臺北市立大安高級職業學校
電子科
專題報告
Arduino 與樂高的結合與應用
The combination of Arduino and Lego

學生　組長 : 潘宇航

組員 : 林廷翰

指導老師 : 王村益

中華民國 110 年 1 月

臺北市立大安高工 電子科

專題報告：

Arduino 與樂高的結合與應用

學生：0704215 林廷翰 _____（簽名）

0704236 潘宇航 _____（簽名）

期末專題報告合格，特予證明

指導老師：王村益 _____

科 主 任：薛元陽 _____

中華民國 109 年 1 月

中文摘要

因為很多人太頭腦裡都會有良好的設計理念，但在實際的製作上卻置礙難行(尤其是機械結構)所以我們設計一個使用方便且低成本的 arduino 與組裝方便的樂高結合，這樣一來既有 arduino 的多功能性，也有樂高的可塑性。利用 3D 列印做出盜版樂高與樂高結合作出自走車和仿生獸，我悶坐遮東西，假如做成產品，製作更加方便，也不需要自印一個電路去做一台自走車，能夠節省更多的時間，不需要像自走車一樣自行拉電路圖。

關鍵字：arduino、樂高

英文摘要

Because many people have good design concepts in their minds, but they are difficult to implement in actual production (especially the mechanical structure), so we designed a convenient and low-cost arduino combined with easy-to-assemble Lego. This way It has the versatility of arduino and the plasticity of Lego. Use 3D printing to make pirated Lego and combine Lego to make self-propelled cars and bionic beasts, I sit and cover things. If it is made into a product, it will be more convenient to make, and there is no need to self-print a circuit to make a self-propelled car, which can save more time and does not need to pull the circuit diagram by itself like a self-propelled car. Keywords: arduino, Lego

目錄

前言

我們主要在做連接 arduino 和 lego 的器具與嘗試列印樂高，我們會介紹專題製作背景及目的 專題製作方法、步驟與進度 預期成果　理論探討　參考文其中會講我們遇到的困難和突破的方法，最後會介紹我們的成果。

英文前言

We are mainly making appliances that connect arduino and lego and trying to print Lego. We will introduce the background and purpose of the production of the topic, the production method, steps and progress of the topic, the expected result, theoretical discussion, and reference
It will talk about the difficulties we encountered and the methods of breakthroughs, and finally will introduce our results.

研究

一. 研究背景

因為想完成專題拿學分

- 興趣

二. 研究目的

改良 arduino 的設計環境

三. 零件介紹

樂高


LEGO
AVENGERS
9+
76153


mindstorms
10+

四.原文書介紹

Reading

Loved by children, adults, and collectors, Lego is one o
best-known toy brands in the world. However, this interna
company actually had **humble**[1] beginnings. In the early 1930s, Ol
Christiansen®, a **Danish**® factory owner and **carpenter**®, was in
financial **trouble**. He started making toys to increase his profits. \
a few years, the company was producing various high-quality wo
toys and became known as Lego.

Ole chose the company name from the Danish words for
well." He later learned that "lego" also meant "I combine" in L
Never could he have guessed that the name had already deter
the company's future. More than a **decade**[2] later, in the 1940s, Ole
Godtfred® decided that **plastic**[3]—not wood—was the future o
because it could be produced **on a large scale**. In 1958, Go
patented[4] the Lego **bricks**® we all know today. These bricks were u

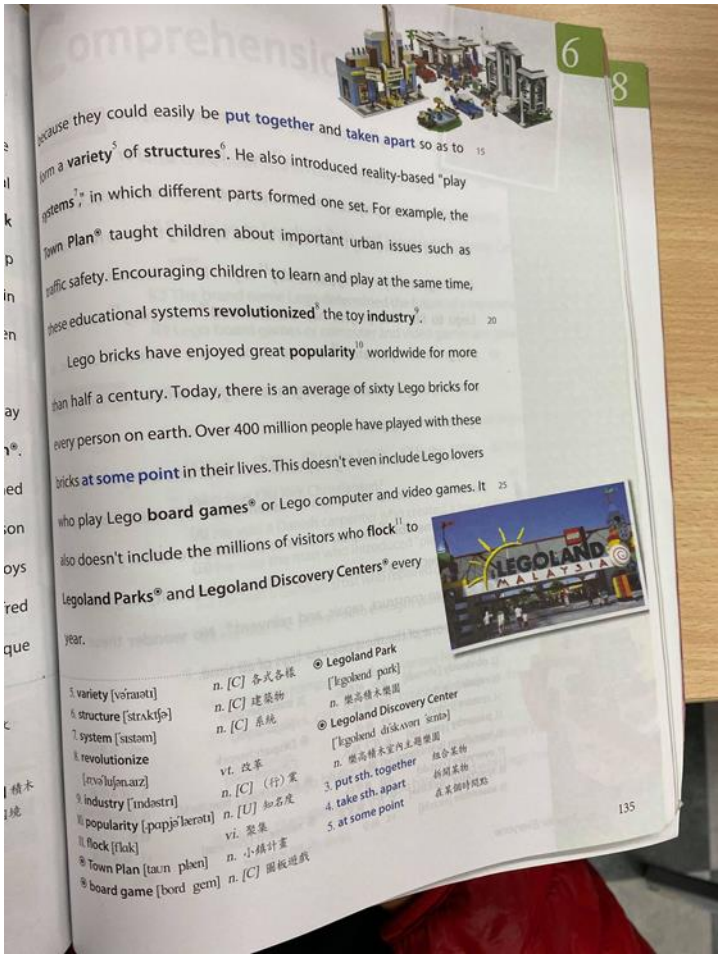
1. **humble** [ˈhʌmbl] *adj.* 不起眼的
2. **decade** [ˈdɛked] *n. [C]* 十年
3. **plastic** [ˈplæstɪk] *n. [U]* 塑膠
4. **patent** [ˈpætn̩t] *vt.* 取得專利

◉ **Ole Kirk Christiansen**
[ol kɜk ˈkrɪstənsn̩]
n. 【丹】歐爾·科克·克里斯汀森

◉ **Danish** [ˈdenɪʃ] *adj.* 丹麥的

◉ **carpenter** [ˈkɑrpəntə] *n. [C]* 木
◉ **Latin** [ˈlætɪn̩] *n. [U]* 拉
◉ **Godtfred** [ˈgɑdfrɪd] *n.* 【丹】
哥特佛萊

◉ **brick** [brɪk] *n. [C]* 【
1. **in... trouble** 陷入……的
2. **on a large scale** 大規模地



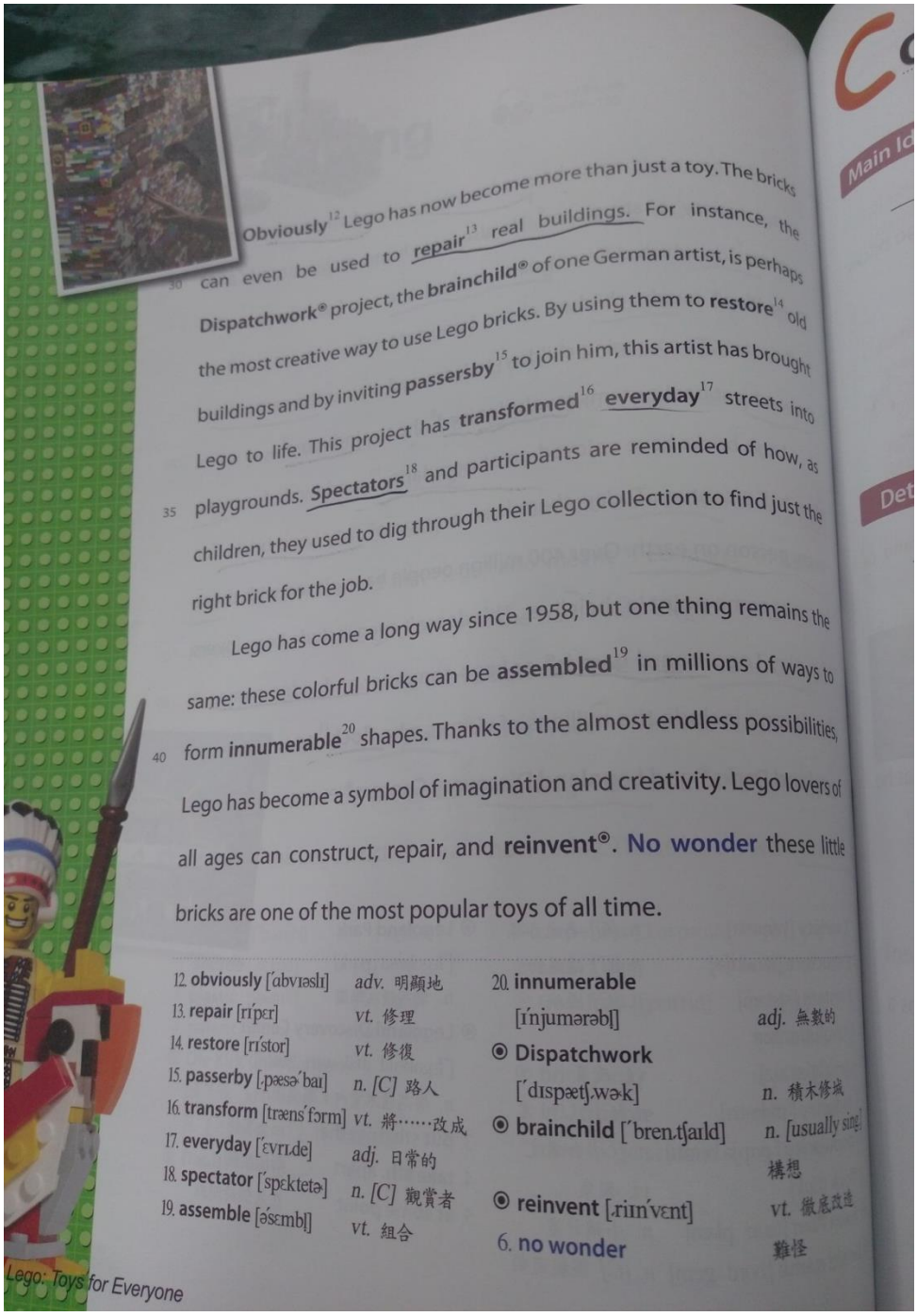
because they could easily be **put together** and **taken apart** so as to form a **variety**[5] of **structures**[6]. He also introduced reality-based "play systems[7]," in which different parts formed one set. For example, the **Town Plan®** taught children about important urban issues such as traffic safety. Encouraging children to learn and play at the same time, these educational systems **revolutionized**[8] the toy **industry**[9].

Lego bricks have enjoyed great **popularity**[10] worldwide for more than half a century. Today, there is an average of sixty Lego bricks for every person on earth. Over 400 million people have played with these bricks **at some point** in their lives. This doesn't even include Lego lovers who play Lego **board games®** or Lego computer and video games. It also doesn't include the millions of visitors who **flock**[11] to **Legoland Parks®** and **Legoland Discovery Centers®** every year.

5. **variety** [vəˈraɪətɪ] *n.* [C] 各式各樣
6. **structure** [ˈstrʌktʃə] *n.* [C] 建築物
7. **system** [ˈsɪstəm] *n.* [C] 系統
8. **revolutionize** [ˌrɛvəˈluʃənˌaɪz] *vt.* 改革
9. **industry** [ˈɪndəstrɪ] *n.* [C] （行）業
10. **popularity** [ˌpɑpjəˈlærətɪ] *n.* [U] 知名度
11. **flock** [flɑk] *vi.* 聚集
- **Town Plan** [taʊn plæn] *n.* 小鎮計畫
- **board game** [bord gem] *n.* [C] 圖板遊戲

- **Legoland Park** [ˈlɛgoˌlænd park] *n.* 樂高積木樂園
- **Legoland Discovery Center** [ˈlɛgoˌlænd dɪsˈkʌvərɪ ˈsɛntə] *n.* 樂高積木室內主題樂園

3. **put sth. together** 組合某物
4. **take sth. apart** 拆開某物
5. **at some point** 在某個時間點



Obviously[12] Lego has now become more than just a toy. The bricks can even be used to **repair**[13] real buildings. For instance, the **Dispatchwork®** project, the **brainchild®** of one German artist, is perhaps the most creative way to use Lego bricks. By using them to **restore**[14] old buildings and by inviting **passersby**[15] to join him, this artist has brought Lego to life. This project has **transformed**[16] **everyday**[17] streets into playgrounds. **Spectators**[18] and participants are reminded of how, as children, they used to dig through their Lego collection to find just the right brick for the job.

Lego has come a long way since 1958, but one thing remains the same: these colorful bricks can be **assembled**[19] in millions of ways to form **innumerable**[20] shapes. Thanks to the almost endless possibilities, Lego has become a symbol of imagination and creativity. Lego lovers of all ages can construct, repair, and **reinvent®**. **No wonder** these little bricks are one of the most popular toys of all time.

12. **obviously** [ˈɑbvɪəslɪ] *adv.* 明顯地
13. **repair** [rɪˈpɛr] *vt.* 修理
14. **restore** [rɪˈstor] *vt.* 修復
15. **passerby** [ˌpæsəˈbaɪ] *n.* [C] 路人
16. **transform** [trænsˈfɔrm] *vt.* 將……改成
17. **everyday** [ˈɛvrɪˌde] *adj.* 日常的
18. **spectator** [ˈspɛktetə] *n.* [C] 觀賞者
19. **assemble** [əˈsɛmbl] *vt.* 組合
20. **innumerable** [ɪˈnjumərəbl] *adj.* 無數的
◉ **Dispatchwork** [ˈdɪspætʃˌwɜk] *n.* 積木修城
◉ **brainchild** [ˈbrenˌtʃaɪld] *n.* [usually sing.] 構想
◉ **reinvent** [ˌriɪnˈvɛnt] *vt.* 徹底改造
6. **no wonder** 難怪

Lego: Toys for Everyone

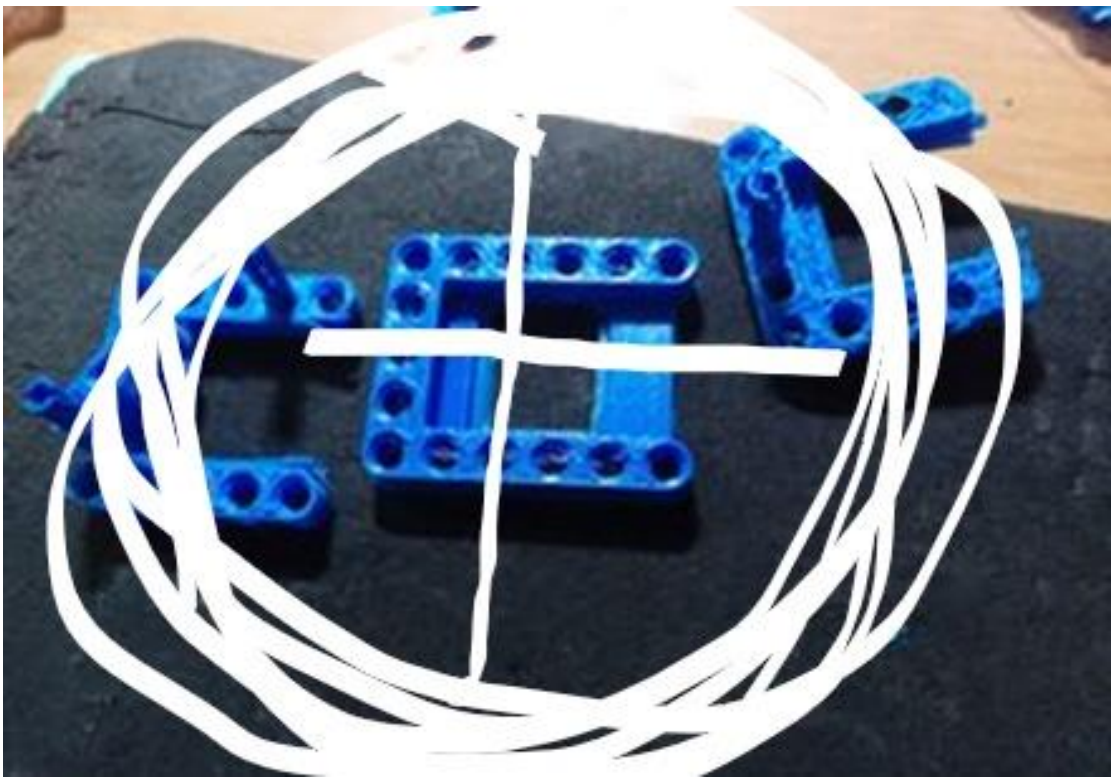
五. 研究過程

- 把樂高黏在模組上

- 
Panasonic
NEO
9V
- 

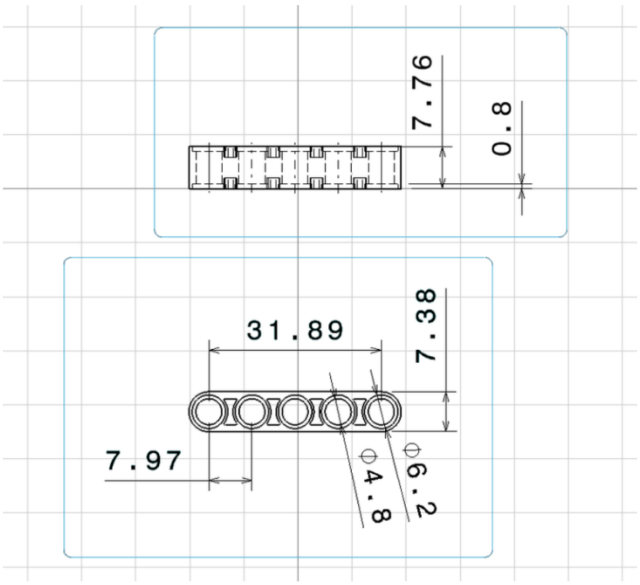
- 

- 印樂高

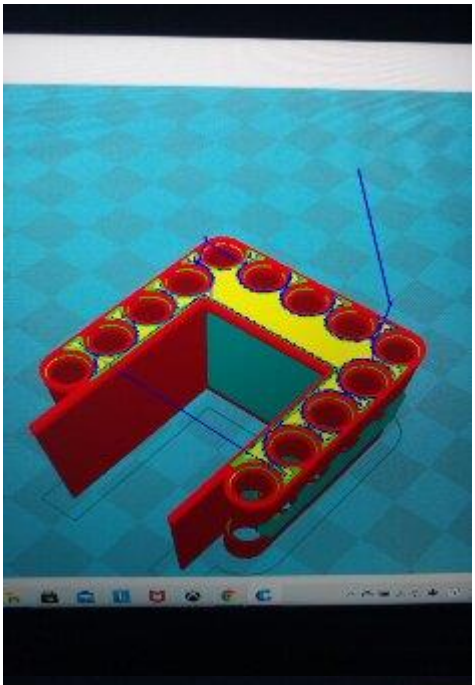
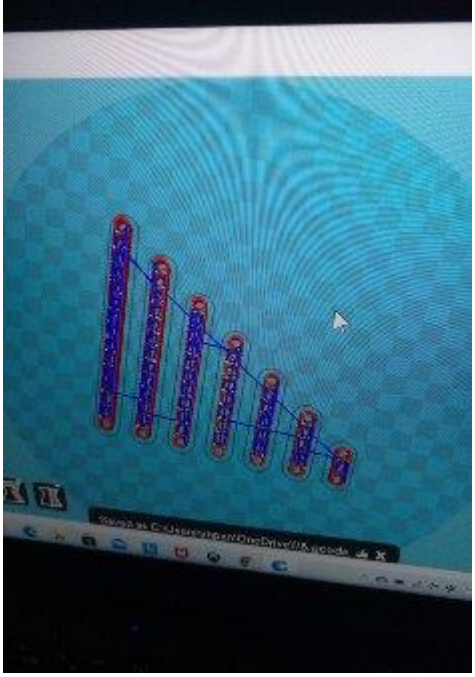
- 

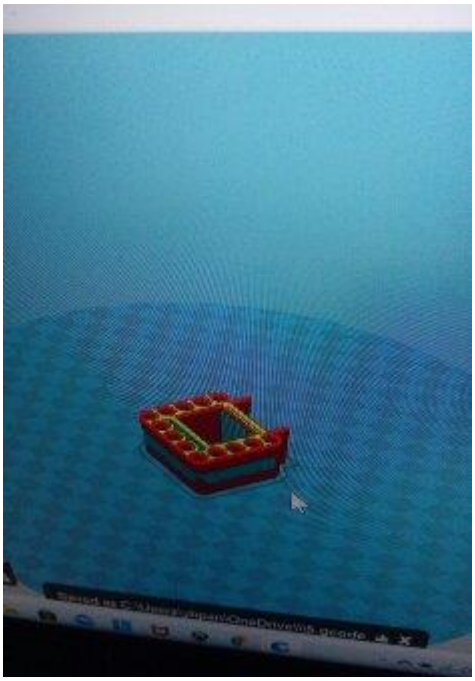
- 印連結器

catalogue for a school project. I measured the LEGO parts and I made an average size. My goal is to create new parts with a Rapid prototyping machine and I wanted to make sure that I used the good dimension.




43% 8:11
taiwaniot.com.tw/
0
36.8
18.8
9.5
7.9
7.9
Φ7.2
Φ5.4
3.6
3.6
Plastic Gear Box
motor power
电源接头端子
22.5
R1.4
22.5
5
2.4
R2.
Φ1.9
11.2
31.8
17.5
64.2
2-Φ3
直流減速電機
直條雙軸減速馬達 1:48 減速比
強磁、帶抗干擾
電壓 空載電流 空載轉速
6V ≤200mA 200±10%
rpm
新客戶使用Google Chrome瀏覽器可能無法產生超商運單，建議使用其他瀏覽器。 忽略

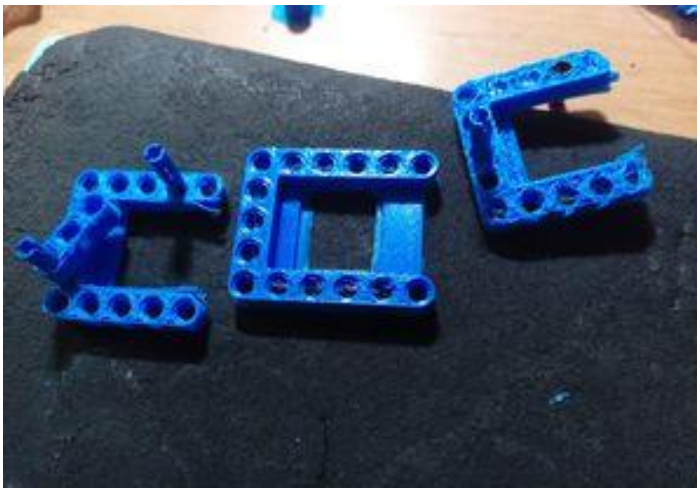
- 
- 

- 
- 遭遇問題

  粗糙

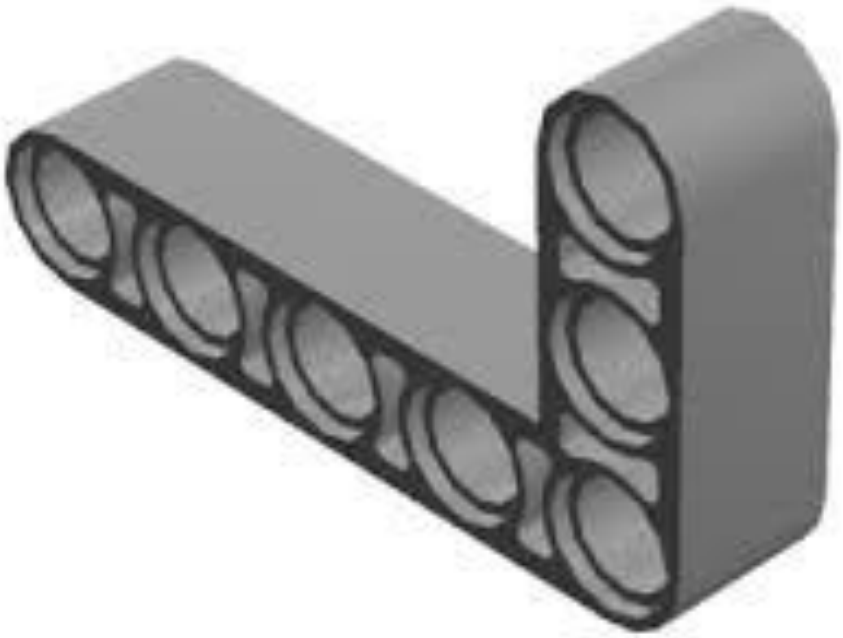
- 

  孔太小

- 

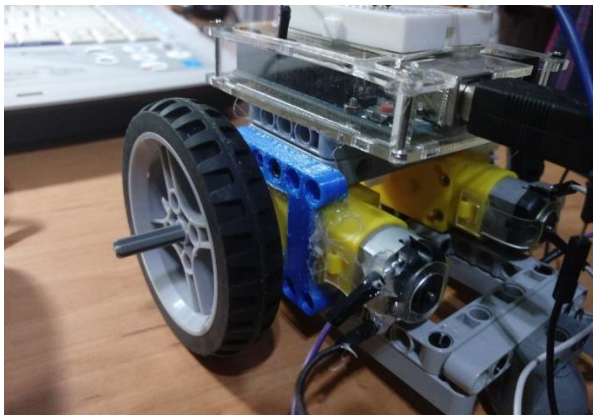
  紋路不清楚

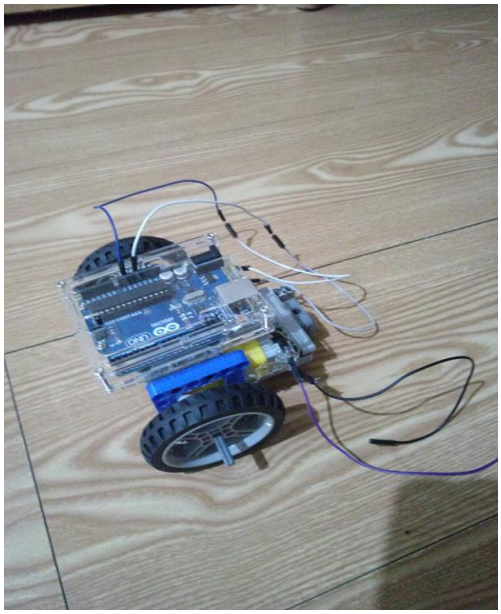
- 
早餐店
飲料櫃
工作人員
05:20-14:20
每週六休



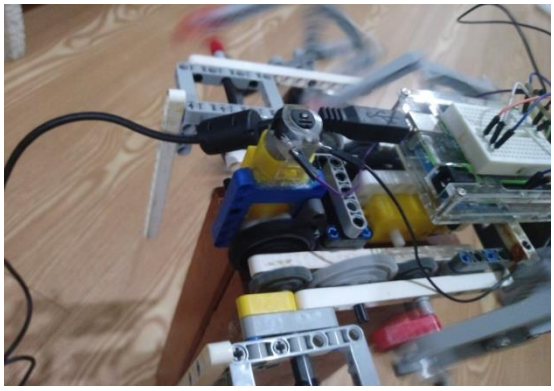
-
- 持續調整列印參數

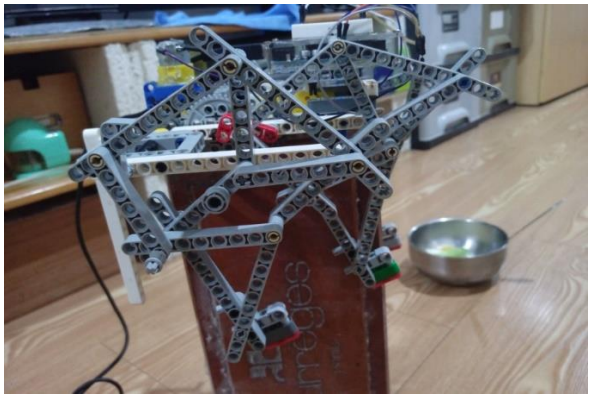
六. 測試

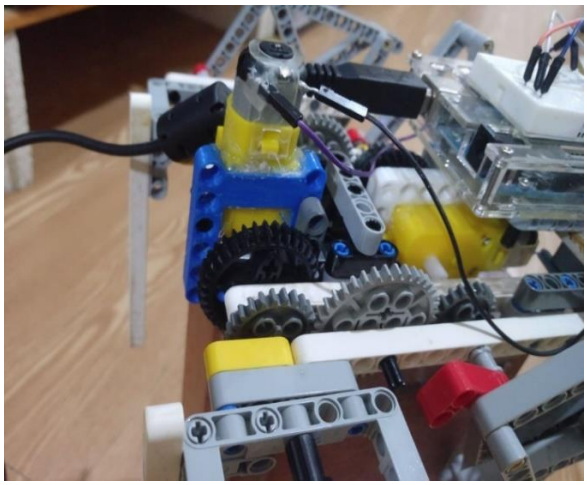




研究成果







心得

這次的專題，我只有負責出錢和最後的書面報告部分。會被當是正常的，但同組的宇航還是把專題的作品和簡報自己做出來了，很有毅力。我大部分都在躺分，其實有點對不起他。要是兩個人一起做應該能做得更好。

我其實也沒做甚麼東西出來，只是把專題做出來。途中我學到了理論跟實際的差距，當初沒想到列印要調整那麼多的東西，但是實際上出來的成果其實跟預期的差了一大截。不過幸好之後都做得蠻順利的。

參考文獻

- https://www.youtube.com/channel/UCq0BbOLnWWwb11s0a5QkZKQ 程式教學
- https://www.youtube.com/channel/UCCd23n-zY1Vfsvc9FLrZZbQ 程式教學
- https://www.lazyt
- omatolab.com/as-09/
- 範例程式網站