and the robot, arrives the emergency station when the robot, distinguishes the color mold train to be able to start, if underneath the robot distinguishes the color mold train with the claw to be consistent, then the claw can loosen.

六、組裝、測試與修改

一、組裝 Assembly:

1. 使用物件 Use things:

(1)口字鋁管:塑造機器人，固定平行四連桿。

Mouth character aluminum tube: Molds the robot, fixed parallel four connecting rods.

(2)L 型鋁板:固定車輪，加強結構穩定度。

L aluminum sheet: Fixed wheel, superstructure stability.

(3)IG-32GM 型馬達:使車輪轉動。

IG-32GM motor: Causes the wheel rotation.

(4)伺服馬達:控制爪子的夾取與拉線。

Servo motor: Controls the claw to clamp takes with the back guy.

(5)抽屜的滑軌:將爪子裝置於此即可在滑槽上滑動。

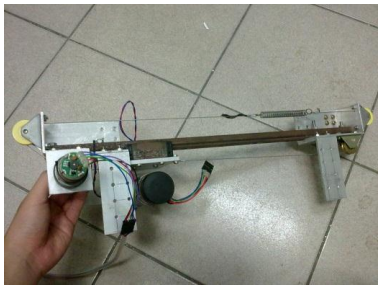
Drawer rail track: Then skids the claw installment in this on the sliding way.

(6)滑輪與拉線機構:使滑軌滑動的控制。

Pulley and back guy organization: Causes the rail track glide the control.

2.組裝圖片:

↑機器人整體外觀



↑滑輪與拉線機構

二、測試 Test:

1. 機構:

(1)輪子:在測試的過程中，發現一開始的車速過慢，導致可能在比賽中限制的 4 分鐘內無法跑完。

Wheels:In the test process, discovered from the very beginning vehicle speed excessively is slow, causes to be possibly unable in 4 minutes which in the competition limits to run.

(2)穩定度:某些地方的結構並不是很堅固，導致機器人在行走的時候會晃動，或是平行四連桿無法正常地轉動。

Stability: Certain place structure is not very firm, causes the robot the time which walks can rock, perhaps the parallel four connecting rods are unable to rotate normally.

(3)拉線機構:在拉線的過程中會發現有鬆緊度或是摩擦的問題。

Back guy organization: In the back guy process can discover has the loose allowance perhaps the

friction question.

(4)馬達:馬達上的軸心不能偏移，否則會導致不正常轉動。

Motor: On the motor axle center cannot displace, otherwise can cause to rotate not normally.

2.感測:

(1)循線:在試跑的過程中，曾經因為一顆 CNY70 不正常地判斷黑白，導致我們的機器人無法循線。

In the process ,we used to be fail. Cause a cny70 can not work rightly. Let our car unable to follow the line.

(2)超音波:必須注意雜訊的干擾。

Supersonic wave: Must pay attention to the miscellaneous news the disturbance.

三、修改:

1.機構:

(1)輪子:由於車速過慢，所以我們選用較大顆的車輪，在馬達轉速一樣的情況下，行走的距離會比較大。

Wheels: Because the vehicle speed excessively is

slow, therefore we select the big wheel, in the motor rotational speed same situation, the distance which walks can quite be big.

(2)穩定度:我們在結構中有直角的地方,加裝上小片的L型鋁板,如此在機器人的鋁管間消除了晃動的問題,至於平行四連桿方面,我們也加裝了一些鋁管,並在間隙中加了些許墊片。

Stability: We have the right angle place in the structure, in the addition the small piece L aluminum sheet, so eliminated the question in between the robot aluminum tube which rocks, as for the parallel four connecting rod aspect, we has also installed some aluminum tubes, and added the trifle filling piece in the gap.

(3)拉線機構:加上一條彈簧,讓線的鬆緊度可以靠彈簧做調整,並使用滑輪減小線與鋁的摩擦力。

Back guy organization: Adds on a spring, enables the line the loose allowance to be possible to depend on the spring to make the adjustment, and uses the

pulley to reduce the string cable and the aluminum friction force.

(4)馬達:加上培林軸承，使馬達不會晃動，導致軸心偏移。

Motor: Adds on cultivates the forest bearing, causes the motor not to be able to rock, causes the axle center displacement.

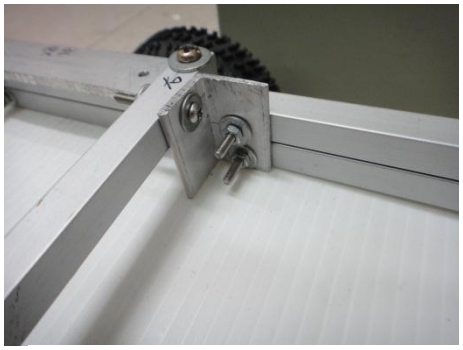
2.感測:

為解決 CNY70 不正常地判斷黑白循線，我們想到的方法是，一顆 CNY70 用一個可變電阻，每個可變電阻去做調整，才有辦法讓 CNY70 正常感測。

To solve the CNY70 detect the black or white wrongly. The way we think is to give each cny70 a variable resistor. That each cny70 can be adjusted by each variable resistor. That can every cny70 work normally.

3.修改後的圖片:

↑將車輪改大



↑加裝小 L 型鋁板固定

七、機器人創意特色說明

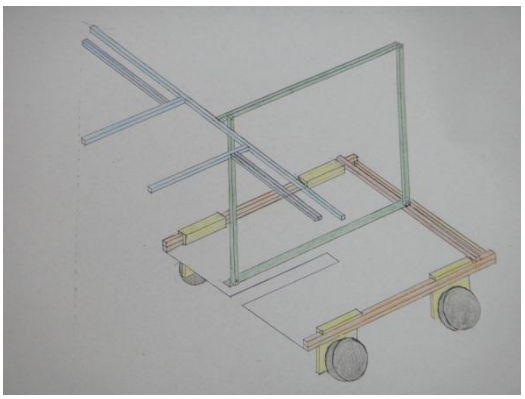
這次的機器人設計中，我們著重的構想是能夠做出「摸蛤仔兼洗褲」的機構，在抬放落石、夾取與放置娃娃使用同一種裝置，來減輕機器人的負擔，有效的降低重量，並且將時間運用得盡善盡美，在救援到娃娃後，立刻行走到救護站放置娃娃，就如同現實生活中的救難，等待解救到災民後，就馬上送往醫院求救。

在我們隊員互相討論之下，決定使用平行四連桿的機構，在山崩區遇到落石時，可以馬上下降抬起落石；救援娃娃時，可以依娃娃的位置高低，轉動到不同的角度，讓爪子夾取；放置娃娃時，可以直接鬆開平行四連桿上的爪子，如此一來，救災大作戰可以迅速的完成。

In this time robot design, our emphatically conception is can make “traces the venerupis philippinarum concurrently washes the trousers” the organization, in lifts puts falls the stone, clamps takes with lays aside the baby to use the identical kind of equipment, reduces the robot the burden, effective reduces the weight, and results in the time utilization the acme of perfection, after rescues the baby, walks immediately to the emergency station lays aside the

baby, in the like real life rescue, after waited for rescues the disaster victims, immediately escorts to the hospital to pray for rescue.

Discusses mutually under our member, decided the use parallel four connecting rods the organization, meets when the landslide area falls the stone, may immediately drop lifts falls the stone; When rescues the baby, may depend on baby's position height, rotates to the different angle, lets the claw clamp takes; When lays aside the baby, may loosen on the parallel four connecting rods directly the claw, then, the disaster relief big combat may rapid completion.



↑手繪的機器人草稿

參、參賽心得

在比完賽後，我們深深的體會到比賽公平的重要性與規則的參考性，許多時候是得情不得理的，我們承認自己的作品有許多該改進的

地方，但是我們中規中矩，做個守法守理的參賽者，還是受規則給控制，最終輸給了心中的固執。

這次的比賽題目可以說是史上最困難的任務，許多隊伍連三輪比賽掛零，我們則是在第一輪得到了二十分，而在秩序手冊上明文規定參賽的隊伍單場分數必須超過四十分才能晉級，第一輪比賽結束我們得到了二十分，但下兩場的比賽我們為了爭取單場四十分，而對我們的機器人做了些許修改，使我們能夠依據規定順利晉級，修改前我們每場都能夠有信心至少得到二十分，積分加總可以到達六十分以上，但要得到單場四十分以上我們必須犧牲機器人的一些性能，使機器人變得不穩定，果不其然，我們在下兩場比賽失了分數，三場比賽的結果是 20、0、0，我們輸的甘願，但是等到複決賽名單出來，沒想到有三隊隊伍單場都沒有超過四十分就能晉級，就連 0、20、20 的分數都能進入前八強，對我們來說實在是非常可惜，無緣進入前八強。

我們遵守規定，為了爭取四十分賭上一把，如果不犧牲機器人性能，一定能夠拿到 20、20、20 的分數順利晉級，但是我們賭了！ 在決賽名單出來後，我們非常失望，沒想到主辦單位和評審團根本無視於這項規定的存在，我們特定上前和主辦單位理論，但是得到的答案竟然是"我們學生必須要體諒主辦單位的抉擇"，但是為什麼主辦單位不能夠體諒我們這些遵守規定的學生?

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

換個角度來想，為什麼不能只讓前五名單場有超過四十分的隊伍互相比較高下呢?而又為了要湊到八名隊伍，為什麼不能再讓剩下的隊伍去爭取後面那三名呢?時間與金錢的花費都不是藉口，但我們還是要尊重主辦單位與評審團的決定。

我們參加比賽的目的是希望能夠學到專業、實作、比賽經驗方面等知識，俗話說「凡走過必留下痕跡」，這次比賽我們學到了很多經驗，不管是我們的進度落後、隊員之間的摩擦、機器人的 bug、時間的規劃等等，如果從頭再來一次，我相信我們一定能夠做的更好，這次的回憶也深深烙印在我們的腦海裡，不管過程是多麼艱辛，往後回想起來必定是甘甜的滋味，期待有機會還能夠參加這樣的比賽。

After compared to match, we deep experience competition fair importance and rule reference, many times is the sentiment does not have to manage, we acknowledged own work have many this improvement places, but in us in the gauge the moment, is the participant who obeys the law defends the principle, receives the rule to give the control, finally has lost to in the heart tenacity.

This time competition topic may say is in the history the most difficult duty, many troops link three turn competition

oddly, we were in first turn obtained two ten points, but the regulations participation troop single field score had to surpass in the order handbook four can be promoted extremely, the first turn competition ended us to obtain two ten points, but next two competed we in order to strive for the single field four ten points, but has made the trifle revision to our robot, enabled us to be promoted smoothly based on the stipulation, before the revision we each all could have the confidence to obtain two ten points at least, the integral add always may arrive six ten pointsAbove, but must obtain single field four above us to have to sacrifice the robot extremely some performance, causes the robot to become unstable, sure enough, we have lost the score at the next two competitions, three competition results are 20, 0, 0, we lose being willing, when but the duplicate finals name list comes out, had not thought has three row troop Shan Changdu not to surpass four extremely can be promoted, 0, 20, 20 scores all can enter first eight, really is was a pity extremely to us, does not have the good fortune to enter first eight.

參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

We observe the stipulation, in order to strive for four bets extremely, if does not sacrifice the robot performance, certainly can attain 20, 20, 20 scores is promoted smoothly, but we bet! Comes out after the finals name list, we are extremely disappointed, had not thought the sponsor unit and the syndicate disregards radically in this stipulation existence, we specific go forward with the sponsor unit theory, but obtains the answer is unexpectedly " we the student must need to forgive the sponsor unit choice ", but why sponsor unit can't forgive the student who our these observe the stipulation?

Trades an angle to think under that, why can't only let the first five name list field have surpasses four extremely troops quite to be mutually high? But in order to also must gather eight troops behind, why can't again let the troop which is left over strive for that three? The time and the money expenditure is all not the pretext, but we must respect the sponsor unit and syndicate's decision.

We attend the competition the goal are the hope can learn

specialized, really make, knowledge and so on competition experience aspect, the slang said “every passes through must leave behind the trace”, this time competed we to learn has very experienced, no matter were between our progress backwardness, member’s friction, robot bug, time plan and so on, if started over from the beginning one time, I believed we could certainly do well, this time recollection also deep deep brand mark in ours mind, no matter the process were how difficult, recollected in the future will surely be the sweet taste, anticipated had the opportunity also to be able to attend such competition.