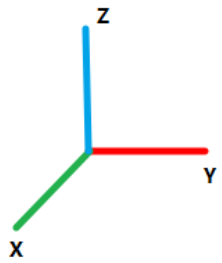
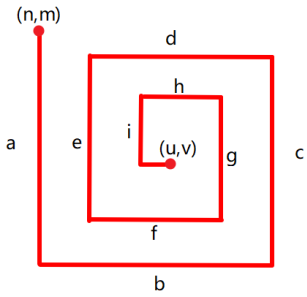
Introduction

A 3D printer with power transmission system and positioning function only is to be fabricated. The mechanism should be driven manually. The machine should be able to locate a spatial coordinate in certain range and achieve a certain type of motion pattern with time limit. Details are elaborated as follows:

1. This is a group project
2. The machine should have at least **3** different types of mechanisms
3. Power source is driven manually, any electrical/electronic control system is not necessary
4. The test range is **250x250x250mm**, randomly given coordinates
5. Recommended tolerance is **±0.5mm**
6. The "nozzle" should be able to draw lines with **0.5mm** pen
7. Budget for each group is **¥ 1,000.00 RMB**
8. Time limit: **5 min (measurement excluded)**
9. x-y-z coordinates system and a pattern example are on the right
10. Machine will be tested **twice** and the better result is counted; additional chance may be granted depends on situation but penalty will be incurred



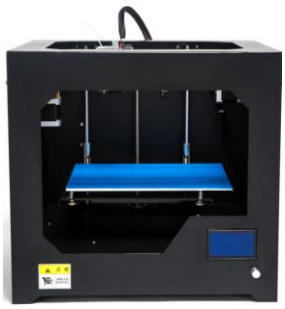


Test procedure

1. A set of x-y coordinates is randomly chosen
2. A sample block with random height is provided and measured by one of the group members
3. The block is removed and set the machine "nozzle" to be at given x-y-z coordinates
4. Place the block back and draw the selected pattern on top of the block (on the paper) while keeping the z-axis coordinate constant (horizontal motion only)
5. Measure the tolerance based on the drawn lines with the given pattern and time spent

Grading rubrics

1. Types of mechanism (20%): 20% for at least 3 types
2. Accuracy (50%): 40% for max. tolerance within ±0.5mm / +5% for ±0.3mm / +5% for ±0.1mm
3. Time (20%): 15% for less than 5 min. / +5% for less than 2 min.
4. Budget spent (10%): 10% for within ¥ 1,000 RMB / 0% for additional budget
5. Others (mark deduction): discontinuous drawing traces, non-uniform ink shade, low linearity, machine malfunction (e.g. low repeatability, low reliability) etc.


Schedule

1. Week 10-11: introduction, Q&A and conceptual design with documentation
2. Week 12-15: procurement, prototype and design iteration with documentation
3. Week 16: test, grading and report submission

Report Template

1. Executive Summary: a piece of every section
2. Function, Objective and Constraint
3. Conceptual Design: describe draft design in words and prepare sw model
4. Fabrication: describe how to fabricate your first prototype
5. Detailed Design: describe your final design
6. Test: how to test your machine in various aspects with different experiments
7. Optimization: problems found during test and methods to improve
8. Conclusion: Results obtained and achievement
9. Reference
10. Appendices

Notes

1. Spend the money wisely: cheap prototype at the beginning and iteration
2. Do **reimbursement** as soon as possible
3. Coordinate is given in Cartesian coordinate system
4. Ensure fair and reasonable team contribution, peer evaluation matters
5.