Problem Chosen	2024	Team Control Number
A	**MCM/ICM** **Summary Sheet**	2417377

An MCM Paper Made by Team 2417377 Based on

Summary

As the...//Considering...(background)

For problem 1, we

For problem 2, we

For problem 3, we

Eventually,

Keywords: MATLAB, mathematics, LaTeX.

Contents

1 Introduction

1.1 Problem Background

A population that is necessarily dependent on reproduction for its development and continuation. Based on sexual reproduction, the birth rate (growth rate) of a population is greatly influenced by the sex ratio. Therefore, although many species exhibit a 1:1 sex ratio at birth, species tend to deviate from an even sex ratio in order to adapt to their environment and continue their populations. This is known as adaptive sex ratio variation[1]. The lamprey is one such typical species.

However, the role of the lamprey is complex. the seven-gill eel is complex. For some lake habitats, it is a parasite that is harmful to the ecosystem, and we want to reduce its reproduction; but at the same time, the seven-gill eel is a source of food in some parts of the world, and we want to promote its reproduction.Therefore, we address these questions by studying the pros and cons of the ability to alter their sex ratio based on resource availability, modeling their relationship with growth rates, and studying their impact on other species in the ecosystem

Figure 1: a fish with lamprey

1.2 Restatement of the Problems

A literatrue[1] say something about this problem ...

- **Task 1**
- **Task 2**

1.3 Overview of Our work

We do such things ...

- We do...
- We do...

Our Work

Find a passage about....

Design a model...
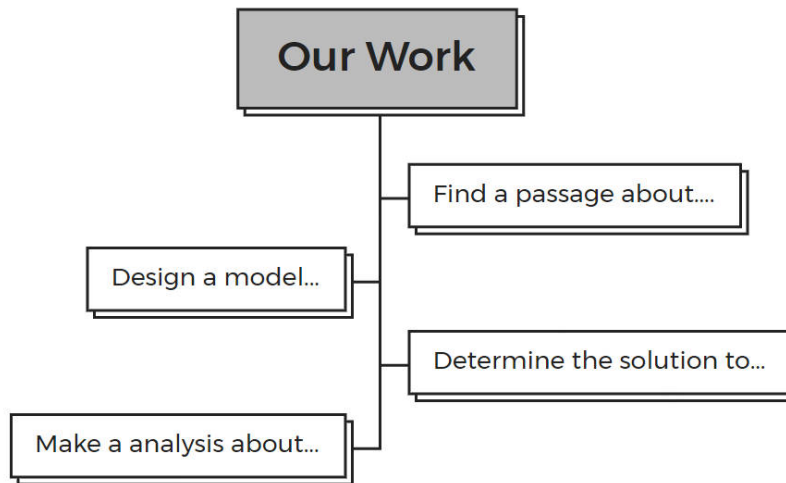
Determine the solution to...

Make a analysis about...

Figure 2: our work

2 Assumptions and Justification

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

- **Assumption 1:**
  ↪Justification:...[1]

- **Assumption 2:**
  ↪Justification:...[2]

- **Assumption 3:**
  ↪Justification:...[3]

3 Notations

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

Table 1: Notations

Symbol	Definition
W	the number of females
M	the number of males
RA	resource availability
α	the Proportion of male minnows
γ	the birth rate relative to resources
β	the mortality rate relative to number
TNF	total number of fish

4 The Models and The solution

4.1 Model 1 and Solution

4.1.1 Details about Model 1

The detail can be described by equation (4-1):

$$\frac{\partial u}{\partial t} - a^2 \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) = f(x, y, z, t) \tag{4-1}$$

4.2 Model 2 and Solution

4.2.1 Details about Model 2

4.2.2 Conclusion of Model 2

The results are shown in Figure 3, where t denotes the time in seconds, and c refers to the concentration of water in the boiler.

4.2.3 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 4 gives an example of subfigures. Figure 4a is on the left, and Figure 4b is on the right.

5 Test the Model

5.1 Sensitivity Analysis

5.2 Error Analysis

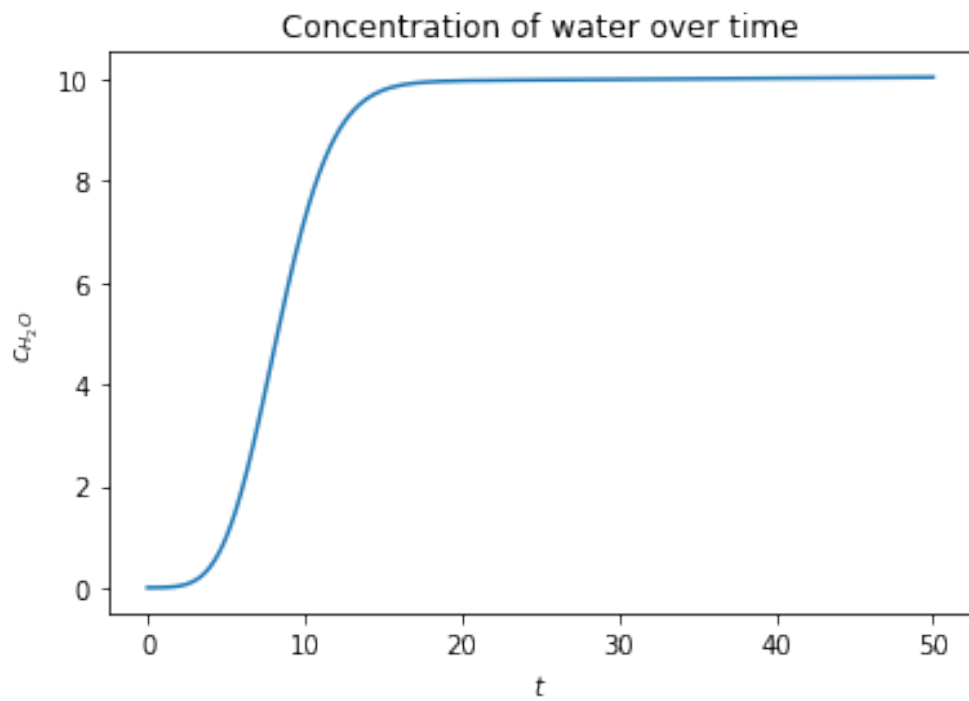# 6 Model Evaluation and Further Discussion

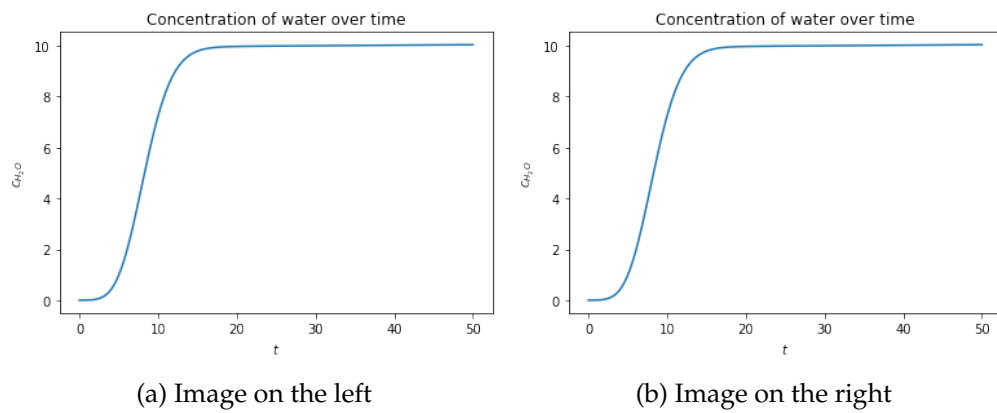## 6.1 Strengths

- First one...

Figure 3: The result of Model 2

(a) Image on the left

(b) Image on the right

Figure 4: Two images

- Second one ...

6.2   Weaknesses

- Only one ...

6.3   Further Discussion

6.3.1   Model Improvement

6.3.2   Model Extension

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!

References

[1] Karlin S, Lessard S. Theoretical studies on sex ratio evolution[J]. 1986.

[2]

[3]

Appendix: 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
% 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;
}
```