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T1 ________________	**84018**	F1 ________________
T2 ________________		F2 ________________
T3 ________________	Problem Chosen	F3 ________________
T4 ________________	**C**	F4 ________________

2018

MCM/ICM

Summary Sheet

We Will Get O Prize(Not U Prize)

Summary

hello world

Keywords:
hello; world

Contents

1 Overview

1.1 Background

The rapid development of modern social economy benefits from the development of energy production. The issue of energy usage and production has always been the focus of world economic development.

In the 21st century, with the economic development and improvement, the energy shortage and the increasing contradiction between supply and demand. Meanwhile, the production and use of fossil energy sources have had a huge negative impact on the environment. Therefore, developing clean and renewable energy is imperative.

The differences between states such as geography, industry, population, climate lead to the contradiction of energy supply. Interstate cooperation and joint management and development of clean and renewable energy are regarded as the best solution to these problems. Nowadays four state governors –California, Arizona, New Mexico and Texas –wish to form a realistic new energy compact. Texas leads the country in total (non-hydro) installed renewable energy capacity, almost all of which comes from the state’s 9,410 MW of wind capacity. California is the leader in solar energy installed capacity, both for photovoltaic technology (738 MW) and concentrating solar power (364 MW).

1.2 Restatement of the Problem

We are required to provide an overview of energy profile for each of the four states and model how these profiles have evolved from 1960 to 2009. In addition, it is necessary to make our results understandable through discussion, including similarities and differences between 4 states. Then we need to establish a criteria model and choose the "best" profile use of cleaner, renewable energy usage targets. Finally, we need to give our suggestions about exact action to achieve the goal we set based on what we predict.

In order to identify In order to determine whether it is clean and renewable energy, for which we check the information and classification of various types of energy.

cleaner, renewable energy (defination from SEDS and):

- Conventional hydroelectric power
- Solar thermal direct use energy and photovoltaic electricity net generation
- Electricity produced by wind
- Wood and wood-derived fuels, biomass waste
- Fuel ethanol minus denaturant

2 Notations and Assumptions

2.1 Notations

2.2 Assumptions and Justifications

We make the following basic assumptions in order to simplify the problem. Each of our assumptions is justified and is consistent with the basic fact.

1. **Ignore the external costs caused by power generation other than coal:**

   In 2005, the mean external damage of coal in the United States due to coal combustion was 3.2 cents/kWh, The external cost of natural gas power generation is 0.16 cents/kwh, which is actually almost entirely caused by coal-fired power. Also life-cycle CO2 emissions from nuclear, wind, biomass, and solar appear so small as to be negligible compared with those from fossil fuels.(information comes from the report "Hidden cost of energy unpriced consequences of energy production and use")

2. **The conversion between generation and consumption is 100%, and the consumption is used to represent the amount of power generation to evaluate.**

Symbol	Meaning
n	the number of samples
p	the number of original indicators
k	the number of principal component
X	$\{x_{ij}\}$ original data matrix (i = 1, 2,⋯, n ; j = 1,2,⋯,p)
Z	$\{z_{ij}\}$ standardization matrix with z-scores (i = 1, 2,⋯, n ; j = 1,2,⋯,p)
U	$\{u_{ij}\}$ partial covariance matrix (i = 1, 2,⋯, n ; j = 1,2,⋯,p)
C	$\{c_{ij}\}$ covariance matrix (j = 1,2,⋯,p)
R	$\{r_{ij}\}$ correlation matrix (j = 1,2,⋯,p)
F	$\{f_{ij}\}$ The eigenvectors matrix of Z (j = 1,2,⋯,p)
Y	$\{y_{ij}\}$ principal component matrix (i = 1, 2,⋯, n ; j = 1,2,⋯,k)
V	$\{v_{ij}\}$ decision matrix (i = 1, 2,⋯, n ; j = 1,2,⋯,k)
A^+ / A^-	positive / negative ideal profile
S_i^+ / S_i^-	positive / negative ideal profile
λ_j	the eigenvalues of Z (j=1,2,⋯,p)
y_i	principal component
C_i	the final performance score in TOPSIS method
kmo	the value of KMO test

Table 1: Abbreviation and Description

3 Model overview

Firstly, considering energy production and consumption, environmental impact, technology, economy, we extract 12 variables from 605 variables to get general energy profile of each state.

In order to show the evolution of energy production, we construct a comprehensive evaluation index system for the level of cleaner, renewable energy development. We use the **Principal Component Analysis** method to carry out the correlation cluster analysis of the index. To make the similarities and differences between 4 states understandable, we use **TOPSIS** method to show our results.At the same time, we can get the extracted principal componment choosing the "best" profile from comprehensive evaluation results ranking.

After determining the “best” profile, we use **ARIMA** method to predict the energy profile of each state, especially as we evaluate the cleaner, renewable energy development in the future.

1. There are three options for each vehicle arriving at the toll plaza and each car entered the shortest path of the queue.
2. All the toll booths are same except charge method (width, construction cost e.t.c)
3. The arrival process is Poisson

4 Statement of our Model

4.1 Definition

- h–Conventional (human-staffed) tollbooths
- a–Exact-change (automated) tollbooths
- e–Electronic toll collection booths
- B_i–Number of types i tollbooths
- b_i–Number of type i tollbooths to open, where
- B–Number of tollbooths

h	Conventional (human-staffed) tollbooths
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B	Number of tollbooths
L	Number of main lanes
l_i	Lower bound for the number of type i lanes to open
u_i	Upper bound for the number of type i lanes to open
λ_i	Mean arrival rate for lane type i, where

Table 2: Definition

- L–Number of main lanes
- l_i–Lower bound for the number of type i lanes to open
- u_i–Upper bound for the number of type i lanes to open
- λ_i–Mean arrival rate for lane type i, where
- λ–Mean total arrival rate of vehicles at the toll plaza, i.e., the number of arrivals per unit time
- μ_i–Mean service rate for a type i tollbooth, i.e., the number of service completions per unit time
- σ_i–Standard deviation of service time for a type i tollbooth
- W–Mean total waiting time in the queue for all arrivals at the toll plaza
- c_i–The rate of the operating cost of a type i lane
- d–The rate of the operating cost of a type i lane
- c_o–The total operating costs at the toll plaza per unit time
- c_w–The total user-waiting costs at the toll plaza per unit time
- Z–The sum of total operating and user-waiting costs at the toll plaza per unit time
- l–the length of buffer segment
- w–the width of booth
- y_i–Traffic accident prediction

- minimizes the discomfort to the hands, or
- maximizes the outgoing velocity of the ball.

We focus exclusively on the second definition.

- the initial velocity and rotation of the ball,
- the initial velocity and rotation of the bat,

- the relative position and orientation of the bat and ball, and
- the force over time that the hitter hands applies on the handle.

- the angular velocity of the bat,
- the velocity of the ball, and
- the position of impact along the bat.

center of percussion [Brody 1986],

Theorem 4.1. *LaTeX*

Lemma 4.2. *TeX.*

Proof. The proof of theorem. □

4.2 Other Assumptions

-
-
-
-

5 Analysis of the Problem

Figure 1.

$$a^2 \tag{1}$$

$$\begin{pmatrix} *20ca_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = \frac{Opposite}{Hypotenuse} \cos^{-1}\theta \arcsin\theta$$

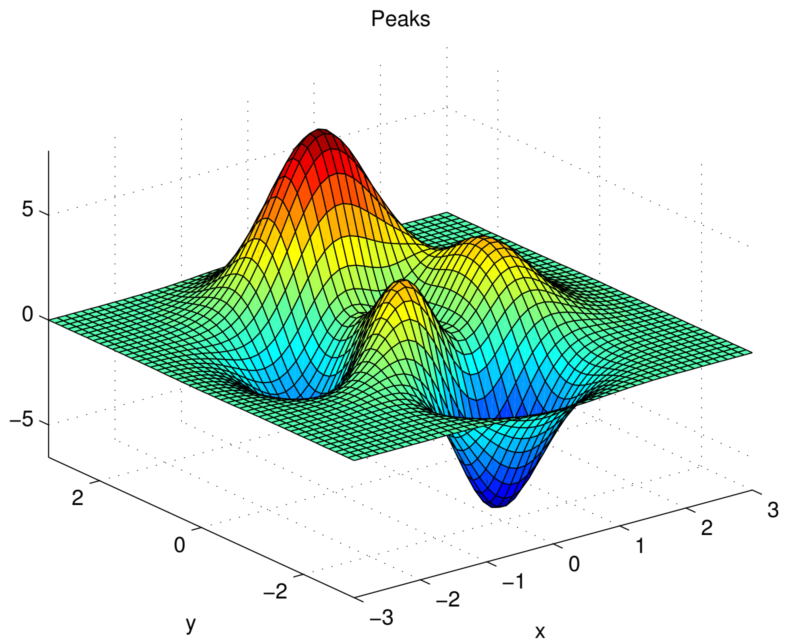

Figure 1: Figure example 1

Figure 2: Figure example 2

Figure 3: Figure example 3

$$p_j = \begin{cases} 0, & \text{if } j \text{ is odd} \\ r!\,(-1)^{j/2}, & \text{if } j \text{ is even} \end{cases}$$

$$\arcsin\theta = \oiiint_{\varphi} \lim_{x\to\infty} \frac{n!}{r!\,(n-r)!} \tag{1}$$

6 Calculating and Simplifying the Model

A_{ij} and A_{ij} 不一样

(123) and Φ123Ψ and （123）不一样

7 The Model Results

8 Validating the Model

CTEX中最繁琐的是表格输入,不过数学建模竞赛中，一般要求输入三线表，这样统一格式的情况下，对于输入表格就简单一点了。

双斜杠是强制换行，在矩阵，表格，大括号的公式常用。
关于表格的合并，见下一部分。给出的例子。

Year	theta	S_1^-	S_2^-	S_3^-	S_4^+	S_5^+	S_6^+
2016	1	0	0	0.0001	0	0	0
2017	0.9997	0.0555	0	0.2889	0.1844	0.463	0
2018	0.9994	0	0	0.0012	0.3269	0.7154	0
2019	0.9993	0	0	0	0.4325	1.0473	0
2020	0.9991	0	0	0	0.5046	1.2022	0
2021	0.999	0	0	0	0.5466	1.2827	0
2022	0.9989	0.0017	0	0.3159	0.562	1.2995	0
2023	0.9989	0	0	0.0109	0.5533	1.2616	0
2024	0.9989	0	0	0	0.5232	1.1769	0
2025	0.9989	0	0	0.1009	0.4738	1.0521	0
2026	0.9991	0	0	0	0.4071	0.8929	0
2027	0.9992	0.0004	0	0.1195	0.3248	0.7042	0
2028	0.9994	0.0164	0	0.046	0.2287	0.4902	0
2029	0.9997	0	0	0.0609	0.12	0.2545	0
2030	1	0	0	0	0	0	0

9 Conclusions

年份	指标	
2017	0.9997	0.0555
2018	0.9994	0
2019	0.9993	0

年份	指标	
2017	0.9997	0.0555
2018	0.9994	0
2019	0.9993	0

Table 3: NAME

Let's to see Table 3.

<table>
<tr><td colspan="2" rowspan="2">合并</td><td>测试</td></tr>
<tr><td>0.9997</td></tr>
<tr><td>2019</td><td>0.9993</td><td>0</td></tr>
</table>

<table>
<tr><th>年份</th><th colspan="3">指标</th></tr>
<tr><td rowspan="3">合并</td><td>2017</td><td>0.9997</td><td>0.0555</td></tr>
<tr><td>2018</td><td>0.9994</td><td>0</td></tr>
<tr><td>2019</td><td>0.9993</td><td>0</td></tr>
</table>

10 A Summary

写入你的中文如果你不想显示上面的那段文字，那就把lipsum删掉

获得更多的latex教材，请添加latex交流群，或者关注迈思数模微信公众号：shumohome 并回复“LATEX资料”美赛LATEX模板交流群：193607493 美赛LATEX模板交流群：193607493

11 Evaluate of the Mode

美赛获得更多的latex教材，请添加latex交流群，或者关注迈思数模微信公众号：shumohome 并回复“LATEX资料”美赛LATEX模板交流群：193607493

12 Strengths and weaknesses

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12.1 Strengths

- **Applies widely**
  This system can be used for many types of airplanes, and it also solves the interference during the procedure of the boarding airplane,as described above we can get to the optimization boarding time.We also know that all the service is automate.
- **Improve the quality of the airport service**
  Balancing the cost of the cost and the benefit, it will bring in more convenient for airport and passengers.It also saves many human resources for the airline.
-

References

[1] D. E. KNUTH The TEXbook the American Mathematical Society and Addison-Wesley Publishing Company , 1984-1986.

[2] Lamport, Leslie, LATEX: “ A Document Preparation System ”, Addison-Wesley Publishing Company, 1986.

[3] http://www.latexstudio.net/

[4] http://www.chinatex.org/

Appendices

Appendix A First appendix

Here are simulation programmes we used in our model as follow.

Input matlab source:

```
function [t,seat,aisle]=OI6Sim(n,target,seated)
pab=rand(1,n);
for i=1:n
    if pab(i)<0.4
       aisleTime(i)=0;
    else
        aisleTime(i)=trirnd(3.2,7.1,38.7);
    end
end
```

Appendix B Second appendix

some more text **Input C++ source:**

```
//===========================================================================
// Name        : Sudoku.cpp
// Author      : wzlf11
// Version     : a.0
// Copyright   : Your copyright notice
// Description : Sudoku in C++.
//===========================================================================

#include <iostream>
#include <cstdlib>
#include <ctime>

using namespace std;

int table[9][9];
```

```
int main() {

    for(int i = 0; i < 9; i++){
        table[0][i] = i + 1;
    }

    srand((unsigned int)time(NULL));

    shuffle((int *)&table[0], 9);

    while(!put_line(1))
    {
        shuffle((int *)&table[0], 9);
    }

    for(int x = 0; x < 9; x++){
        for(int y = 0; y < 9; y++){
            cout << table[x][y] << " ";
        }

        cout << endl;
    }

    return 0;
}
```