

Global Delivery Problem

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General Description

Suppose I am a manager of an international express company. The aim of our company is delivering goods everywhere in the world. Therefore, we must establish an efficient logistics system to make sure that we can deliver customs' goods in time no matter where are the starts and destinations. Since it is a new company, our financial status does not allow us to invest a large number of logistical centers. So the objective of this program is to build logistical centers throughout the world as few as possible under the premise of delivering in time.

Details

With the objective above, I would like to present some details about this program. At present, we usually use two kinds of transport, aircrafts and vehicles (Vessel is possible if necessary). Obviously, to deliver goods, both of the transport ways should be used. Thus, you may see that the logistical centers play an important role in our delivery system. A logical center is a place to switch the goods between the vehicle and aircraft, as well as an airport which send/receive the goods to/from other logical centers, or provide refuelling service for the aircrafts. There are some crucial parameters to this program that are the maximum flight range and average speed of the aircraft, the maximum driving distance and average rate of a vehicle, the interval of the two planes which depart from the same logistical center, and, of course, the range of the earth. In particular, how to schedule the limited aircrafts to reach the most efficient utilization is another interesting and independent linear programming. Therefore, if you do not want your problem seem too complicated at this time, it will be fine to simplify this condition.

To illustrate the delivery procedure, let me give you a concrete example. Mr. Smith needs to send a document from his home in China to McGill in three business days. First, the staff in the nearest logical center drives to Mr. Smith's, picks up the document and returns to the center. After a certain time waiting for the aircraft, the document sits in the plane and gets to the destination logical center, Montreal airport(There may be refuelling or packages picking up in the middle of the way).Finally, the document is sent from the Montreal airport to McGill.

Something should especially concern

One of the biggest concerns about this program is the geographical partition of the world. Naturally, there are seven continents, however, regardless the irregular shape of each continent, what we must consider are that no permanent resident lives in Antarctic and the four great oceans occupy a large part of earth. Moreover, for the regions where there are few people to live, e.g. the north of Canada, it seems no need to set up a logistical

center even though the company will probably get some penalty in the case of delivery over the deadline. So there are plenty of stuffs I may concern, however, in order to make the programming not too difficult, you can make some simple assumptions.

PS: If you have any suggestions, please feel free to contact me at yiwei.shi@mail.mcgill.ca.

Good Luck!