1：教師 (Advisor)

葉賜旭 老師

　　是本校智慧機電研究室的教授，也是機器人社社團的指導老師，老師主要協助我們在機器人製作上，馬達及感測器之選用，還有在自動控制之電路設計上的指導，還有競賽當天之租車及住宿的事宜。

Syh-Shiuh Yeh

Research is a professor of electrical and mechanical , but also the social community to guide the robot teacher, the teacher mainly to assist us in making the robot, the selection of motors and sensors, as well as in automatic control of the circuit design guidance, as well as the day of the race car rental and accommodation matters.

2：學生第 1 位(1st team member)

徐傳勛

　　隊長：這次主要負責機電的部分，負責製作驅動硬體用的驅動器。由於這次電控的部分是採用電子式的，所以也有負責製作電路板和感測器的測試。由於以前並沒有很常接觸這些電子零件，但因為這次的比賽所迫使所以在這一方面有很大的突破，這令我十分開心而且有成就感。

Chuan Hsun Hsu

In this team I play a captain row, which is responsible for announcing my teammate to show up, reporting our schedule to the professor. My duty at the team is to manufacture the driver for the hardware, which is the circuit board. During the period I've learn a lot of new stuff about electronic device which I weren't act knowledge; I was really proud of my circuit board and I was really happy making it.

3：學生第 2 位

(2nd team member)

吳志泓

　　組員：這次負責機器人程式的撰寫，以組合語言控制機器人判別娃娃、循線、下階梯…等動作，感測器的選用與訊號判斷也是我負責的工作範圍，得意之事為將各個動作寫成副程式，再以流程方式依序撰寫簡化程式的複雜度。

Jhih Hong Wu

The robot program is responsible for the writing of assembly language to control robot discriminant doll assembly language, through the line, down the ladder ... and other action, following the line ... etc, my responsibility is to determine the sensors and signal, as a matter of pride to all actionwritten subprogram, and then sequentially written to simplify the process approach the complexity of the program.

4：學生第 3 位
 (3rd team member)

許筌祺

　　組員:這次我主要負責機構部分，對於比賽的關卡針對破關策略而設計機構，包括了車體的設計、整體夾爪機構、倉儲系統機構、彈射系統的規劃及設計製作，透過小組討論後針對我們需求而設計，並且於後期針對機構而架設基本的電路系統。

Xu Quan Qi

　　The body primarily responsible for part of the the barriers broken off strategy game design agencies, including the design of the bodywork, overall jaw agencies, the warehousing system institutions, ejection system planning and design, through group discussions, the demand for ourdesigned, and at a later stage for the erection of a basic circuit system.

(4rd team member)

邱創郁

　　組員：負責影像處理控制，對於紅綠顏色進行客製化處理，軟體部分以 C 語言為基礎，撰寫比賽所需的指令，硬體部分以網路攝影機(Webcam)為幫助，捕捉及時影像，分析其色彩資訊，應變不同時刻之所需。

Chiu Chuang Yu

Responsible for the image processing control, customized software part of the C language, writing competitions instruction, the hardware part of the Web Camera (Webcam) to help capture the timely images to analyze the color for red-green colorinformation required strain at different times.

6：機器人特色 1 (Robot Characteristics)

　　車體採用 19 X 19 的鋁桿製成，底盤 700 X 650 X 100 ㎜，為了因應轉速與地面的接觸故將動力源搭配鏈輪作動力傳輸，夾爪的設計為避免目標台上有障礙物的存在，故將設計為有橈性的繩索做為捕捉的機構，而所抓的娃娃有三隻所以須搭配個倉儲系統來將其歸納，並且也因為娃娃有紅綠之分故也需要設計一個辨色系統，透過視訊來辨識其顏色搭配於倉儲系統內，以便於歸納與顏色判定。

　　Bodywork is made of 19 X 19 aluminum pole, chassis 700 X 650 X 100 mm, to response speed contact with the ground, it will be a power source with sprockets for power transmission, the design of the jaws obstacle to avoid target tableexists, it will be designed to have three so it must be used with a warehousing system to be summarized, and also because the doll red and green of the points it is also necessary

to design a resolution radial rope as capture institutions are caught dollcolor system through the video to identify the color with the warehousing system, to facilitate the induction and color determination.

6.0 概說(Abstract)

　　這次比賽為了因應格子間的間距，所以車體底盤的尺寸設計為底盤 700 X 650 X 100 mm；輪子部分則採用可作為緩衝的橡膠輪胎， 分析關卡內容後規劃出針對不同關卡，如何知道在平台上、或者是要如何上階梯、或如何辨識娃娃顏色，且要如何判斷位置，並且能夠過關斬將回到終點。

The competition in order to response to the lattice spacing, so the size of the car body chassis design chassis 700 X 650 X 100 mm; wheels and partly as a buffer rubber tires, after analyzing checkpoints content planning for different checkpoints, how to know the platform, or how on the ladder, or how to identify the doll color, and how to determine the location, and the ability to fight its way through to the finishing point.

6.1 機構(Mechanism)

A、車體架構

　　第一台車我們先用基本材製作，因為這樣可以在做正式版機構之前，發現一些機構上的問題及需加強的部份，後來，我們發現在，因此，在製作正式版車體時我們會特別注意這個部分，且在構思的過程中，會先和全部隊員討論，經過大家的意見整合後，再決定是否做修正，亦或維持原狀，所以機構都是大家意見經過整合後的產物。

A、the body structure

　Let's first car produced with the basic material, because it can be done before the official version of the agency, found that the number of institutions on the problem and the need to strengthen the part, later, we found, therefore, in the production of the official version of the bodywork special attention to this part, and in the process of idea will be discussed and all of the team, after the integration of everyone's views, and then decide whether to do a correction, or will remain intact, and institutions are the views of the product after the integration.

B、彈射裝置

利用快速的馬達瞬間拉動繩子,並且透過繩子連結於上半部的機構,讓其可以瞬間的拉力將其拉起,並且透過瞬間的力道讓娃娃可以彈射至救援區。

B、 the ejection mechanism

Fast motor instantly pull rope, and links through the ropes in the upper half of the institutions, so that it could instantly pull pull through instantaneous force the doll can catapult to the rescue zone.

C、分類裝置

透過馬達旋轉,並且搭配瓦楞板搭成的裝置並且透過單晶片控制及辨色系統輸出訊號來進行分類。

C、classification of devices

Through the rotation of the motor, and with a the corrugated board barricaded device and classification system output signals through a single-chip control and color vision.

D、輸送裝置

架設輸送帶裝置,此裝置透過鍊輪傳動並且於這架設辨設裝置可以判斷且也可以暫停讓視訊作用進行辨色,再進行輸送至分類裝置。

D、the conveying device

Erection of conveyor belt device, this device through the sprocket drive and this erection resolution set the device can be judged and can also pause the video the role of color vision, and then transported to the classification of the device.

E、夾爪機構

　　夾娃娃的機構我們是希望可以一抓三隻娃娃，也希望可以以一個手臂應付三個不同高度的關卡。由於這次的尺寸都比較大，所以是以繩索及繩輪傳動。手臂的伸縮式採用繩索及彈簧的設計。由繩索去拉起手臂，後再以彈簧復歸其機構。手臂設計了上極限開關和下極限開關，好讓單晶片知道手臂目前的位態。此外，也作了一個芳指過拉的機構；由於彈簧的機構不能拉超過 90 度，所以製作一個防止手臂過拉的保護裝置

E 、jaw mechanism

Clip doll bodies that we hope can be a grasping three dolls also hope to be able to cope with an arm three different heights of the barriers. Larger than this size, it is a rope and sheave drive. The telescopic arm using rope and spring design. By ropes to pull up the arm, and then spring return their institutions. Arm design of the upper limit switch and lower limit switch, single-chip so know the the arm current bit state. In addition, also made by an aryl means through a pull mechanism; than 90 degrees due to the agency of the spring can not pull, so making a to prevent the arm over-pull protection device

6.2 底盤(Chassis)

因應比賽場地比較大，故這次比賽的動力來源將下處理:
　a. 比較大的輪子
　b. 馬達使用功率較大的(24V)
　c. 用鏈條傳動
　　在於軸的部分避免其左右搖晃故我們將其弄上軸承讓他可以穩定得在其中旋轉不會有徑向的搖晃，也於前面所說，此比賽場地較大所以我們利用鏈條來傳動使其可以更大的動力來源及穩定的速度輸出，後來因為車體需求並且考量到車體負重後底盤輪胎所需要乘載的力，顧將輪胎設計改為內側，此可以將力所分配出而不會施加在於輪胎連軸器上。

Response to relatively large venue, it is the power source of this competition will be the next treatment:

a relatively large wheels
b. motors use large power (24V)
c with chain drive

Is to avoid shaking about we get on bearings so that he can have stability in which the rotation does not have radial shaking, but also in the earlier part of the shaft, this venue so we use the chain to drive its the speed can be a greater source of energy and stable output, and later because the body needs and considerations to the car body weight chassis tires need to take the force contained, Gu tire design changed the inside, this can be a force assigned out not impose that tire couplings.

6.3 控制(Control)

以組合語言撰寫程式，將各個流程動作寫成副程式 EX:轉彎、循線、機構觸動，再以流程方式依序 call 各個副程式，達到須該使用機構時才作動，以流程控制的方式簡化程式的複雜度並減少除錯的時間。

Assembly language programming, written subroutine EX: turning, through the line agencies touched each workflow actions sequentially call each subroutine process, reaching to the use of the agency when actuated process control simplifies programthe complexity and reduce debugging time.

6.4 機電(Mechatronics)

電路系統，一開始是以比較簡單的機械式的繼電器作馬達控制。但因為之後有轉速控制的需求所已改用 mosfet 場效電晶體作馬達控制在以 PWM 控速。中途有用一些 mosfet driver(TC427)搭配一些邏輯元件去做控制，但最後發現邏輯元件使用上有些問題，有時反應不過來造成短路，所以最後改用 OP 放大器去做比較和判斷。此外就只剩一些瑣碎的感測器應用和其週邊電路。

機構部分電路控制，透過架設極限開關讓其可以在瞬間停止並且可以有規則性運動，透過繼電器的控制讓其可以不同向運動。

Circuit system, one starts out in a relatively simple mechanical relay for the motor control. However, after demand speed control has to switch mosfet field effect transistor motor control in PWM speed control. The midway useful to some mosfet driver (TC427) with a number of logic elements do control, but finally found some problems in the use of logic elements, and sometimes reaction, but to cause a short circuit, so in the end to do the comparison and judgment to switch to OP amplifier. Moreover only some trivial sensor applications and peripheral circuits.

The institutional part of the circuit control, through the erection of the limit switch so that it could be stopped in an instant and can regularity of movement, so that it could to the movement through the relay control.

6.5 其他(Other)

　感測器使用，車體在循線修正時，會因轉速過快導致修正時衝出線外，所以我們以 PWM 的方式來控制馬達轉速，依循線感測板上的 CNY70 訊號，以馬達控速的方式來做車體與黑線的大修正或小修正，已確保車體可以循線前進，循線板左右邊的兩個 CNY70，用來辨別十字路口、丁字路口等兩黑線交會處，藉由這 2 顆 CNY70 來算紀錄行經的格子數即可知道車體目前所在的位置。

Webcam 影像辨識選擇 OpenCV 進行顏色辨識，首先在 Dev-C++環境下安裝 OpenCV，安裝完成後，以 C 語言撰寫程式，程式首先擷取 webcam 拍攝到的影像，顯示在螢幕上，按下鍵盤上的 C，即拍出一張相片，命名為 Picture 1，儲存在與程式相同的資料夾，爾後按下 Esc 退出拍照程序。

　開始分析照片的像素構成，由於拍攝的圖片為 640*480，圖片的 x 軸中心點為 320，y 軸為 240，從中心向周圍進行掃描，讀取 B、G、R 的像素資訊，比較其臨界值，如果 R 值比 G 值大，程式編譯後則顯示” RED=80,GREEN=1”， 如果 G 值比 R 值大，程式編譯後則顯示” RED=1,GREEN=80”，顏色數字大者表示照片中主要顏色為該者，以布林代數輸出該值，顏色範圍內輸出 1，非顏色範圍內輸出 0，將輸出的值運用並列通訊傳給單晶片。

Use sensors, body correction through the line, due to excessive speed led to the amendment out of line, so we have a way to control the PWM motor speed, follow the the line sensing board CNY70 signal to the motor controlspeed the way to do a big correction or correction of the body and the black line, have ensured that the bodywork can advance through the line, through the line side of the plate around two CNY70, used to identify the intersection of the crossroads, T-junction of the two black linespassing record by two CNY70 count the number of lattice to know the the bodywork current position.

Webcam image recognition to select the OpenCV for color identification, first in the Dev-C + + environment install OpenCV, after the installation is complete, the program written in C language, the program first capture webcam captured images displayed on the screen, press C on your keyboard shoot a photo, named as Picture 1,

stored in the program the same folder and then, press Esc to exit photographed program.

Start analysis photo pixels, because the captured image is 640 * 480, the picture of the center point of the x-axis 320, the y-axis 240, from the center to the periphery of scanning, reading B, G, R of the pixel information, compare their threshold value, if the R value ratio G value is large, the program compiled is displayed "RED = 80, GREEN = 1", if the G value than the R value is displayed, the program compiled "Red = 1, Green = 80", color digital large main color for photo output the value to a Boolean algebra, color range output 1, the range of non-color output 0, the output value of the use of parallel communication to a single chip.

7：參賽心得 (Highs and Lows)

許筌祺：

　這次參加這個比賽讓我學習到很多很多，原本只對於機構製作技術上有所鑽研，但這次可以針對比賽關卡設計做設計發想，並且將腦袋裡的想發所付諸行事後，那感覺是很不一樣的再透過配置電路後，當機構能照所設計的功能所作動時，那是一種感動，從這次比賽我學到更勝於以前的電路及機構設計，讓自己能夠好好運用所學。

Xu Quan Qi

　After this I learned a lot, had only been studying for institutional production technology to participate in this competition, but this time for the race checkpoints designed to do the design thoughts and want to send the head that put the act, it feelsvery different through the configuration of the circuit, when the institutions according to the design features made moving, it is a kind of moved, I learned more from this competition design is better than the previous circuit and institutions, and to be able to make good use of what they have learned.

吳志泓：

　透過參與這次比賽的過程，我學到很多關於單晶片的流程 ，控制與循線、編碼器、距離感測…等程式的撰寫經驗，也體驗到團隊的專業分工與整合是很重要的，雖然常常會發生意見不和的狀況，但 是通常可以透過開會討論來得到共識。

Jhih Hong Wu

　Through the process of participating in this competition, I learned a lot about the process of the single-chip control through the line encoder, distance sensing program writing experience, specialization and integration experience to the team is very important, although views and the situation often occurs, but usually through a meeting held to discuss a consensus.

邱創郁:

　　這次比賽需要自動分辨娃娃的顏色,想了許多的方法,感應器、光敏電阻、網路攝影機,前兩項不是敏感度太低就是效率奇差,網路攝影機成為我們的首選,就像人眼直接分辨照片一樣,方便又靈敏,重點是不用花什麼錢,純粹是要不要做的技術能力,很開心,最後的成果是滿意的,學到關於程式辨色的內容,同組的隊員互相鼓勵扶持,在做不出想破頭時,給予關心,是非常開心的,如果有機會,也想嘗試看看學校相關方面的課程,對於本有的底子再更上層樓

Chiu Chuang Yu

This game needs to automatically distinguish the color of the doll, like many sensor photoresistor, network cameras, the first two are not the sensitivity is too low efficiency of extremely poor webcams become our first choice, just like the human eyedirectly distinguish photo, convenient and sensitive focus without having to spend any money, pure or technical capacity to do, very happy, and the final results are satisfied, learned the content of the program color vision, the same group of players encourage each othersupport usually do not want to break the head, to give care, is very happy, if given the opportunity, would also like to try to look at school-related aspects of the course, for some of the foundation heights

徐傳勛

　　這次的比賽望我成長了很多,我想很少會有時候可以像這樣子發覺自己的進步,而這些進步並不是單指技術方面的進步,而是我因為這次的比賽而有機會去面對自己以前所不想面對的缺點。由於我是隊長的身分,所以還頗有壓力的。我要負責聯絡組員並準備好開會的內容,我想這是我在管理方面很大的磨練。但最讓我感動是,這次比賽我們受惠於很多人,很多學長姐都很願意給我們意見盛至還會主動的關心,學弟也都願意犧牲時間來幫我,我的組員們都會適時的糾正我的錯誤讓我很放心的做事;是他們的協助讓我勇敢的跨步。

Chuan Hsun Hsu

The game I hope to grow a lot, and I think that rarely can sometimes be like this to find their own progress, these advances not just referring to the advances in technology, but because this game have the opportunity to facehis past shortcomings do not want to face. I as a captain, so it is quite stressful. I want to be responsible for liaison crew ready for the meeting, I think I honed in the management of. But most moved me was this game we benefited from a lot of people, a lot of seniors are willing to give us views Sheng to also take the initiative to concern school brother are willing to sacrifice the time to help me, my team will be timely correct my mistakes so that I am assured of doing things; their assistance let me brave stride.