For office use only	Team Control Number	For office use only
T1 _____	**89760**	F1 _____
T2 _____		F2 _____
T3 _____	Problem Chosen	F3 _____
T4 _____	**B**	F4 _____

2018
MCM/ICM
Summary Sheet

Camping on the Grand River

summary

Key words:

Contents

1 Introduction

1.1 Background

1.2 Restatement of the problem

1.3 Our works

2 Analysis of Overall and Key Points

3 Assumptions and Justification

- **Each month is 30 days in Drifting season, that is, the total number of days people can drifting is 180.**To simplify our model we assume 30 days per month, and this assumption is reasonable.
- **The tourists' choice of travel time complies with the Poisson distribution.**Since the choice of tourists for travel dates is unknown, the Poisson distribution is a good way to model this process and to facilitate our model building.
- **The demand for drifting is always greater than the supply.**which is a assumption based on the facts set by the context of the incident.
- **All travel teams are drifting during the day and their maximum daily drifting time is 8 hours.**According to Reference 1, we assume that the maximum daily drifting time for a tour group is 8 and the tour group can only go downstream.
- **The daily travel distance and rafting times chosen by the tour group for the same number of travel days are up to themselves.**This assumption is very realistic, river management companies will not be fixed tourist travel itinerary.
- **Assuming that for any tour group, once they have chosen the mode of transport, they will not change their means of transport for the entire journey.** We assume that the river management department to take into account the efficient use of the efficiency of the vessel, for any tour only to provide a means of transport.
- **The total number of camping sites unchanged.**According to Reference 1, we assume that there are 38 camps evenly distributed along the bank.
- The total number of campsites remains unchanged, reference 1, and we assume that there are 38 camps evenly distributed along the bank.

4 Symbols and Definitions

In the section, we use some symbols for constructing the model as follows:

Table 1: Symbols and Definitions

Symbol	Denition
X	Trips travel down the Big Long River each year during a six month period

5 Models

6 Conclusions

7 Sensitivity analysis of the model

8 Strengths and weaknesses

8.1 Strengths

- The model ensures maximum utilization of campgrounds and the concept of minimizing exposure quantifies the concept of "touch";
- Put forward many maths to solve the problem matrices: unit camping matrices, camping matrices, materiel battalion matrices, and the establishment of dual-objective optimization model;
- The carrying capacity of rivers is defined by the number of campsites, and the number of campsites is a constant. Inspired by the definition of tourism carrying capacity, we introduced the number of encounters to quantify the carrying capacity of rivers.

8.2 weaknesses

- Model operation is more difficult, so we can only draw approximate results;
- Ignore the fact that some plans are implemented more than once. If you want to make the model more realistic, consider the case where the number of planned executions is greater than 1;
- The model has some limitations in practice.

9 Future Improvements

- Since we assume a fixed transport for each tour group while establishing the model and consider the tour's choice of modes of transportation to be random, the fact that there is a selection of tours of the rafts and motorboats was proportionate. If we can get historical data on river rafting, we will be able to find out the possibility of choosing two modes of transport for any group of tourists and figure out the patterns of travel days for travelers, and these results will make our model more accurate

- In this paper, we establish a traditional goal of two-goal optimization, which may have some limitations. We consider that a cellular automaton model can be used. We will set some parameters of the cellular automata by the laws of presentation in the historical data and use them to simulate the tour of the Grand River. In this way, we allow visitors to freely choose the length of travel time, departure date and mode of transport and minimize the number of collisions, which will give tourists a high degree of satisfaction. Finally, we can find the best travel program from this model.

10 Memorandum

References

[1] `http://canyonx.com/trip_lengths_logistics.php`

[2] Shang Pengchao, Zhang Cong, Ren Qingfeng, et al.Arrangement of drifting travel plan [J] .Journal of Yan'an University (Natural Science Edition), 2012, 31 (3): 48-50. Addison-Wesley Publishing Company, 1986.

[3] XU Dao, CAO Xiaoyu, GENG Jianghua.Application of 0-1 Integer Programming Model to Rafting Travel Schedule [J]. Science Technology Information, 2012 (27): 158-158.

Appendices

First appendix

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

Input java source:

```
/**
 * @author aolish333@gmail.com
 * @date 2018/1/31 20:49
 * User:Lee
 */
public class Campsite {
    public int getCampsiteNo() {
        return campsiteNo;
    }

    public void setCampsiteNo(int campsiteNo) {
        this.campsiteNo = campsiteNo;
    }



    public void setBeLiveNumber(int beLiveNumber) {
        this.beLiveNumber = beLiveNumber;
    }

    public Boolean getLive() {
        return isLive;
    }

    public void setLive(Boolean live) {
        isLive = live;
    }

    public Campsite(int campsiteNo, int beLiveNumber, Boolean isLive) {
        this.campsiteNo = campsiteNo;
        this.beLiveNumber = beLiveNumber;
        this.isLive = isLive;
    }

    private int campsiteNo;

    public int getBeLiveNumber() {
        return beLiveNumber;
    }

    private int beLiveNumber;
    private Boolean isLive;
}
```

Second appendix