Problem Chosen	2025HSB MCM/ICM Summary Sheet	Team Number
B		MI66566

Yarlung Zangbo River comprehensive development plan based on optimization model

Summary

The Yarlung Zangbo River is the longest plateau river in China and has great development value.In this paper, the development of it is discussed.

For problem 1, discussing the feasibility of constructing Hydropower station on Yarlung Zangbo River, we first selected five sites for analysis based on the feasibility of the five power stations on the Yarlung Zangbo River[1]. Then, according to literature study[2] and theoretical analysis, we screened out dam construction costs, electricity demand, tax collection, and benefits from improving environmental conditions. With a deep covering layer and 11 indicators such as road, railway and other transportation facilities, EWM-TOPSIS model is constructed to find the best dam site. Finally, it is concluded that the feasibility of constructing Hydropower station is the highest in Nang County, and there are no huge problems in the three factors of migrant compensation cost, dam construction project cost and dam operation cost. And the economic benefits obtained under the same circumstances are the most sizable.

For problem 2, in order to explore the number of Hydropower stations that can be built on the main stream of the Yarlung Zangbo River and the potential total power generation that can be generated on the premise of obtaining the maximum energy, this paper adopts the maxmin model, which is established to ensure the maximum output as the optimization objective, and uses matlab to solve the problem through dynamic programming method. To obtain the maximum guaranteed output so as to ensure the functional relationship between output and generation to solve the maximum generation. Finally, according to the scale of selected Hydropower stations, the number of Hydropower stations that can be built on the main stream of the Yarlung Zangbo River is 17, and the potential total power generation is 366.982.2 billion kWh/day.

For problem 3, in order to verify the feasibility of "Hongqi River" project from the perspective of economic benefits, we set up a feasibility model to evaluate the project of "bringing Tibet to Xinjiang". We have learned that the basic goal of the project is to invest 4 trillion yuan to transfer 60 billion 3 of water to Xinjiang and other arid areas. With the benefit and cost of the project as the goal and technology, ecology and other factors as the constraint, whether the reverse calculation can meet the goal. Based on the annual average runoff of each river, we calculated that the estimated investment amount of the project could not support the completion of the "Hongqi River" project, so the feasibility of the construction of the project is very small.

For problem 4, in order to maximize the value of comprehensive utilization, we establish a multi- objective scheduling optimization model with water transfer, power generation and ecological indicators of hydrological change as objective functions to find a scheme that can maximize economic and ecological benefits. Finally, the scheme of water transfer, higher power generation value, larger WQL and smaller HA is selected.

Finally, we evaluated the strengths and weaknesses of the model and promoted it. At the same time, we provided a policy recommendation to the Chinese government based on our research and conclusions.

Keywords: Markov chains; Random forest algorithm; Hierarchical clustering

Contents

1 Introduction

1.1 Problem Background

1.2 Restatement of the Problem

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1.3 Literature Review

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1.4 Our Work

The problem requires us to fight fires by optimizing the locations of two type of drones. Our work mainly includes the following:

1.

2.

3.

In order to avoid complicated description, intuitively reflect our work process, the flow chart is shown in Figure :

2 Assumptions and Explanations

Considering that practical problems always contain many complex factors, first of all, we need to make reasonable assumptions to simplify the model, and each hypothesis is closely followed by its corresponding explanation:

***Assumption* 1:**

Explanation:

***Assumption* 2:**

Explanation:

***Assumption* 3:**

Explanation:

***Assumption* 4:**

Explanation:

Additional assumptions are made to simplify analysis for individual sections. These assumptions will be discussed at the appropriate locations.

3 Notations

Some important mathematical notations used in this paper are listed in Table 1.

Table 1: Notations used in this paper

Symbol	Description
x_i	Longitude within the i-th Wildfire Grid
y_i	Latitude within the i-th Wildfire Grid
Ω_i	The area of the i-th grid
d_{ki}	the distance d_{ki} between the k-th roaming grid and the i-th grid
SC_k	Score for evaluating the k-th wildfire grid
$x_{ki}^{(\alpha)}$	the SSA_α drone sent by the k-th EOC to the i-th wild-fire grid
$x_{ki}^{(\beta)}$	the RR_β drone sent by the k-th EOC to the i-th wildfire grid
t_{fly}^{δ}	The flight time of drones

*There are some variables that are not listed here and will be discussed in detail in each section.

4 Model Preparation

4.1 Data Overview

4.1.1 Data Collection

The official website of FEC in Victoria, Australia was queried and lots of data about wildfires were obtained. And other data sources are shown in Table 2.

Table 2: Data and Database Websites

Database Names	**Database Websites**
Fire Alerts	https://www.globalforestwatch.org/map/
Altitude	https://search.earthdata.nasa.gov/search
Latitude and Longitude	https://www.kaggle.com/carlosparadis/
Google Scholar	https://scholar.google.com/
Maps	© 2021 Mapbox © OpenStreetMap

4.1.2 Data Screening

1.

2.

3.

5 XX model based on XX algorithm

5.1 The first model

5.1.1 First step in modelling

$$E = mc^2 \tag{1}$$

***XXX* 1:**

***XXX* 2:**

***XXX* 3:**

5.1.2 Second step in modelling

5.2 The second model

6 Sensitivity Analysis

7 Strengths and Weaknesses

7.1

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7.2

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References

[1]

[2]

[3]

[4]

[5]

A Appendix:1

```
print("Hello World!")
```

B Appendix:2