參賽隊伍人員及機器人簡介

Team Member and Robot Introduction

組　　別：自動組	指導老師：白明昌
學校名稱：南開科技大學	隊伍名：　　搶救安妮
School：Nan Kai University of Technology	Team name：Rescue Anne

壹、參賽隊伍人員：

一、指導老師

1：教師：白明昌

主要研究領域為強健控制與機電整合技術。針對此一專題之製作，提供控制系統及機構設計規劃之建議。並結合理論與實務，進而達到機器人之機構、造型與動作方面有所創意。

(Advisor: Pai Ming-Chang)

The main research fields include robust control and mechaelectronic control and automation technology. As for this project, some recommendations about control system and mechanism design have been offered. Also, some theories and practical experience are applied so that the creative construction, formation and motion of this developed robot can be achieved.

2：學生第 1 位 王伯泉

(1th team member: Wang Bo-Quan)

組長：負責工作編配、初步草圖繪製、機構設計、CAD 設計繪圖、現場加工、鉗工加工、鑽孔加工、電路配線及焊接、車體架構製作、組裝機構零件、小組採購、拍照、小組討論與工作紀錄、書面報告設計撰寫。

Group leader：responsible for coordination of group works, sketch draw of the preliminary model, mechanism design, CAD drawing, manufacture, drilling machine elaboration, bench work elaboration, cable arrangements and welding, fabrication of bodywork, integration of all components, group purchase, photography, group discussion and job record, final report.

3：學生第 2 位 陳冠甫

組員：負責小組工作協調、機構設計、CAD 設計繪製、3D MAX 繪製、電路配線、架構分析製作、現場加工。

(2nd team member: Chen Guan-Fu)

Group member: responsible for coordination of group works, mechanism design, CAD drawing, 3D MAX drawing, cable arrangements, analysis and manufacture of framework, manufacture.

4：學生第 3 位 王少原

組員：鑽床加工、鉗工加工、組裝各機構零件、車體架構製作、小組討論與工作紀錄、本組機器操作手小組採購。

(3rd team member: Wang Shao-Yuan)

Drilling machine elaboration, bench work elaboration, integration of all components, fabrication of bodywork, group discussion and job record, the robot operator of this group and group purchase.

5：學生第 4 位 劉芃睿

組員:整體車架設計、現場加工、底盤設計、銑床加工、車床加工、組裝各機構零件、電路焊接、電路控制、PLC 程式設計與測試、機構功能測試、車體架構組裝、書面資料整理、。

(4th team member: Chen Chia-Lun)

Group member: responsible for design of whole model, manufacture, batholiths design, miller elaboration, lathe elaboration, integration of all components, welding, circuit control, PLC program design and test, function test, fabrication of bodywork, and collection of data.

貳、機器人簡介

一、構想與策略分析

基於創新及穩定為原則，機器人以履帶式的穩定取代單一驅動式的速度，如此機器人之運動行為將可達到穩定運行及方便軌跡修正。在創思的要求下，設計多功能之搬物與救人機構，以減少機構長度重量影響車身運作上的失誤。

Based on the innovation and the stability, the robot is built in the track type for the stability instead of the single drive type for the speed so that the exercise behavior of the robot will be able to reach a stable running and conveniently revise the track. Under the request of innovation, the multi-functional mechanism was designed for removing things and rescuing people so that the operation error caused by the mechanism is minimized.

二、機構設計

1 底盤

以重型挖掘機為底盤架構作為機器人的雛型然後加以修改。並在後輪的左右兩側各別裝置一顆伺服馬達，經由履帶的方式來帶動左右前輪，因而增加其穩定性。

2 上升機構

上升機構是由馬達傳送至渦桿及渦輪機構，因渦輪機構為不可逆傳動，如此可帶動齒輪及齒條將物品升至所需高度。

3 夾麒麟娃娃機構

設計夾爪，搭配氣壓缸作動，來夾麒麟娃娃。

1. Chassis

First, the structure of chassis is built in the type of heavy-duty excavator. Then, we modified it better. Two servo motors are installed on the both sides of the rear wheel respectively. By using the track belt, the power is transmitted to the front wheels and the stability of the whole structure is increased.

2. Lift mechanism

Lift mechanism is designed by motor worm and turbine institutions due to turbine institutions irreversible drive, so driven gear and rack items rose to the desired height.

3 Fetch Kirin Doll mechanism

We design the jaws with pneumatic cylinder to fetch the Kirin dolls.

三、輪子驅動設計

用兩顆直流馬達驅動左右兩側後輪，再利用履帶皮帶方式把動力傳動至前輪。使用左右馬達的速差來達到轉向目的，在大角度時左右側馬達採反方向運作，來達到所要角度。

First, the both sides of rear wheel are driven by two DC motors. Then, the track belt is utilized to transmit the power to the front wheel. The diversion of the wheels can be made by changing the speed difference of two motors. In the large angle in the direction, we adopt reverse direction operation for both motors so that it can be reach the desired direction.

四、電路設計

控制系統包括控制器(PLC)，驅動器(馬達)及循軌感測器(CNY70)，所先利用感測器CNY70循軌感測，並將循軌感測的訊號傳回PLC，PLC判斷後驅動馬達，達到循軌定位。

The control system includes the controller (PLC), the sensors (CNY70), and the driver (two servo motors). First, the CNY70 is used to detect the rail. Then, the PLC receives the signal detected from the CNY70 and drives the motors so that the track rail can be followed.

五、感測器設計

利用感測器CNY70循軌感測，並利用紅外線感測器完成下列任務，(1) 在落石區用在搬運石塊時感測石塊的所在地。(2) 在土石流區區時能感應障礙物使機台可以躲避障礙而不扣分。(3) 用於夾娃娃感測使氣壓缸可以正確的夾到娃娃。

The sensors (CNY70) are used to follow the trail. Also, the infrared sensors are used to complete the following tasks. (1) To detect the location of the stones in the rock-falling zone. (2) To detect obstacles so that the machine can avoid obstacles without penalty points. (3) To detect the location of the dolls so that it can precisely fetch them.

六、組裝、測試與修改

1. 組裝

(1) 組裝以鋁條為主要機桿為四方形的機身。
(2) 裝好機身後再裝上馬達輪軸等。
(3) 在將輪子皮帶還有防止皮帶鬆脫的機構裝上。
(4) 機台的基底大至裝好後在內部加裝鐵籃子放置物品。
(5) 整合PLC、馬達驅動器、電線。
(6) 在裝上堆高機構，加上減速比的減速器。
(7) 裝上用氣壓缸的夾爪。

2. 測試與修改

我們先測試CNY70感測器因為感測距離較短所以要用螺絲調整高度使CNY70感測器可以正常無誤的運作。接著我們測試堆高機構因為我們是做可以升高的所以要找到適合的長度和距離才不會過頭或卡住。

1. Assembly

(1) To assemble the main machine lever for a square body with aluminum bar.
(2) To install fuselage and then mounted on the motor axle.
(3) To mount on the wheel belt prevent the belt from loosening in the mechanism.
(4) To install the base of the machine the large in the internal installation of iron basket placed articles.
(5) To integrate the PLC, motor driver and wires.
(6) mounted on the forklift sector, coupled with the reduction ratio reducer.
(7) mounted on the jaws with a pneumatic cylinder.

2 Test and Modify

We first test CNY70 sensors sensing distance is shorter so use screws adjust height CNY70 sensors can be normal and correct operation of. Then we test heap high agency to find a suitable length and distance because we do can be elevated so it

will not overdone or jammed.

七、機器人創意特色說明

1 底盤

以重型挖掘機為底盤架構作為機器人的雛型然後加以修改。並在後輪的左右兩側各別裝置一顆伺服馬達，經由履帶的方式來帶動左右前輪，因而增加其穩定性。

2 上升機構

上升機構是由馬達傳送至渦桿及渦輪機構，因渦輪機構為不可逆傳動，如此可帶動齒輪及齒條將物品升至所需高度。

3 夾麒麟娃娃機構

設計夾爪，搭配氣壓缸作動，來夾麒麟娃娃。

1. Chassis

First, the structure of chassis is built in the type of heavy-duty excavator. Then, we modified it better. Two servo motors are installed on the both sides of the rear wheel respectively. By using the track belt, the power is transmitted to the front wheels and the stability of the whole structure is increased.

2. Lift mechanism

Lift mechanism is designed by motor worm and turbine institutions due to turbine institutions irreversible drive, so driven gear and rack items rose to the desired height.

3 Fetch Kirin doll mechanism

We design the jaws with pneumatic cylinder to fetch the Kirin dolls.

參、參賽心得

今年真的很高興能夠有這個機會代表學校的自動化工程系出去比賽，這是一個很美好的經歷過程，雖然在製作與設計的過程中，遇到許許多多的挫折，但經過大家一起共患難的克服，在競賽中雖然未進入前八強，當時看到自己親手製作的機器人有如此成績，製作的辛苦一切都有了值得，我們會吸取今年在速度上的缺失，讓明年的比賽更加完美與成功。

We were really glad to have the chance to go out match on behalf of Department of Automation Engineering of NKUT in this year. This is a very wonderful experience. Though we had a lot of setbacks during the process of making and designing the machine, we overcame them together. In the competition, though we were not successfully in the final eight and we were so happy about the result. It is a good experience for us and we will make it better in the coming match next year.