Problem Chosen	2021 MCM/ICM Summary Sheet	Team Control Number
B		2120710

Fighting Wildfire with Unmanned Aerial Vehicle

Summary

在这里写 summary

key words : 关键词 1; 关键词 2; 关键词 3

Budget Request

FROM: Team 2120710 , MCM
To: The group of Governors
Date: February 8, 2020

这里是 br 正文。

Sincerely yours,
MCM Team 2120710

Contents

1 Introduction

1.1 Restatement of the Problem

Many people...Therefore we are facing the following problems:

- aaaaaa
- bbbbbbb

1.2 Our Works

- aaaaaa
- bbbbbbb

2 Assumptions and Notations

2.1 Assumptions

Due to the lack of necessary data, we make the following assumptions to help us perform modeling:

1. The circumstance remain unchanged in the time interval we investigated.
2. We omit the possibility of any other kinds of aerial vehcle or flying creature hitting our UAV.
3. Accroding to Bureau of Meteorology of Australian Government, litghting is the major causation of bushfire in some area, Victoria included.[**] Based on this fact, we evaluat the possibility for a certain place to catch fire with the possibility of a lightning to occour there.
4. We adopt the Equal Possibility Hypothesis when our UVAs are patrolling for the purpose of monitoring any outbreak of fire.Under this hypothesis, an area of high possibility to catch fire indicates

the frequency of fire outbreak here is high, thus the command center should pay closer attention to this area to alarm fire outbreaks timely.

5. All UAVs are equipped with a timer.
6. All UAVs are directed by a preprogrammed system given by us, which means they are all automatic.
7. Staffes are always available in any charging stations, which guarantees the UVAs will always work in the stanterd situation.
8. A drone can carry either a set of thermal imaging cameras and telemetry sensors or a radio repeater. The former combination can and can only detect any fire outbreak, while the latter can and can only extend the valid zone of radio wave signals.

2.2 Notations

Here are all the notations and their meanings in this paper.

Symbol	Meaning
(x, y, z)	Coordinates
$M(i, x, y, z, t)$	Coordinates matrix of i -th SSA at time t
$P_{hexa}(x, y, z, t)$	Coordinates matrix of front-line personnel at time t
$P(j, w, g, t)$	前线人员的经纬度坐标
$Posi(j, w, g)$	维多利亚省的经纬度坐标
$h(x, y, z)$	地点高度
$S(x, y, z)$	过去五年着火严重程度，约化火痕面积
$F(x, y, z)$	森林覆盖程度，用单位密度植物密度计
$Strength(i, x, y, z, t)$	t 时刻第 i 个中继器在（x，y）处的信号强度
$E(x, y, z, N)$	有 N 个无人机在一点的覆盖效度
$Slop(x, y, z)$	一点的最大坡度
$\beta(x, y, z)$	梯度权重
Γ	梯度因子
$Nmp(j)$	第 j 个区域的人-机信号衰减率
$Nmm(i, k)$	第 i 个和第 k 个无人机之间的信号衰减频率

3 Model Construction

blablablabla

4 Conclusion

We build a.....interesting findings:[1]

- aaaaaaa
- aaaaaaa

References

[1] M. Kilinc and J. Beringer, "The spatial and temporal distribution of lightning strikes and their relationship with vegetation type, elevation, and fire scars in the northern territory," Journal of Climate, vol. 20, no. 7, pp. 1161 – 1173, 01 Apr. 2007.

Appendices

Here is Code we used in our model, which python is the main development language.

Appendices A

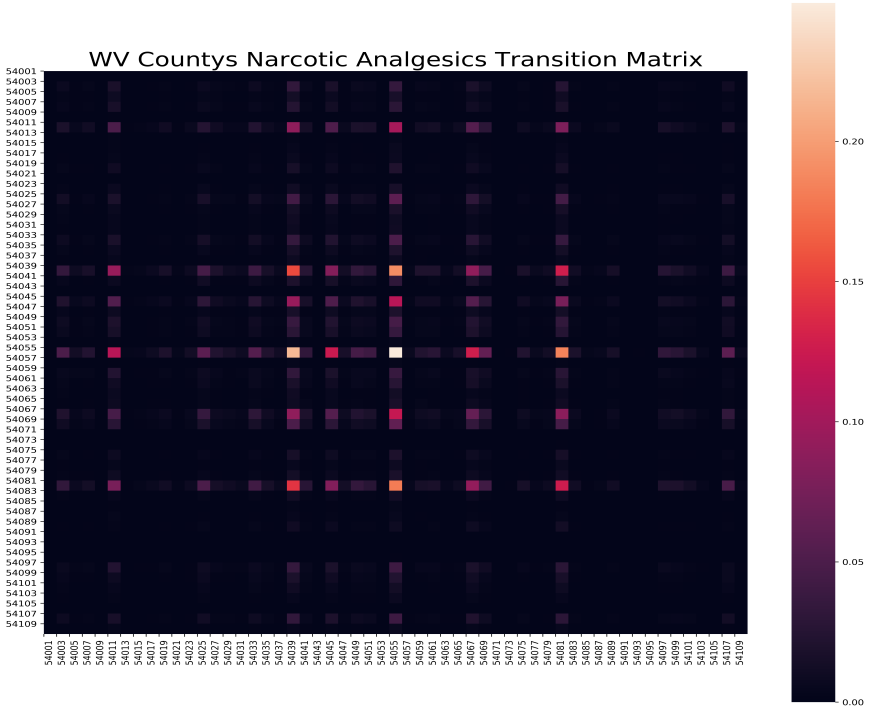

Figure 1: Transition matrix for synthetic opioid spread rate in West Virginia