

Introduction to the Satellite Image Mosaic Combination Problem

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Abstract:

Governments and military forces are no longer solely occupying the space industry market, which continues to grow rapidly.

According to a recent European Union Space Program Agency report, the Global Satellite Navigation and Earth Observation (EO) market reached revenues of around 200 billion euros in 2022 and is expected to reach 500 billion euros by 2031. As access to space has become cheaper, more private companies have entered the space business. Some companies even use space data without owning any space assets, thanks to services such as satellite-as-a-service.

Thanks to advances in satellite design and high-resolution remote sensors, the EO sector has experienced significant growth in recent years. In 2021, the number of satellites dedicated to EO was more effective than the number of launches from 2012-2016. In 2020, more than 100 terabytes of satellite images were generated per day.

This research focuses on the combinatorial optimization problem of selecting a set of satellite images that form a mosaic covering the interested area. The goal is to recommend a collection of images that meet the user's criteria by optimizing specific parameters, for example, the total cost of the images or the image resolution. The main contribution of this abstract is the presentation and modeling of the problem, which we call the Satellite Image Mosaic Combination Problem (SIMCOP).

At higher levels of abstraction, some similarities can be found between SIMCOP and the Cloud Brokering Problem, especially for the bundled version. Another problem that can be somehow related to SIMCOP is the Internet Shopping Optimization Problem in various variations, where a customer plans to buy products from online stores.