2017 HiMCM

Problem A: Drone Clusters as Sky Light Displays

Intel® developed its Shooting Star™ drone and is using clusters of these drones for aerial light shows. In 2016, a cluster of 500 drones, controlled by a single laptop and one pilot, performed a beautifully choreographed light show (<https://www.youtube.com/watch?v=jNIAzeU8POQ>). Your large city has an annual festival and is considering adding an outdoor aerial light show. The Mayor has asked your team to investigate the idea of using drones to create three possible sky displays.

Part 1 – For each　display:

a)  Determine the number of drones required and mathematically describe the initial location for each drone device that will result in the sky display (similar to fireworks display) of a static image.

b)  Determine the flight paths of each drone or set of drones that would animate your image and describe the animation. (Note that you do not have a actually write a program to animate the image. But you do need to mathematically describe the flight paths.)

Display 1: Ferris wheel

Display 2: Dragon

Display 3: Create your own image

Part 2 – Determine and discuss the requirements for your 3-display light show to include, but not limited to, the number of drones, required launch area, required air space, safety consideration as to whether or not to do the aerial light show.

Your submission should consist of:

l One-page Summary Sheet,

l Two-page memo to the Mayor,

l Your solution of not more than 30 pages, for a maximum of 33 pages with your summary and memo.

l Note: Reference list and any appendices do not count toward the 33-pages limit and should appear after your completed solution.

Problem B: Ski Slope

Winter is coming! In February 2018, Pyeong Chang, South Korea will host the Winter Olympics. And, in 2022, Beijing, China will be the host city. The Winter Olympics have over fifty ski related events in the disciplines of Alpine, Nordic, Cross-Country, Ski Jumping, Snowboarding, and Freestyle.

A group of wealthy winter sport fans are looking for a new mountain to develop into a ski resort that could perhaps host the Winter Olympics in the future. An agent, calling herself Ms. Mogul, represents them.

Wasatch Peaks Ranch in Peterson, Utah, USA is for sale! This almost 13,000 acre ranch has an estimated 5,500 acres of potential ski slopes with an 11 mile ridgeline, a 4750 foot drop among its 24 peaks, and 15 bowls. Ms. Mogul wants your team to identify potential ski slopes and trails on the property in order to develop it as one of the top ski resorts in North America and a potential future Winter Olympics location.