

# National Formosa University

## Mechanical Design Engineering

### Computer-Aided Design Internship bg3 Final Report

鋼球運動系統

Marble Machine System

學生：

機械設計工程系二乙 40623203 蔡宜芳

機械設計工程系二乙 40623206 邱妍蓁

機械設計工程系二乙 40623207 呂沛蓉

機械設計工程系二乙 40623244 林俊鎧

機械設計工程系二乙 40623248 廖柏誠

機械設計工程系二乙 40623250 湯峻傑

指導教授：嚴家銘

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# Chapter 1 Preface

## 前言

### 1.1 Design Motivation

After grouping, among the eight subjects given by the teacher, we discussed and studied each subject. Finally, we selected the topic of the marble machine system. Because the marble machine system is the suitable for our ability, we decided to design the system by ourselves. After the research in many aspect, decided to build a playground for the marble machine system, and watch the bobo always rolling. It's soothing that make everyone calm.

### 1.2 Design Purpose

The purpose of this topic is to skillfully use Onshape to draw components and V-rep simulations, promote our own strength and apply the system to the future practical applications. For the reason, we search for the related videos on the web and refer to the topic of the senior sister. However, we refer to most of the data to be single. It makes us want to make more mechanism to coordinate with each other and design our own marble machine system.

## Chapter 2 Application Software

軟體

### 2.1 Onshape

Onshape is a computer-aided design (CAD) software system, delivered over the Internet via a Software as a Service (SAAS) model.

Onshape makes extensive use of cloud computing.

Onshape allows teams to collaborate on a single shared design, the same way multiple writers can work together editing a shared document via cloud services.

Onshape upgrades are released directly to the web interface, and the software does not require maintenance work from the user.

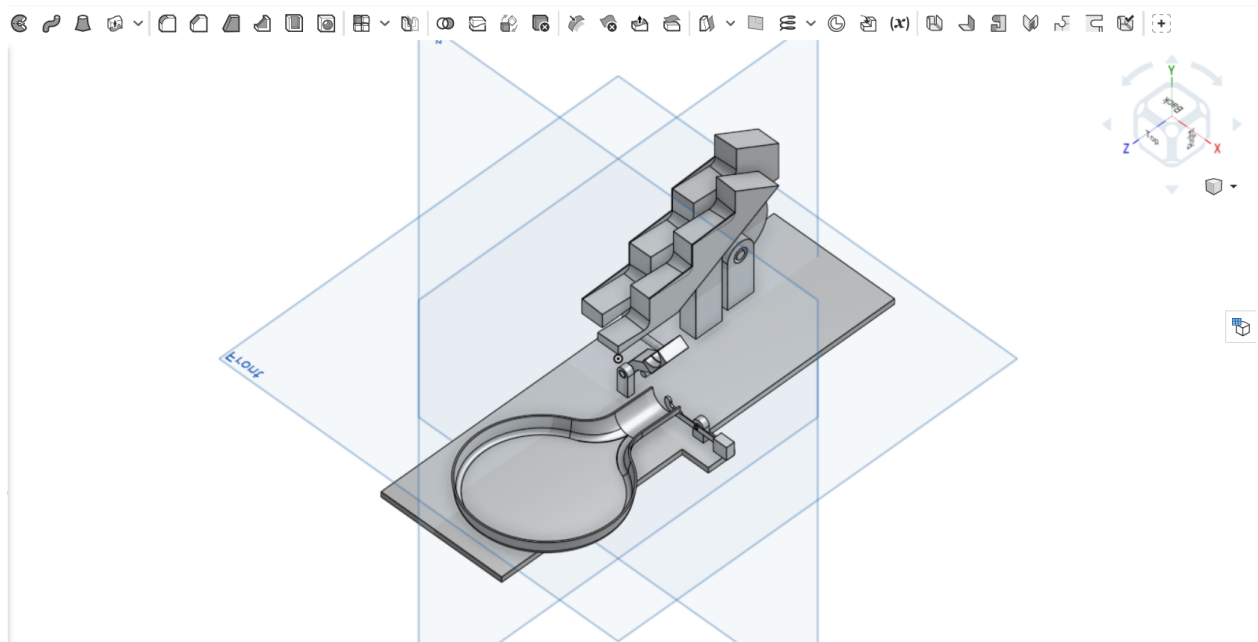


Figure 2.1: Lift

### 2.2 Inventor

Autodesk Inventor is a computer-aided design application for 3D mechanical design, simulation, visualization, and documentation developed.

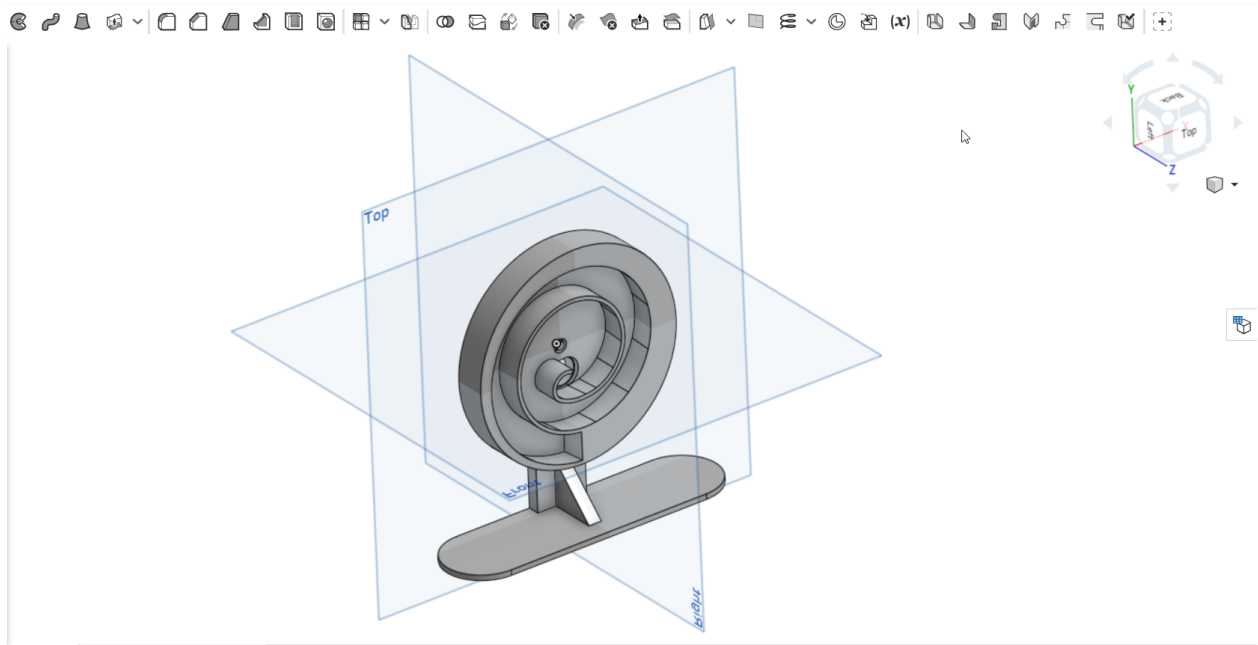


Figure 2.2: Vortex-rotating-disk

Inventor allows 2D and 3D data integration in a single environment, creating a virtual representation of the final product that enables users to validate the form, fit, and function of the product before it is ever built. Autodesk Inventor includes powerful parametric, direct edit and freeform modeling tools as well as multi-CAD translation capabilities and in their standard DWG™ drawings.

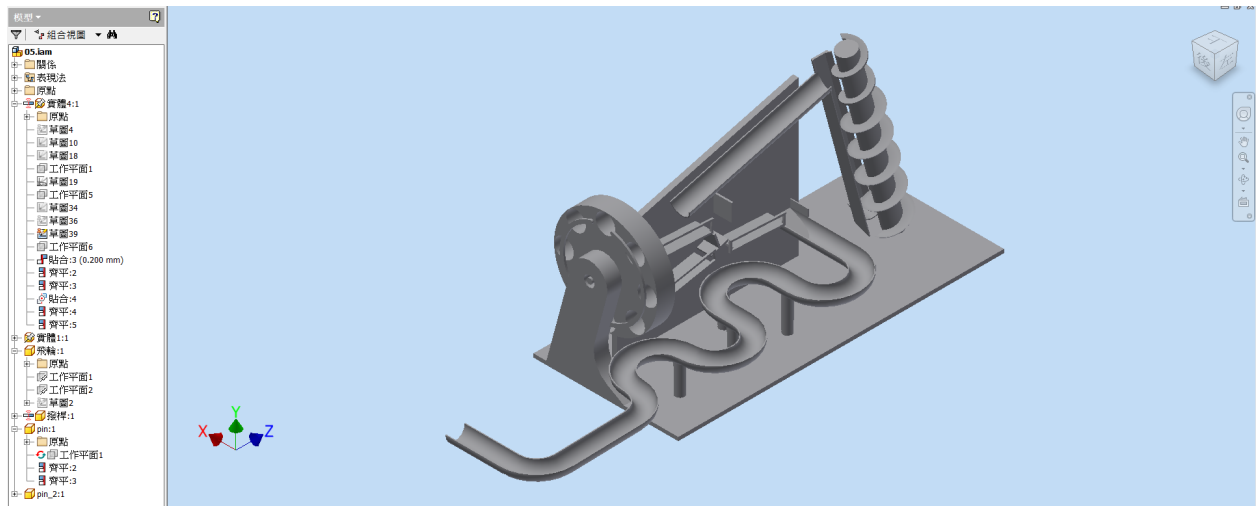


Figure 2.3: Screw-and-Flywheel

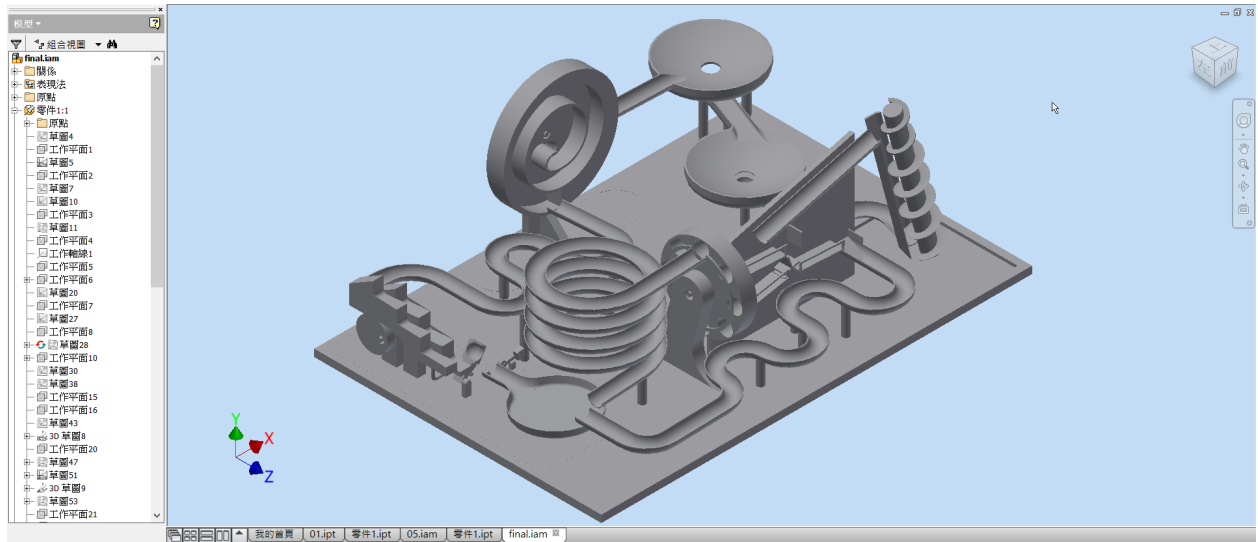


Figure 2.4: Assembly

## 2.3 V-rep

V-rep provides a unified framework combining many powerful internal and external libraries that are often useful for robotics simulations. This includes dynamic simulation engines, forward/inverse kinematics tools, collision detection libraries, vision sensor simulations, path planning, GUI development tools, and built-in models of many common robots.

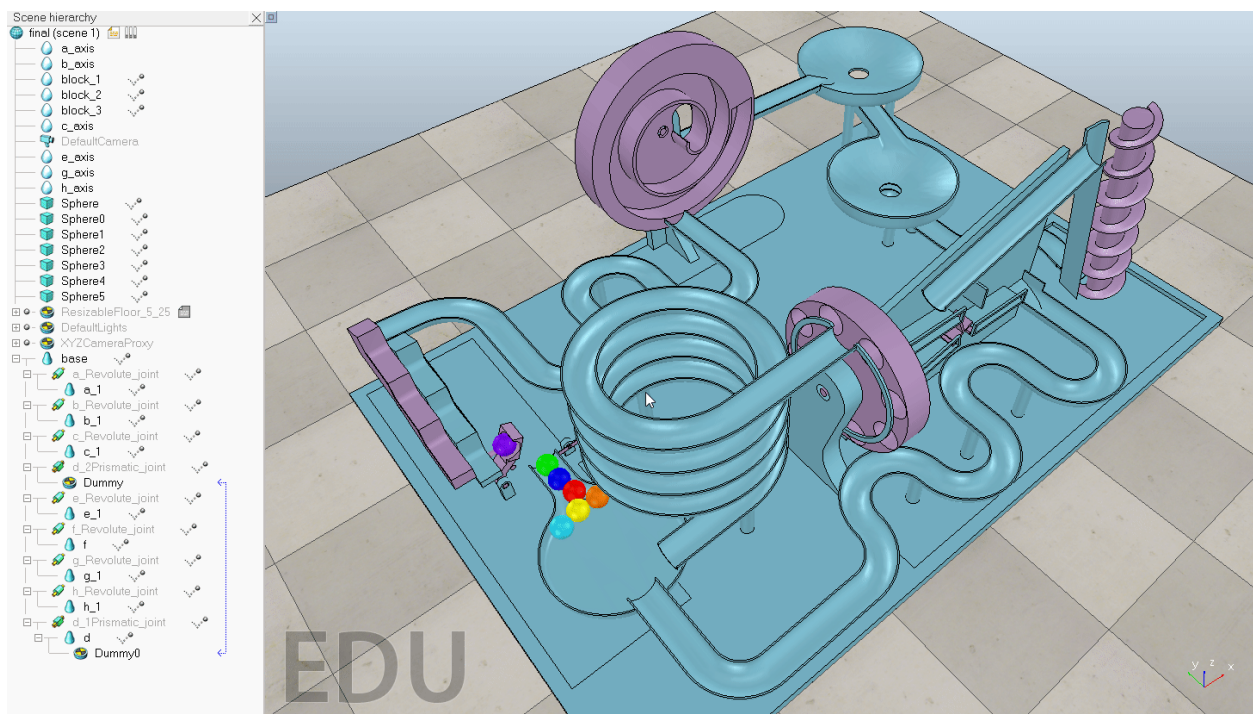


Figure 2.5: Simulation



## Chapter 3 Design Introduction

介紹

### 3.1 Introduction

## Chapter 4 Process

過程

### 4.1 Process

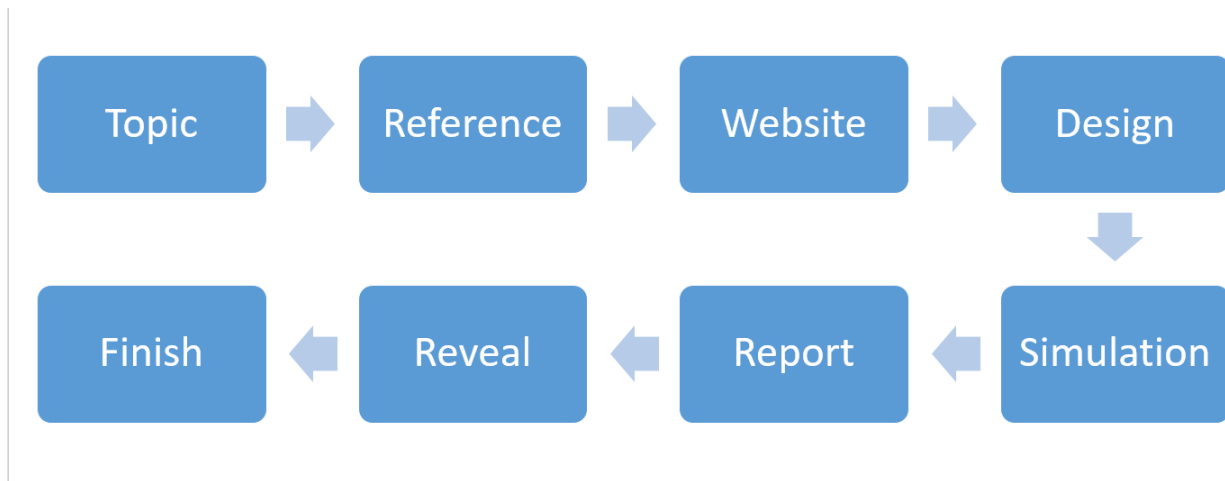


Figure 4.1: Process

**Topic:** 在眾多題目中選定鋼球運動系統

**Reference:** 參考網路上的影片

**Website:** 編輯期末分組網站

**Design:** 設計機構與配合

**Simulation:** 用 V-rep 模擬讓球在軌道上運動

**Report:** 製作專題報告

**Reveal:** 報告專題重點及工作分配

**Finish:** 報告完成

## Chapter 5 Issue & Solution

### Q&A

#### 5.1 Design

Q: 丟到 v-rep 模擬時很容易有干涉，在模擬過程中，鋼球很容易卡住

A: 增加軌道斜度或高度

#### 5.2 V-rep

Q: 零件無法拆開

A: 零件跟零件間要有空隙，合在一起會被當成一個零件

Q: 開了實體碰撞，零件無法在正常的軌道上運作，會一直抖動

A: 因為實體跟實體的間隔不可能為 0，所以零件跟零件間要有空隙

Q: 軌道開了實體碰撞，模擬就會非常 lag

A: 將軌道的實體碰撞開至只與球進行碰撞

#### 5.3 Report

Q: Pandoc 找不到路徑

A: 需在 start.bat 設置 path2 及啟動 path2

Q: LaTeX 修改名字無法跳行

A: 利用 for 迴圈編譯他

Q: 老師的名字無法顯示在 pdf

A: 在 advisor\_zh: 跳行加 - 空格再書寫

Q: 無法在 leo 轉 pdf

A: 到指定路徑下執行

Q: 無法更新目錄

A: 在 button Report pdf 下修改目錄名稱

Q: 圖片無法顯示

```
@echo off
REM 設定 y 硬碟代號與 data 目錄對應
set Disk=y
subst %Disk%: "data"
REM 設定 leo 相關對應 Home 位置
set HomePath=%Disk%:\home
set HomeDrive=%Disk%:\home
set Home=%Disk%:\home
REM 將系統 Python 程式的 io 設為 utf-8
set PYTHONIOENCODING="utf-8"
REM 將後續的指令執行, 以 %Disk% 為主
%Disk%:
REM 設定 PYTHONPATH
set PYTHONPATH=%Disk%:\p37;
REM can not set PYTHONHOME due to bug on VIM
REM https://github.com/vim/vim/commit/0424958bde3d3e74c721ba39ab4d5a4744897393
REM set PYTHONHOME=%Disk%:\p37;
set path1=%Disk%:;%Disk%:\p37;%Disk%:\p37\Scripts;%Disk%:\gnuplot\bin;%Disk%:\git\bin;
set path2=%Disk%:\pandoc-2.4-windows-x86_64;%Disk%:\miktex_portable\texmf\install\miktex\bin;
path=%path%;%path1%;%path2%;
start /MIN %Disk%:\scite\bin\Sc1.exe
start /MIN %Disk%:\scite\bin\Sc1.exe
start /MIN cmd.exe
start /MIN cmd.exe
rem start /MIN cmd.exe /k "y:\cp2018.bat"
rem start /MIN cmd.exe /k "y:\cp2018_http_server.bat"
rem start /MIN cmd.exe /k "y:\cadp2018.bat"
REM 啟動 Leo 編輯器
%Disk%:\p37\python.exe %Disk%:\launchLeo.py
Exit
```

Figure 5.1: Start.bat

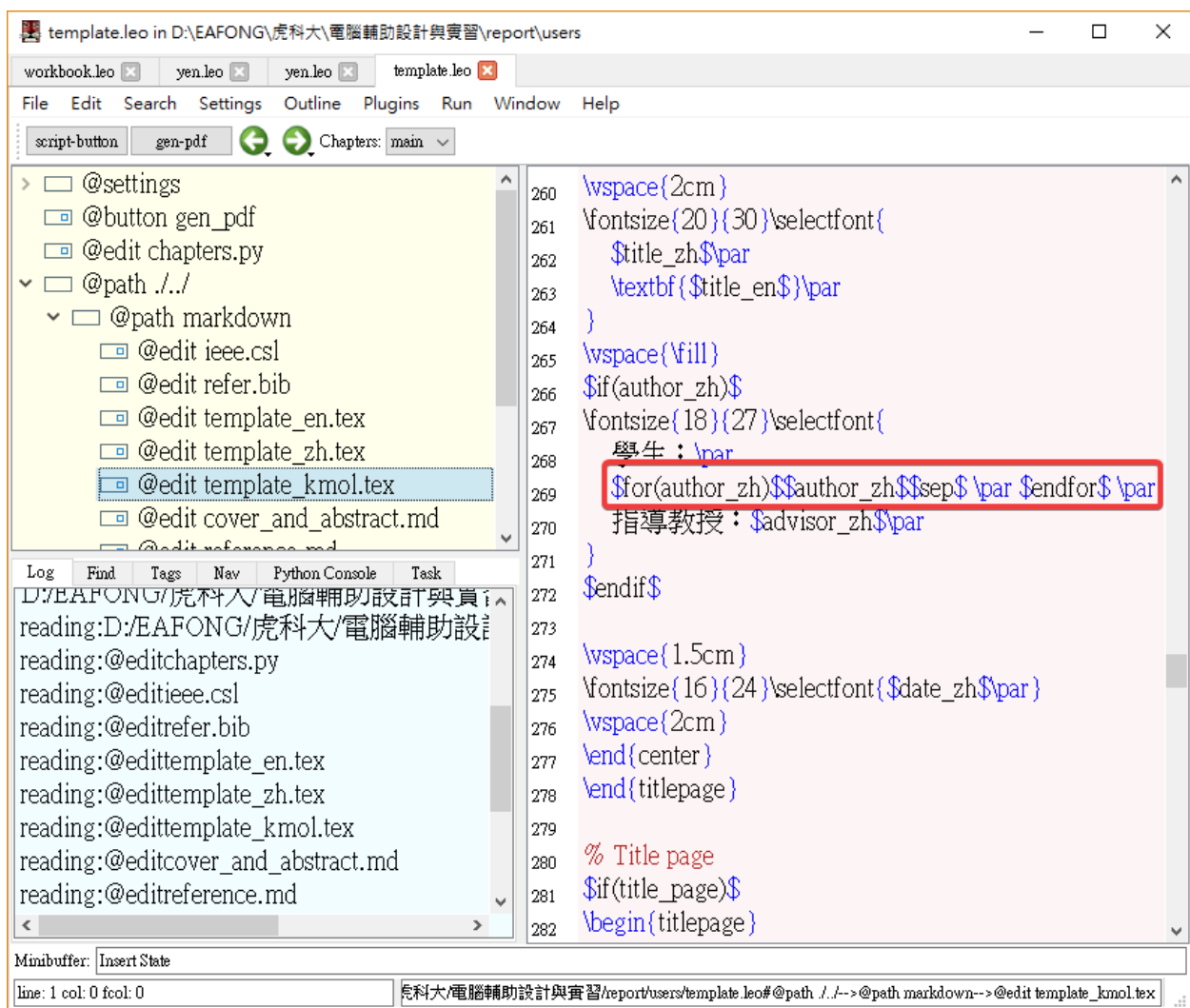


Figure 5.2: For loop

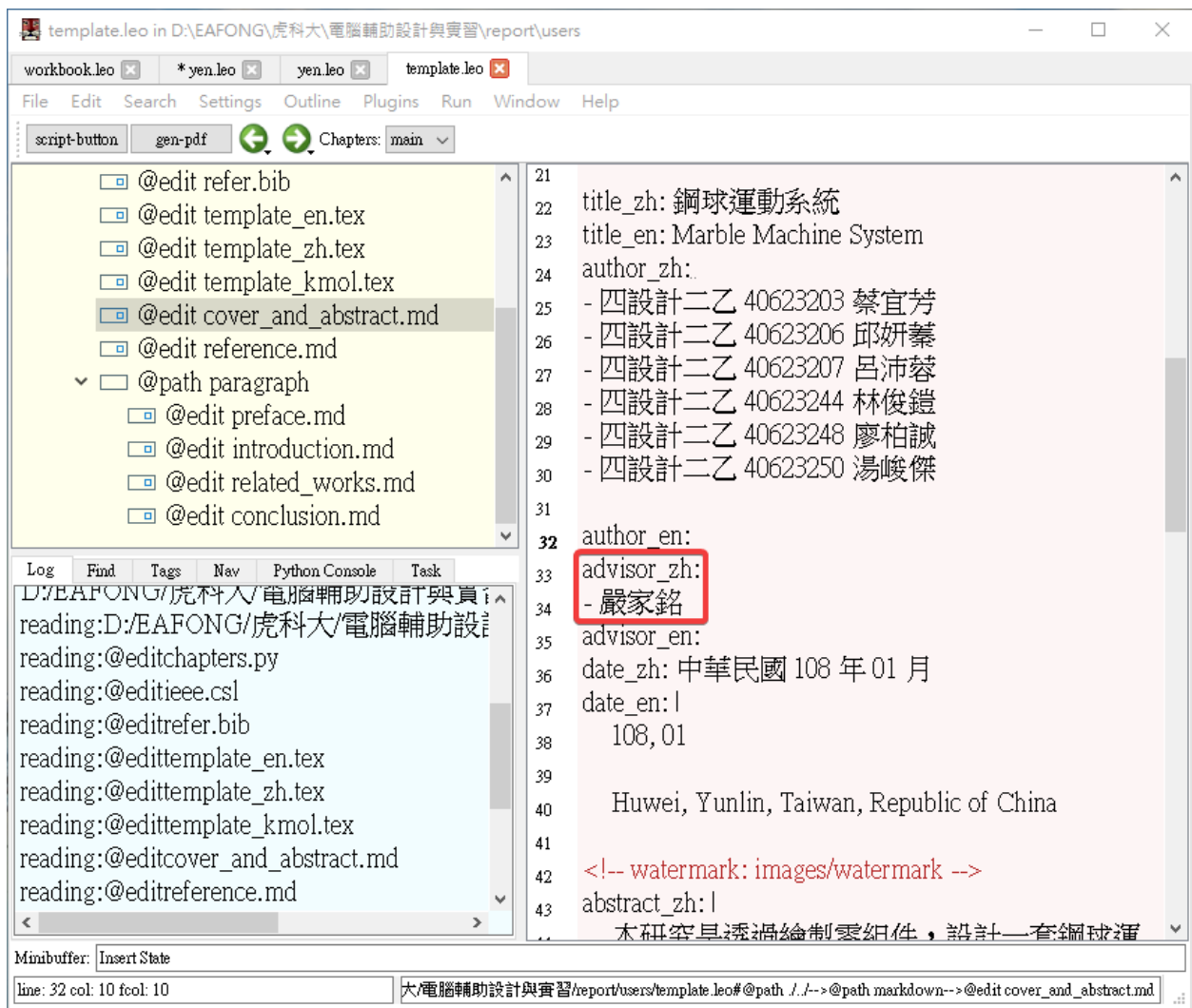


Figure 5.3: Advisor

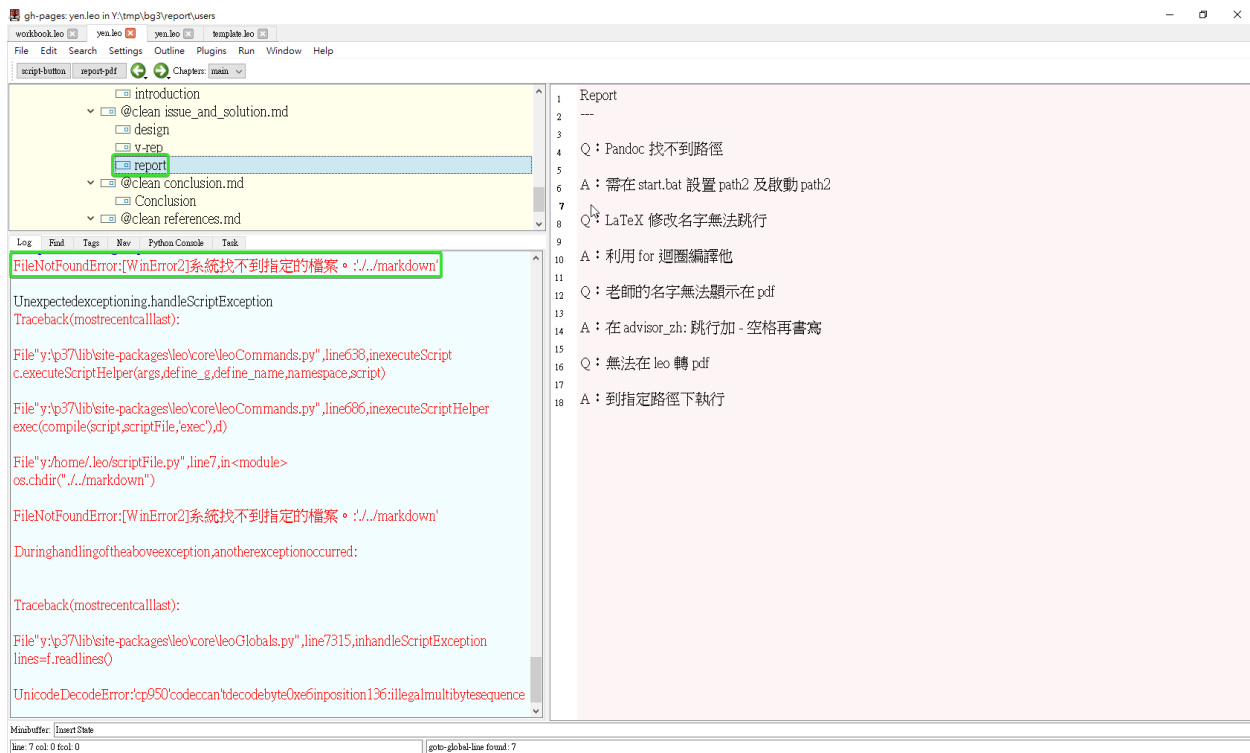


Figure 5.4: transform-mistake

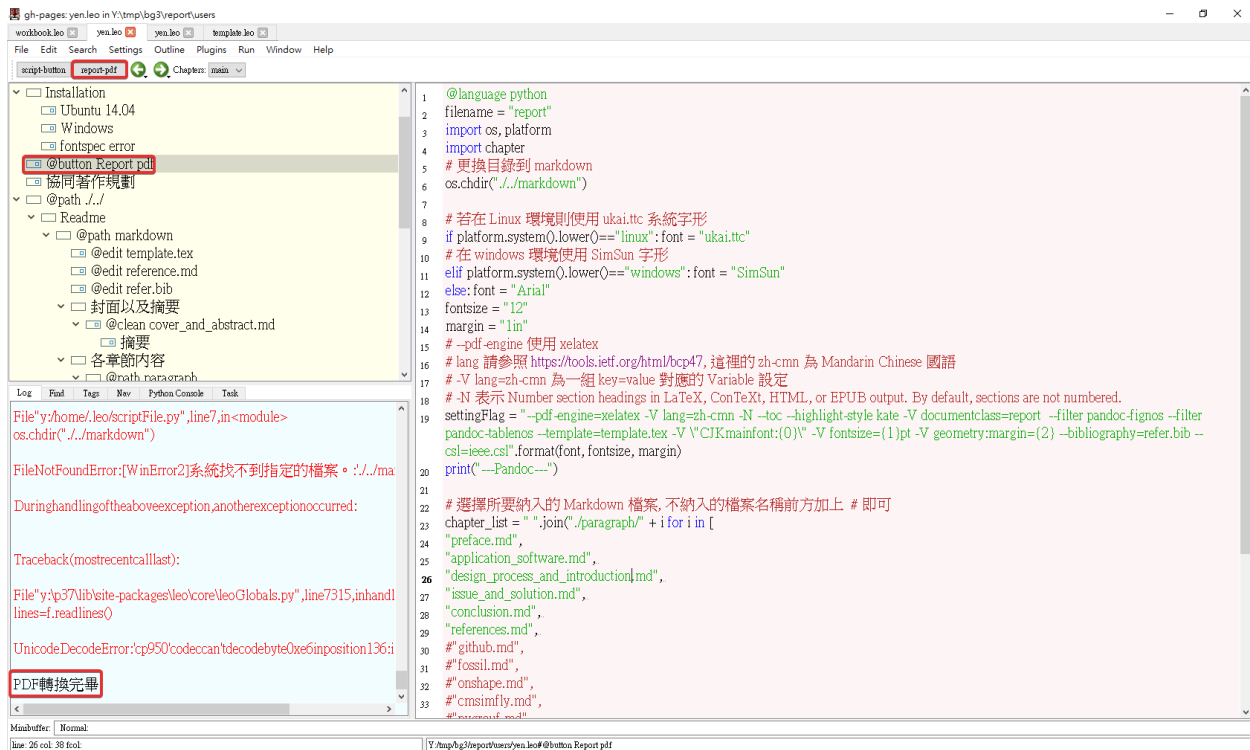


Figure 5.5: transform-correct

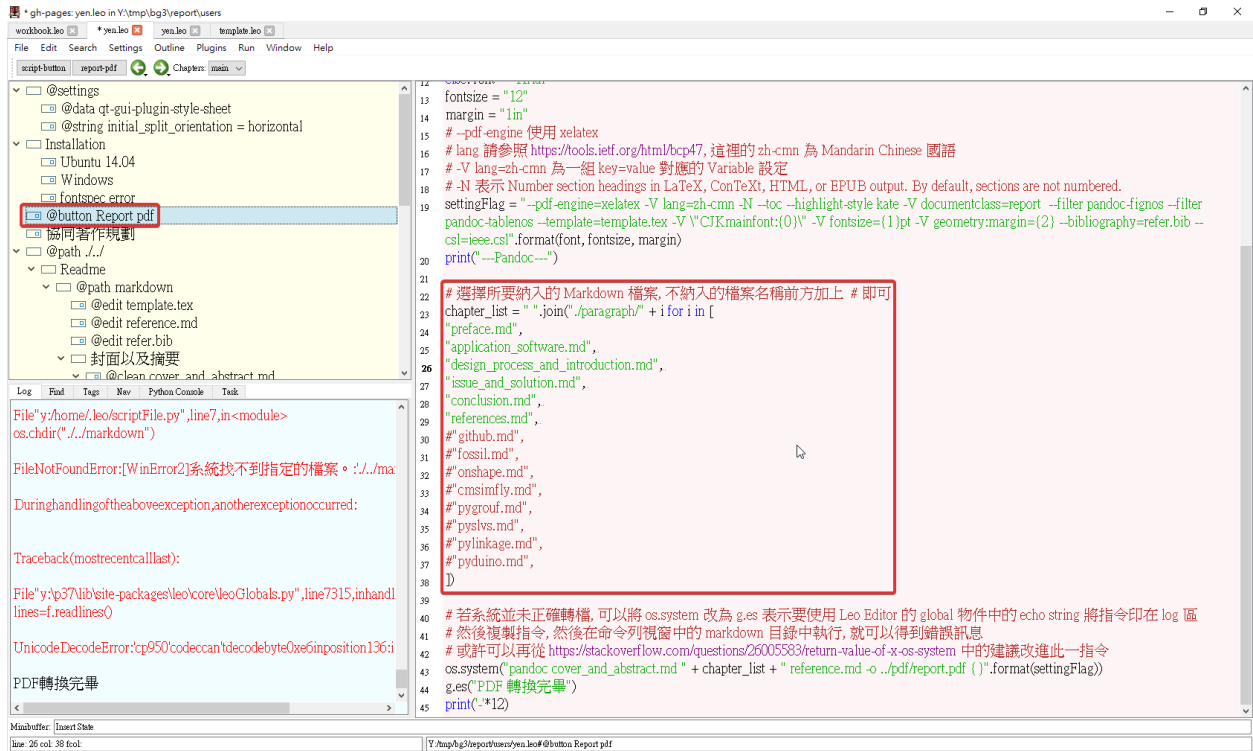


Figure 5.6: modify-chapters

A: 路徑錯誤, 要在 images 底下執行



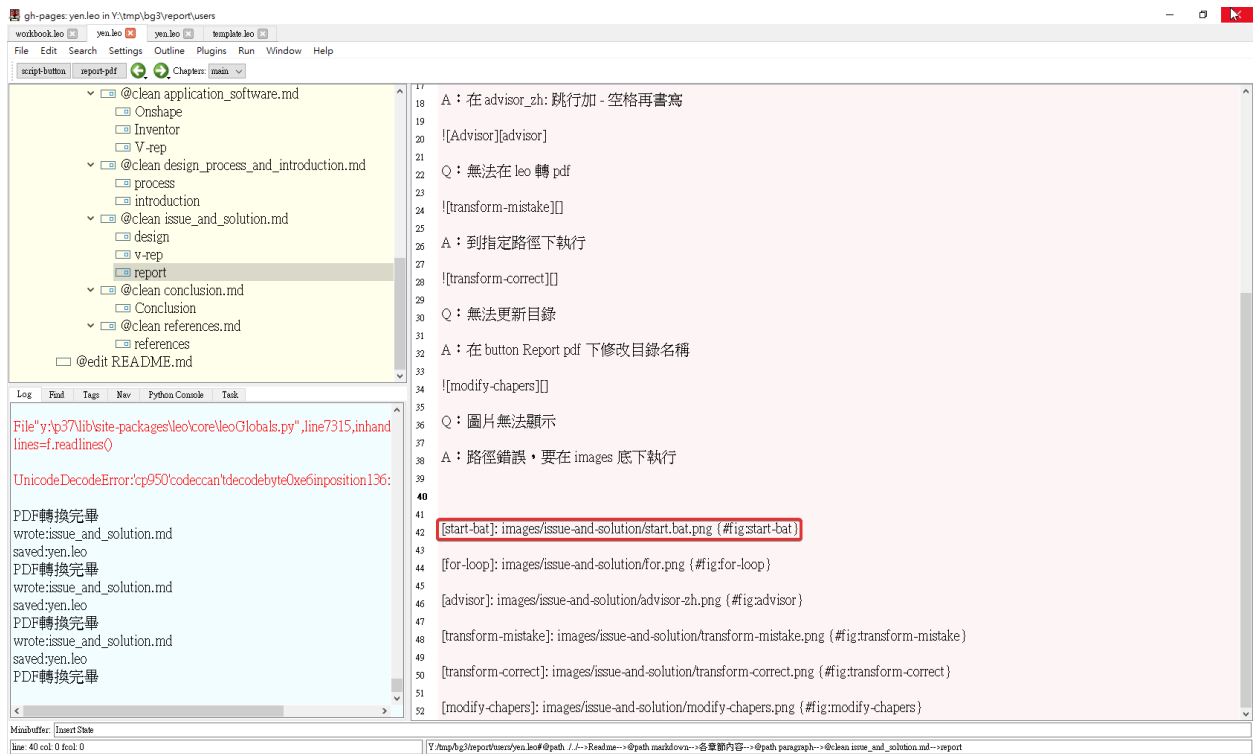


Figure 5.7: image

# Chapter 6 Assignments

工作分配

## 6.1 Assignments

40623203 蔡宜芳: Onshape Interface and Geometry, Website, PDF

40623206 邱妍蓁: Onshape Drawing

40623207 呂沛蓉: Onshape Sheet Metal

40623244 林俊鎧: Design, Translation, inform

40623248 廖柏誠: Onshape Assembled, Design, V-rep

40623250 湯峻傑: Onshape Constraint and Feature, Design

## Chapter 7 Conclusion

結論

### 7.1 Conclusion

## Chapter 8 References