



A New Method to Calculate an Irregular Area of a Lake using Image Processing Techniques

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Abstract— Monte Carlo methods are a class of computational algorithms that rely on repeated random sampling to compute their results. These methods implemented in varsity application, which is used for solving certain stochastic or deterministic problems. In practical application it is crucial to calculate the surface area for environmental objects such as lakes, Islands, and Oil slick. In this work we focus on computing the surface area for different shapes of lakes.

Suppose we have an irregular region whose area can't be calculated with convectional mathematical methods. Such regions might be approximated using a Monte Carlo simulation. The idea behinds Monte Carlo simulation is to surround the irregular shape (lake) by a regular shape such as rectangle, triangle, or circle. The areas of these regular shapes are easily to be calculated.

We started to shoot randomly K points (darts) in a surrounded regular area. Let N represents the number of points that ended up in the irregular region (lake); such that $K \leq N$. We could estimate the lake area using the following formula:

$$\text{Lake Area} = (K / N) * \text{Area Surrounded}$$

The suggested proposal calculates any irregular shapes using an image processing techniques have been implemented using clusters algorithm. The simulated results have been compared with the regular shapes beside other available studies. The results appeared quite satisfactory results.

Keyword- Monte Carlo Simulation, Image Processing, cluster algorithm

I. INTRODUCTION

Nowadays, Monte Carlo methods are widely used to solve complex physical and mathematical problems particularly those involving multiple independent variables where more conventional numerical methods would demand challenging amounts of memory and computer time. Its core idea is to use random samples of parameters or inputs to explore the behavior of a complex system or process. Because of their reliance on repeated computation of random or pseudo-random numbers, these methods are most suited to calculation by a computer and tend to be used when it is unfeasible or impossible to compute an exact result with a deterministic algorithm, see [1-3].

In many applications a surface area and volume attribute have been used to calculate water loss, heat transfer in many environmental fields. The computing surface area is one of the most important factors in all these application fields. Research work has been done to determine the relationship between surface area and various attributes such as increasing desert land, water scarcity, and oil slick. Different mathematical models and numerical analysis methods have been to extract an irregular surface area [4, 5].