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Control #1924744

28th January 2019

Summary

"All models are wrong but some are useful"

HELP INC MEMO

Contents

1 Introduction

1.1 Background

Puerto Rico is a small US territory situated on the 18th parallel.

1.2 Problem Restatement

Our problem is divided into two main objectives;

- Delivering required medical packages to the associated medical centres.

2 The Assumptions

The following core assumptions were made before embarking on our first model. These were necessary to fully understand the strategy we would need to develop to distribute medical supplies and survey roads:

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3 The Ideal Setup

3.1 P-CB (Package to Cargo Bay) Configuration

In order to understand which drone was suitable to use in deliveries it was necessary to begin with the core fundamentals of how a cargo bay would store medical packages. In order to visualize this a table was generated for the different combinations of medical packages each cargo bay could carry. In the table below the different maximum loads each cargo bay can hold is shown.
m_x = medical package x

Cargo Bay 1	$(m_1), (m_2), (m_3)$
Cargo Bay 2	$(m_1), (m_2, m_2, m_2), (m_3, m_3), (m_1, m_2)(m_2, m_3)$

As seen in the table cargo bay 1 is limited to sending one medical package per drone whereas cargo bay 2 has much more flexible types of combinations available. We will next look at which drones can carry which medical packages as well as their flight range.

3.2 CB combinations for medical centres

Medical Centre	Daily Need	C1	C2
1	m_1, m_3	$(m_1), (m_3)$	$(m_1), (m_2, m_3), (m_3, m_3)$
2	m_1, m_1, m_3	$(m_1), (m_2)$	$(m_1), (m_2, m_3), (m_3, m_3)$
3	m_1, m_2	$(m_1), (m_2)$	$(m_1), (m_2, m_3), (m_3, m_3)$
4	m_1, m_1, m_2, m_3, m_3	$(m_1), (m_2)$	$(m_1), (m_2, m_3), (m_3, m_3)$
5	m_1	$(m_1), (m_2)$	$(m_1), (m_2, m_3), (m_3, m_3)$

3.3 D-C (Drone to Container) Configuration

4 The Models

5 Comparison Between Models

6 Sensitivity Analysis

7 Conclusions

8 Appendices