Дальневосточный федеральный университет

Алгоритмы и структуры данных

Алгоритм Форчуна

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Б9121-09.03.03ПИКД

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Постановка задачи

- 1. Изучить алгоритм Форчуна и описать его в виде научного доклада
- 2. Реализовать алгоритм Форчуна
- 3. Провести исследование на ***
- 4. Результат работы выложить на GitHub



История создания

Опубликован Стивеном Форчуном (1985)

A Sweepline Algorithm for Veronei Diagrams

Steven Fortune AT&T Bell Laboratories Murray BID, New Jersey 07974

*Links

We present a transformation that can be used to compare Verson diagrams with a sweegine technique. The transformation is used to obtain simple algorithms for comparing the Versond diagram of point star, of line suggests that, and of weighted point site. All algorithms have Olir logs?) werst time running time and use Oliving some

L. Introduction

We present simple algorithms for the construction of Voronoi diagrams of a set of situs in the plane. The ales can be points or line segments. The algorithms are based on the sweepline technique [581]. The sweepline inchaique conceptually everys a horizontal line upwards across the plane, soring the regions intersected by the has so the line moves. Computing the Voronsi diagram directly with a sweeplage technique is difficult, because the Vorceoi region of a site may be interested by the sweepline long before the site itself is intersected by the tweepline. Rather than compute the Voronce diagram, we compute a geometric transformation of it. The transfermed Vorceei diagram has the property that the lowest point of the transformed Varanus region of a site appears at the site itself. Thus the awapping algorithm eased consider the Voronoi region of a site only when the site has been intersected by the awarplies. It turns out to be easy to reconstruct the real Voronoi diagram from its transformation; in fact in practice the real Vorsess diagram would be constructed, and the transformation computed only as mostoary. The sweepline algorithms all have seproptistic running time O'snlogal and space

Previous algorithms for Veronis diagrams fall into two congreins. First are incornected algorithms, which construct the Veronois diagram by adding a size at a time. These algorithms are relatively simple, but have sense; case time complexity Ord-76. However, the algorithms may have good expected time behavior (BWY80) 105771 (2014).

The second integrity of algorithms are divideance-compact algorithms. The set of sizes in split into two parts, the Verson diagram of each part compant focussively, and thus the two Versoni diagrams merged together. If the sizes are points, then they can be uplit simply by farsing a line that separates the sizes into two

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habed(S873). If the sizes are line segments, then more complex participants is necessary 19741. With care, the invide-and-conquer algorithms can be implemented in worst case time Ofeniqual. The difficulty of the divideand-compare algorithm is generally with the nearge stepthal combines two Vaconsi diagrams together. While the time required for this step is only linear in the smoother of sizes, the datasit of the average are complex months of sizes, the datasit of the average are

The inception algorithms presented in this paper are competitive in simplicity with the increenedtal algorithms. Since they arend the merge step, they are mach simpler to implement than the divide-and-compare algorithms. But they have the same vent-case time complexity as the divide-and-compare algorithms.

We also present an algorithm to compute the Venomic diagram of verigited point sites, in which each site has an address weight associated with it. The algorithm uses exactly the same awarpine technique, and has time compliancy of to logal. It has algorithm with this time compliancy was previously known for this problem.

All algorithms presented in this paper are assumed to be implemented in exact real artification. We hope to investigate stability issues of the algorithms in more reasemable models of faming point artifemetic.

I. Point Site

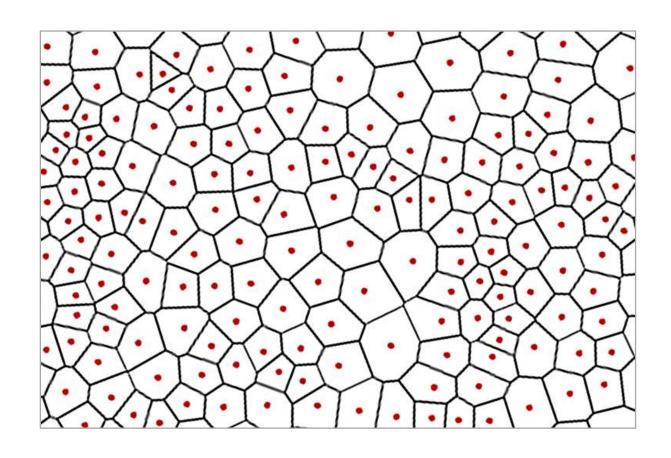
We first consider the case that all situs are points in the plane. This simple case has been discussed extrasively in the literature. For more details, see for example ISHTNI or ILOBAL. For a more general situation than point situs, see ILSSPAI.

If $p \in R^+$, then p_+ and p_+ are the a and p numbers of p_- respectively. Points $p_+q \in R^+$ are leatingraphically undered, $p < q_+ \in P$ $p_+ < q_+$ at $p_+ < q_+$ and $p_+ < q_+$.

Let S be a set of point in the plane, called attention F for $p \in S$, $d_p, R^{2} - R^{2}$ is the Gholdstard distance from a point in R^{2} in p_{p} and $d_{p}R^{2} - R^{2}$ is man d_{p} . The Forever circle at $p \in R^{2}$ is the circle construct at p of radius d(p). The blances R_{p} of $p_{p} \in S$ is $(R^{2}, R_{p}, R_{p}, R_{p})$ is of course a line, the usual bisoctron of p and q. R_{p} is $(FR^{2}, R_{p}, R_{p}, R_{p})$ is of C course a line, the usual bisoctron of p and q. R_{p} is (FR^{2}, R_{p}, R_{p}) in convent, possibly unbounded. The Forever Region of (FS, R_{p}) is of (FS, R_{p}) in (FS, R_{p}) in (FS, R_{p}) in (FS, R_{p}) is (FS, R_{p}) in (FS, R_{p}) . The (FS, R_{p}) is (FS, R_{p}) in $(FS, R_{p}$

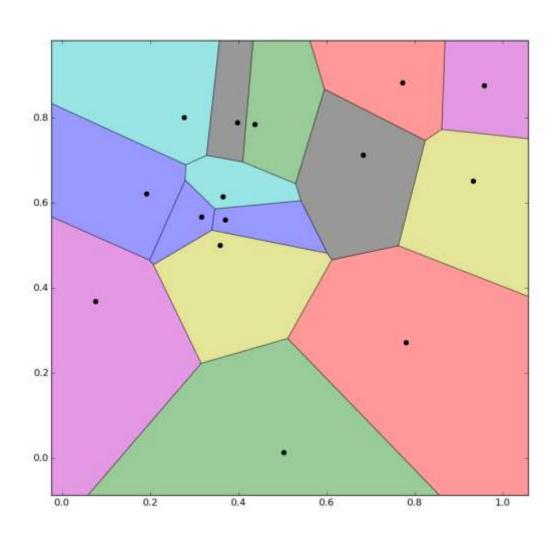
113

Диаграмма вороного



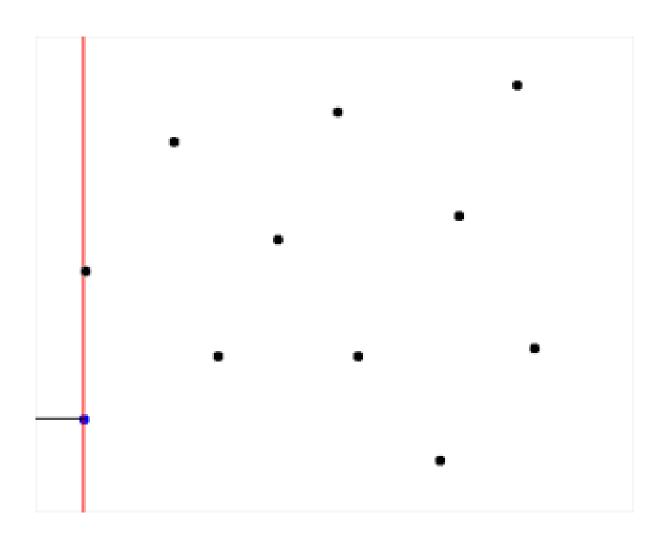
P={p₁,p₂,...,p_n}— множество точек на плоскости

Результат работы алгоритма Форчуна



Готовая диаграмма Вороного

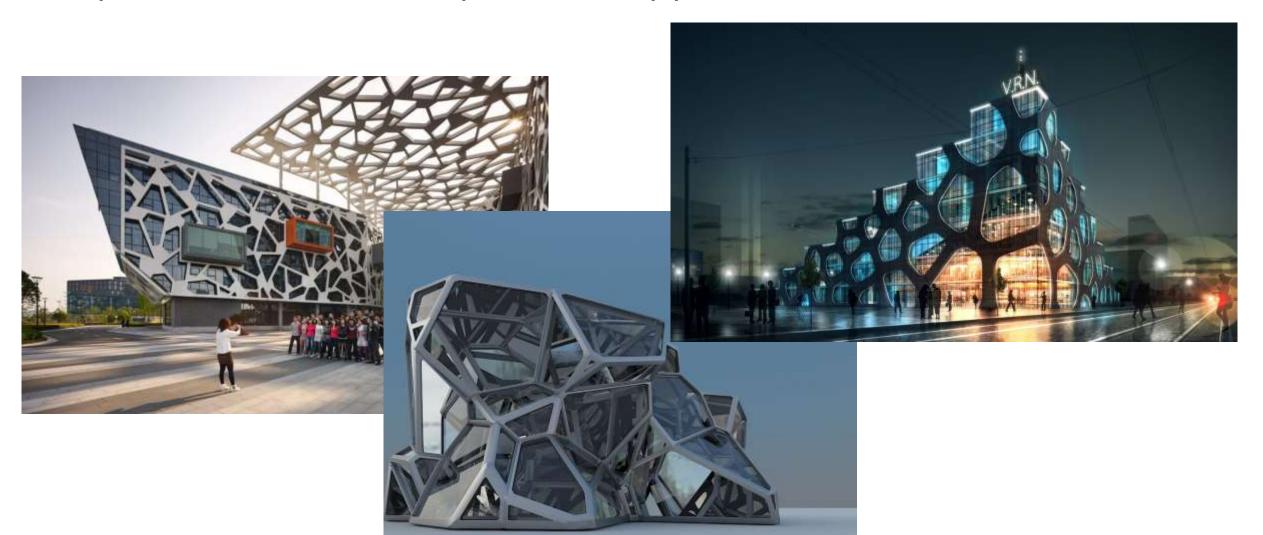
Движение заметающей прямой



Принцип работы Алгоритма Форчуна

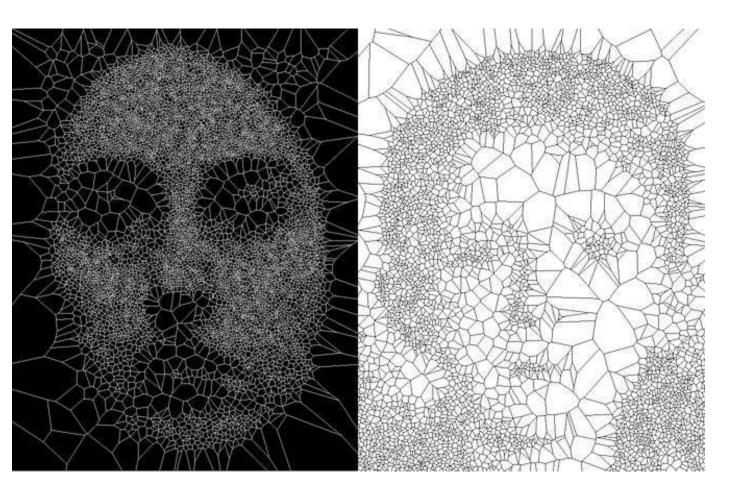
Описание работы алгоритма Форчуна

Применение в архитектуре

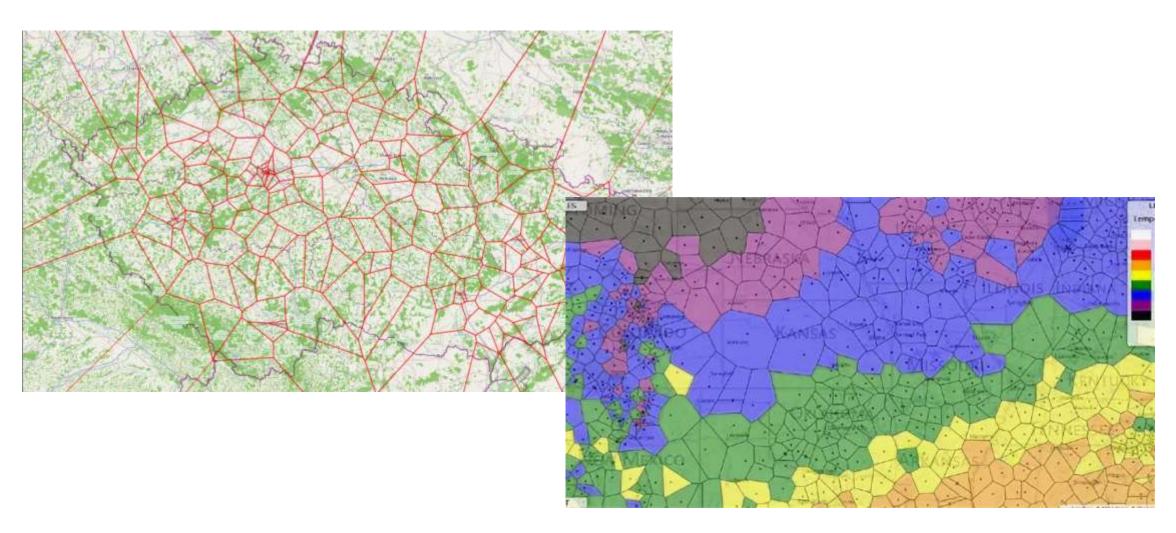


Применение в моделировании изображений





Применение в картографии



Исследование производительности



