



美赛论文写作和经验分享

— EXPERIENCE SHARING —

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目录

CONTENTS

01

论文写作、翻译技巧

02

比赛经验



01

论文写作、翻译技巧

论文框架

美赛论文要求：禁止超过25页；全英文；页码要求；页眉要求；
论文框架：

Summary Sheet(摘要页)

Contents(目录)

1 Introduction(引言)

2 Assumptions and Justifications(模型假设和合理性验证)

3 Notations(符号说明)

4 The name of model 1(模型1的建立和求解，一般用来解决题目问的第一个问题)

5 The name of model 2(模型2的建立和求解，一般用来解决题目问的第二个问题)

6 The name of model 3(模型3的建立和求解，一般用来解决题目问的第三个问题)

7 Sensitivity Analysis(灵敏度分析)

8 Model Evaluation and Further Discussion(模型的评价和进一步的讨论)

9 Conclusion(结论)

References(参考文献)

Appendices(附录)

Contents

1	Introduction	3
1.1	Problem Background	3
1.2	Restatement of the Problem	4
1.3	Our Work	4
2	Assumptions and Justifications	5
3	Notations	6
4	Calculation of Total Forest Carbon Sequestration	7
4.1	Calculation of Tree Carbon Sequestration Based on GLO-PEM	7
4.2	Calculation of Carbon Sequestration of Forest Products	8
5	Tree-Products-Environment Carbon Sequestration (TPE) Model	10
5.1	Data Collection	10
5.2	The Establishment of TPE Model	11
5.3	Simulation of TPE Model	13
6	Forest Management Evaluation (FME) Model	15
6.1	Evaluation Factors and Weight Distribution Based on AHP	15
6.2	Calculation Method of Evaluation Factors	16
6.3	TOPSIS Comprehensive Evaluation Method	17
6.4	Analysis of Results	17
6.5	Scope of Management Plan	19
7	Sensitivity Analysis	20
8	Model Evaluation	21
8.1	Strengths	21
8.2	Weaknesses	21
9	Conclusion	22
	References	25

Summary/摘要——简明扼要，反复打磨

布局：

(1) 开头段（题目重述、概括全文工作）

第一句话引人入胜、阐明问题（As the lung of the earth, forest is……），所以我们建立了XX模型解决了XX问题（Therefore, we established……Model to……）

(2) 针对问题一（模型阐述）

逻辑通顺的前提下，重点突出方法、算法、结论、创新点、合理性验证，简要将解题方法阐述清楚，不用包含太多细节。模型名称用缩写，重要计算结果以具体数字形式给出更有说服力，最好不用数学公式。

older trees. Then is applied to ChangBai forest, find that when the rotation period is 10 years and the cutting ratio is 20 %, which can be the most effective plan, the carbon sequestration in 100 years is as high as $3.57 \times 10^{10} g$.

(3) 针对问题二（同上）

(4) 针对问题三（同上）

(5) 结尾（可选）

阐述结尾部分的工作，比如灵敏度分析、杂志文章。

(6) 关键词

模型缩写、算法名称、重要参数、策略名称。

模板： Firstly…， The next up…， Further…， Finally…；

For problem1…， For problem2…， For problem3…， Finally…；

常用语句、词语：【2023美赛培训-论文写作-哔哩哔哩】 <https://b23.tv/4GPebeE> (定位18:12)

Introduction/引言

内容:

(1) Problem Background/问题背景

总结题目背景+自己查到的资料，可结合自己对赛题的理解，对题目概念的解释往自己的研究方向靠。

(2) Restatement of the Problem /问题重述

用自己的语言总结题目所问的问题。

Our team considers the establishment of……model to…… and evaluate……, We need to solve the following problems: 1/2/3

(3) Literature review/文献综述 (可选)

总结该问题的研究现状和成果

(4) Our Work/我们的工作

分析思路和建模框架，相当于摘要部分的扩充。建议画一个好看的流程图放在最后。

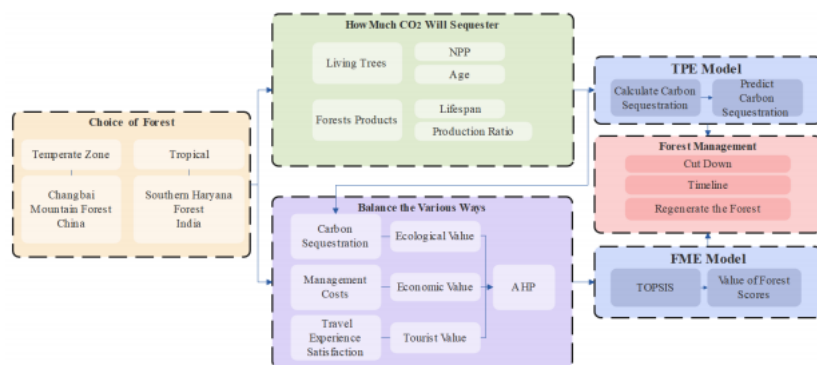


Figure 1.1 Our Work

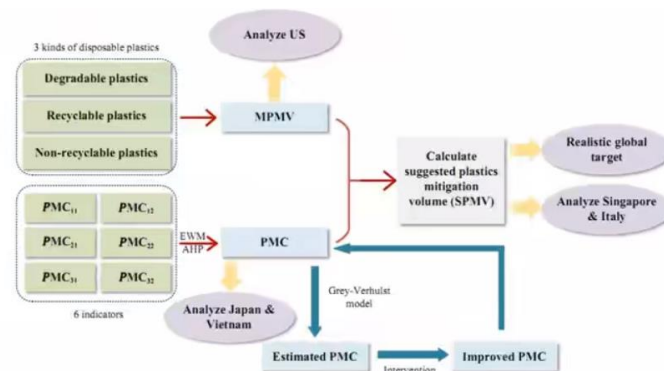


Figure 1: The structure of our paper.

Assumptions and Justification/模型假设与合理性解释

内容：

写下模型假设，记得论证合理性！美赛会更看重该部分。

2 Assumptions and Justifications

To simplify the problem, we make the following basic assumptions, each of which is properly justified.

- **We assume that the data obtained are accurate and reliable.**

We get data from trusted websites and papers.

- **Trees grow at the same rate each year.**

The growth rate of trees will be affected by climate change, and the growth rate will be different between years. However, in the long run, the average growth rate is relatively stable.

- **Tree growth is healthy and normal without large-scale natural disasters.**

Large-scale natural disasters are small probability events. We can ignore this problem when we study models of general laws.

- **Processing loss of forest products does not affect the total value of forests**

In the process of producing forest products, certain losses will inevitably occur, but these losses will be included in the cost of products and reflected in another form of value, so the overall value of the forest is unchanged.

符号说明

- **第一列：**符号，可译为Notation/Symbol
- **第二列：**定义，可译为Description/Definition
- **第三列：**单位/Unit，没有单位用“-”代替

The key mathematical notations used in this paper are listed in Table 3.1.

Table 3.1: Partial symbols used in this paper

Symbol	Description	Unit
NPP	Carbon content of carbon dioxide net absorbed by forests per unit time per unit area from the atmosphere	$g \cdot m^{-2} a^{-1}$
$C(t)$	Average cumulative carbon sequestration of forests at t	g
$P(t)$	The cumulative total carbon sequestration of trees in the forest at time t	g
$Q(t)$	Total remaining carbon sequestration of trees made into forest products at t	g

注：少数有Glossary/术语汇编，可合并为Notation and Glossary

论文主体——模型建立与求解

内容：

- (1) 数据预处理（可引用图表）
- (2) 一般模型、算法的原理（列公式、代入自己的参数，不要生搬硬套，简要解释即可）
- (3) 自己的模型、针对问题写求解过程、结果结论（多用图表展示计算结果，并适当分析）
- (4) 标题的命名（可以用问问题的形式，比较有趣吸睛）

4	Calculation of Total Forest Carbon Sequestration	7
4.1	Calculation of Tree Carbon Sequestration Based on GLO-PEM	7
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6.3	TOPSIS Comprehensive Evaluation Method	17
6.4	Analysis of Results	17
6.5	Scope of Management Plan	19

4	Leaving Home: Where Will the Fish Be In the Next 50 Years?	4
4.1	How Has Ocean Temperature Increased in Recent Years?	4
4.2	Scottish Herring and Mackerel Are Moving	5
5	The Arrival of the Scottish Fishing Crisis	11
5.1	Macleaf Model: Fish Are Swimming Out of the Control of the Fishing Company	11
5.2	Prepare for the Best and Worst Cases	12
6	The Survival of Scottish Fishery is Making a Difference!	13
6.1	In order to fish, Take the Company to Wander	13
6.2	We Have Purchased New Fishing Boats With Refrigeration Equipment	15
6.3	Comprehensive Business Strategy	16
7	Force Majeure: Can't Steal Others Small Fish	17
7.1	Entry Into the Territorial Sea of Another Country is Not Allowed	17
7.2	Friendly Exchanges and Cooperation in Fishing	18

Sensitivity Analysis/灵敏度分析

内容：

灵敏度分析、误差分析、稳定性检验

（改变参数对比前后误差，配上图表，最后分析模型灵敏度、稳定性）

！！！这部分非常重要，一定要写

7 Sensitivity Analysis

The goal of forest managers is to maximize the value of this forest. When the interval between two harvests is limited, namely, the rotation cycle, it is necessary to adjust the strategy of cutting proportion to make the management plan achieve an optimal solution. The results obtained from the algorithm simulation are shown in the following figure.

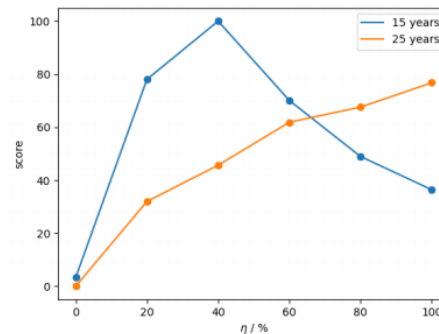


Figure 7.1 The Relationship between Management Plan Effect and Cutting Proportion Under Different Rotation Cycles

From the above figure can be seen, for a smaller rotation cycle, the cutting proportion should not be too large; for a larger rotation cycle, a larger cutting proportion is needed. The cutting strategies given in this paper are preferred to cut older trees to avoid the waste of resources caused by natural death and corruption. If the rotation cycle is too large and the cutting proportion is small, there will be more natural death and corruption of trees in the two cutting times, which will lead to a large amount of waste of resources. Therefore, in a large rotation cycle, a large proportion of cutting is needed to cut and utilize trees that may naturally die within the interval of two cutting, so as to make full use of the value of forests.

其他部分

➤ Model Evaluation and Further Discussion/模型评价与推广

- (1) Strengths/优点 (多写一点)
- (2) Weaknesses/缺点 (客观性写一些, 不要写太多, 比优点少几个)
- (3) Further Discussion/进一步讨论 (可以写一些来不及做的内容, 进一步的改进和拓展。

ps:写不完的话, 可以只写优缺点, 标题改成Model Evaluation即可)

➤ Conclusion/结论

论文中心思想的重申、主要结果的归纳, 也可以和模型评价放一起

➤ Artical/杂志文章、Letter/信件、Memo/备忘录

注意不同文体的格式, 适当施展艺术细胞

➤ References/参考文献

切记不要出现中文

➤ Appendices/附录

不是特别重要, 可写可不写。

关于代码, 可以尝试写伪代码放在正文

➤ Simulation Algorithm Steps

Algorithm: Simulation and Prediction of Average Carbon Storage

Input: S, T, η

Output: $C(t)$

for $t = 1$ to 300 do

Age of all trees plus one in S and delete natural dead trees

if $t \bmod T$ is equal to 0 do

Determine the allowable range of deforestation (mature forest, overripe forest) area, according to η to calculate the need to deforestation forest area

The carbon sequestration content corresponding to the planned felling part of the forest was pushed forward to R , and if the planned felling area was not considered as 0

end

Determination of new seedlings based on reduced number of trees in forests

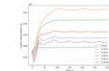
Calculate $C(t)$ under given T and η by formula (5.5).

end



Rational Harvesting and Renewal to Protect Forest Resources

Forest resources play an important role in supporting ecological environment and improving climate. However, due to excessive logging and spilling, forest resources are destroyed, resulting in continuous deterioration of forest ecological environment, and frequent natural disasters such as floods, sandstorms and land droughts. So how to develop forest resources such as floods, sandstorms and land droughts? The answer is to protect forest resources. The answer is to protect forest resources.



The above figure shows that with the increase of deforestation rate, forest carbon storage will decrease. A certain level of deforestation and forest filling, but the overall carbon storage is still higher than the initial deforestation.

How to make a proper logging strategy?

Firstly, when formulating logging strategy, it should be adapted to local conditions. According to the growth of trees, water and soil conditions, the implementation plan of cutting and replanting construction work is formulated. For example, for the Chukotka District forest type in the Greater Khingan Mountains, clear cutting can be taken if the slope is less than 15° and the cutting is well updated. In this case, clear cutting can choose trading cutting, gradual cutting or selective cutting, and the type of application is selected according to the type of application.

Secondly, different cutting intensity should be determined according to forest type, forest age, climate, slope, aspect and soil conditions. Cutting intensity is of great significance in the regulation of forest ecological conditions. Different cutting measures have different effects on the growth and development of seedlings, saplings and overmature trees, especially the high conditions and increments in the forest, which directly affect the

ground temperature. Therefore, it is necessary to control the cutting density and manner period.

Thirdly, the reasonable selection of the collection method. Cutting operation can ensure the period of ecological environment protection in the whole forest cutting operation. It effectively prevents forest degradation, preventing water loss and maintaining forest productivity. This has led to the fact that the forest should be cut according to the topography and slope of the cutting area.

Fourthly, pay attention to the characteristics of different types of forests. Different types of forests have different characteristics. For example, in the case of clear cutting, it is necessary to consider the characteristics of the forest type, the vertical and horizontal structure of the forest, the growth and development of the forest, and the characteristics of the forest type. In the case of clear cutting, it is necessary to consider the characteristics of the forest type, the vertical and horizontal structure of the forest, the growth and development of the forest, and the characteristics of the forest type.

Finally, the reasonable selection of the collection method. Cutting operation can ensure the period of ecological environment protection in the whole forest cutting operation. It effectively prevents forest degradation, preventing water loss and maintaining forest productivity. This has led to the fact that the forest should be cut according to the topography and slope of the cutting area.

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文献翻译

- 知云文献翻译
- 谷歌浏览器
(自带整页翻译)
- 有道词典
(划词翻译、文档
翻译赛题)



写作翻译

- cnki翻译助手



论文写作

- **【数学建模清风——论文写作方法教程（国赛和美赛）-哔哩哔哩】**
<https://b23.tv/oCIRdn0>



02

比赛经验

分工



队员1

建模+写作

擅长搜集资料；
掌握建模方法，掌握简单编程；
掌握论文写作技巧、擅长画图；



队员2

建模+写作

擅长搜集资料；
掌握建模方法，掌握简单编程；
掌握论文写作技巧、擅长画图；



队员3

建模+编程+写作

掌握建模方法，编程能力强；
能够完成算法部分的写作；
具备较强数据分析能力；

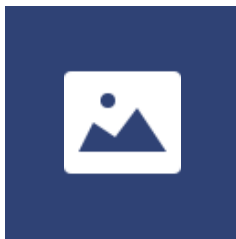
好处就是：

- 1、三个建模手独立思考后再讨论，有利于思路补充，提高建模质量。
- 2、建模手和写作手集于一身，思路流畅，节省时间。
- 3、相当于3个建模手+3个写作手+1.5个编程手，建模效率高。

比赛时间安排

DAY1

仔细审题，上网查找资源，确定选题，理出每小问解决思路，初步搜集数据（因为那天返校，所以进度偏慢，正常速度可以把第一问模型算法确定下来，第二天再做优化）



DAY3

完成第二问模型代码，第三问代入模型二求解，同时写完该部分的论文。做题时要记录模型的假设、参考文献，晚上整理完成模型假设和符号说明部分，至此论文躯干大体完成了。



DAY2

完成第一问模型代码，论文完成引言、第一问建模、求解过程、结果分析。晚上查阅第二问资料，初步确定使用的模型和算法，并完善第一问写作、绘图。有余力尝试优化代码。

DAY4

编程手继续灵敏度分析（一定要有）、有余力尝试优化模型，其他两人完成美工画图、打磨摘要（重要!!!），模型评价，结论（略写即可），杂志小文章（注意格式、多图，一定要好看），参考文献附录整理，翻译排版整合。晚上到第二天凌晨，查缺补漏，准备提交（最好6点前就交，后面可能很挤）

其他



关于选题

尽量选择比较靠近自己专业背景的，思路会比较多。如果没有，可以选往期研究资料多、容易理解的，我们当时在C题和E题纠结，虽然都是偏向我们擅长的大数据题型，但因为C题涉及经济类的专业知识更多，我们没优势，所以放弃了。有理论研究的题比较考验语文功底，文字基础不好的慎选，一不小心会变成假大空的语文建模。总之，每道题的获奖概率都是一样的，一定要选择自己最擅长、并且可以写下**完整思路**的！



参考资料

数据和思路可以查很多文献来参考，很多模型和问题都是有论文已经研究过的，可以引用，适当修改然后作为自己的模型。



关于审题

仔细多看几遍题目，题目中会有一些**思路的提示**。

（比如固碳量，题目中提到了活植物和林产品，而林产品的具体分类也有说明）

（比如森林管理计划以及最后价值判断中要考虑的因素，原问题中也有提示）



合理规划

- 每天都有规划，比如每天的预期是完成什么部分
- 合理的休息，比如我们吃饭都是三个人一起去餐厅吃饭，不吃外卖。出去一趟再回到题目可能会有不同的想法。



谢谢聆听

—— THANK YOU VERY MUCH ——