| Problem Chosen | 2025 MCM/ICM Summary Sheet | Team Control Number |
| --- | --- | --- |
| B | | 2510625 |

# An MCM Paper Made by Team 2510625


**Summary**

Here is the abstract of your paper.

Firstly, that is ...

Secondly, that is ...

Finally, that is ...

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# 1 Introduction

## 1.1 Problem Background

Here is the problem background. Three major problems are discussed in this paper, which are:

- **地理位置：**朱诺市是美国阿拉斯加州的首府，位于阿拉斯加东南部，拥有约30,000名居民。这座城市以其丰富的自然资源、独特的地理位置和迷人的自然景观而闻名，是许多游客前往阿拉斯加的首选目的地之一。朱诺市不仅是阿拉斯加的政治中心，也是一个重要的旅游枢纽，以其冰川、雨林和丰富的野生动物资源吸引着来自世界各地的游客。
- **旅游现状：**近年来，朱诺市的旅游业经历了迅猛的发展，尤其是在邮轮旅游方面。2023年，朱诺市创下了接待160万邮轮游客的纪录，单日最多接待7艘大型邮轮，游客数量高达20,000人。[1]这些游客为城市带来了可观的经济收益，约3.75亿美元。[2]然而，这种快速发展的旅游业也带来了一系列问题，尤其是与过度旅游相关的挑战。
- **环境影响：**朱诺市的门登霍尔冰川是该市的主要旅游景点之一，但近年来由于气温上升，冰川正在快速消退。自2007年以来，冰川已经后退了相当于八个足球场的距离。这种环境变化不仅对自然景观造成了破坏，也引发了当地居民对旅游业可持续性的担忧。[3]

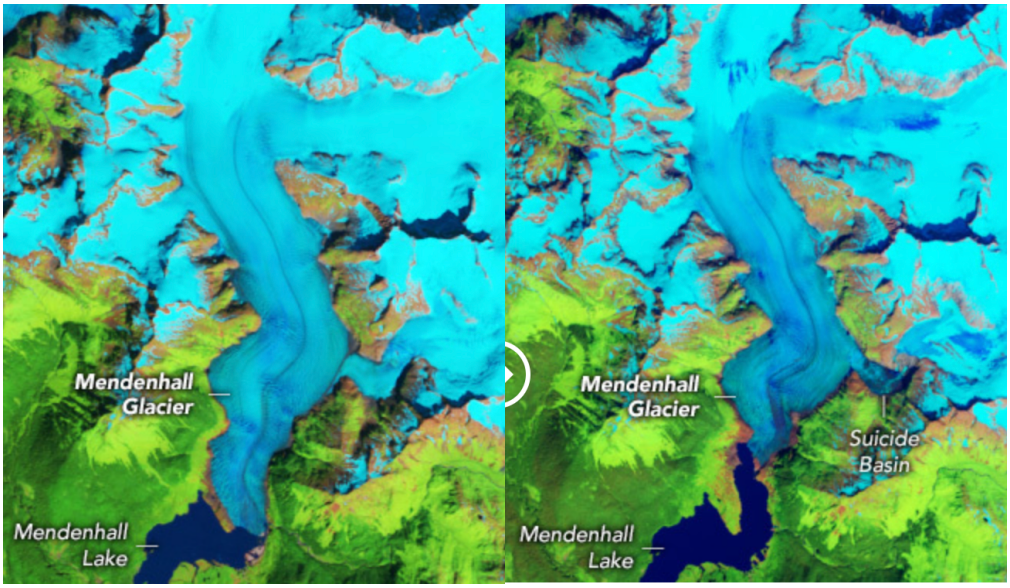



Figure 1: glacier

## 1.2 Problem Restatement and Analysis

- **Problem1:** 建立一个可持续旅游产业的模型，它应当满足最大化收入，最大化环境质量且最大化社会满意度并对其进行敏感性分析。
- **Problem2:** 建立一个模型去解决游客分流到其他人流量比较小的景点，这也是增加收入减少区域压力的措施。
- **Problem3:** 展示模型如何可以适应另一个受过度旅游影响的旅游目的地，应当去获取另一个城市的相关信息并用模型进行预测。
- **Problem4:** 展示模型随着具体措施会发生的变化以此来为决策者提供更好的建议，比如加酒店税、游客费用、每日游客数量上限以及限制酒精销售和消费等。
- **An article:** 为朱诺市旅游局写一封一页的备忘录，概述结果的预测、各种措施的影响以及对如何优化结果的建议。

## 1.3 Our work

**1)** We do ...

**2)** We do ...

**3)** We do ...

# 2 Preparation of the Models

## 2.1 Assumptions

## 2.2 Notations

The primary notations used in this paper are listed in Table 1.

Table 1: Notations

| Symbol | Definition |
|---|---|
| $N_t$ | Number of tourists |
| $N_{tmax}$ | Maximum number of tourists allowed per day |
| $\tau_t$ | Tourists taxes or surcharges per tourist |
| $P_t$ | Average spending per tourists |
| $P_b$ | Infrastructuren investiment expenditure |
| $P_e$ | Environment protection investiment expenditure |
| $CO_{2p}$ | Carbon emissions per person |
| $R_e$ | Total revenue |
| $C_h$ | Hidden cost |
| $E$ | Environment Quality Index |
| $R_{nature}$ | Nature Recovery |
| $S_{residents}$ | Residents' satisfaction |
| $S_{tourists}$ | Tourists' satisfaction |
| $S$ | Societal satisfaction |
| $C_{infra}$ | Infractructure carrying capacity |

# 3 The Models

## 3.1 Model 1

### 3.1.1 Details about Model 1

The detail can be described by equation (1):

$$\frac{\partial u}{\partial t} - a^2 \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) = f(x, y, z, t) \tag{1}$$

## 3.2 Model 2

### 3.2.1 Conclusion of Model 2

The results are shown in Figure 2, where $t$ denotes the time in seconds, and $c$ refers to the concentration of water in the boiler.

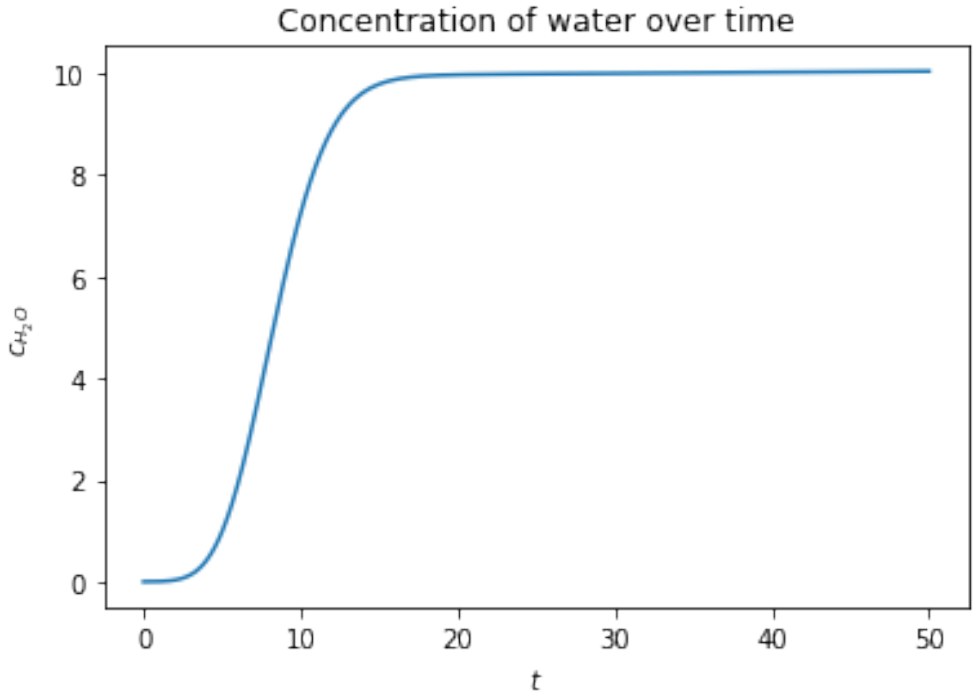



Figure 2: The result of Model 2

### 3.2.2 Commetary on Model 2

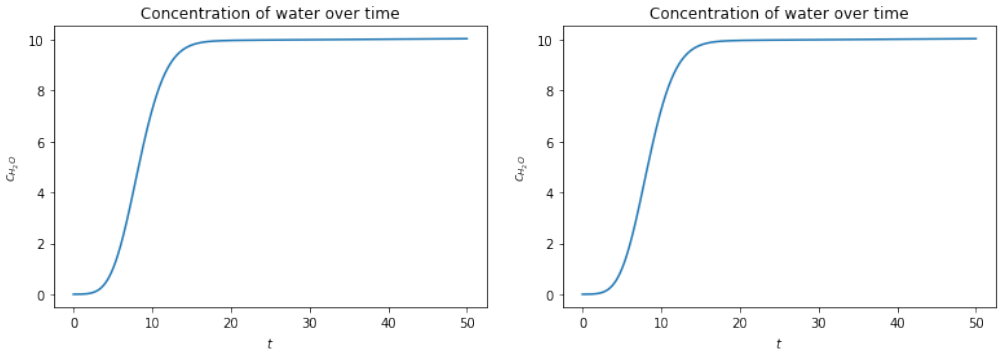
The instance of long and wide tables are shown in Table 2.

Table 2: Basic Information about Three Main Continents (scratched from Wikipedia)

| Continent | Description | Information |
|---|---|---|
| Africa | Africa Continent is surrounded by the Mediterranean Sea to the north, the Isthmus of Suez and the Red Sea to the northeast, the Indian Ocean to the southeast and the Atlantic Ocean to the west. | At about 30.3 million $km^2$ including adjacent islands, it covers 6% of Earth's total surface area and 20% of its land area. With 1.3 billion people as of 2018, it accounts for about 16% of the world's human population. |
| Asia | Asia is Earth's largest and most populous continent which located primarily in the Eastern and Northern Hemispheres. It shares the continental landmass of Eurasia with the continent of Europe and the continental landmass of Afro-Eurasia with both Europe and Africa. | Asia covers an area of 44,579,000 square kilometres, about 30% of Earth's total land area and 8.7% of the Earth's total surface area. Its 4.5 billion people (as of June 2019) constitute roughly 60% of the world's population. |
| Europe | Europe is a continent located entirely in the Northern Hemisphere and mostly in the Eastern Hemisphere. It comprises the westernmost part of Eurasia and is bordered by the Arctic Ocean to the north, the Atlantic Ocean to the west, the Mediterranean Sea to the south, and Asia to the east. | Europe covers about 10,180,000 $km^2$, or 2% of the Earth's surface (6.8% of land area), making it the second smallest continent. Europe had a total population of about 741 million (about 11% of the world population) as of 2018. |

Figure 3 gives an example of subfigures. Figure 3a is on the left, and Figure 3b is on

the right.




(a) Image on the left (b) Image on the right

Figure 3: Two images

# 4 Strengths and Weaknesses

## 4.1 Strengths

- First one...
- Second one ...

## 4.2 Weaknesses

- Only one ...

# Memorandum

**To:** Heishan Yan
**From:** Team 1234567
**Date:** October 1st, 2019
**Subject:** A better choice than MS Word: LaTeX

In the memo, we want to introduce you an alternate typesetting program to the prevailing MS Word: **LaTeX**. In fact, the history of LaTeX is even longer than that of MS Word. In 1970s, the famous computer scientist Donald Knuth first came out with a typesetting program, which named TeX . . .

Firstly, . . .

Secondly, . . .

Lastly, . . .

According to all those mentioned above, it is really worth to have a try on LaTeX!

# 参考文献

[1] https://abc7.com/post/juneau-alaska-cruise-ship-limits-overtourism/15048713/

[2] https://juneau.org/wp-content/uploads/2024/01/CBJ-Cruise-Impacts-2023-Report-1.22.24.pdf

[3] https://alaskapublic.org/2023/08/07/crammed-with-tourists-juneau-wonders-what-will-happen-as-mendenhall-glacier-recedes/

[4] *A simple, easy LaTeX template for MCM/ICM: EasyMCM*. (2018). Retrieved December 1, 2019, from https://www.cnblogs.com/xjtu-blacksmith/p/easymcm.html

# Appendix A: Further on LaTeX

To clarify the importance of using LaTeX in MCM or ICM, several points need to be covered, which are ...

To be more specific, ...

All in all, ...

Anyway, nobody **really** needs such appendix ...

# Appendix B: Program Codes

Here are the program codes we used in our research.

**test.py**

```python
# Python code example
for i in range(10):
    print('Hello, world!')
```

**test.m**

```
% MATLAB code example
for i = 1:10
    disp("hello, world!");
end
```

**test.cpp**

```cpp
// C++ code example
#include <iostream>
using namespace std;

int main() {
    for (int i = 0; i < 10; i++)
        cout << "hello, world" << endl;
    return 0;
}
```