

Задание 4

Для полутонового изображения вычислить его размерность Минковского методом построения покрывала.

Используемые формулы:

$$u_{\delta}(i, j) = \max \left\{ u_{\delta-1}(i, j) + 1, \max_{|(m,n)-(i,j)| \leq 1} u_{\delta-1}(m, n) \right\}; \quad (1)$$

$$b_{\delta}(i, j) = \min \left\{ u_{\delta-1}(i, j) - 1, \min_{|(m,n)-(i,j)| \leq 1} u_{\delta-1}(m, n) \right\}. \quad (2)$$

$$\text{Vol}_{\delta} = \sum_{i,j} (u_{\delta}(i, j) - b_{\delta}(i, j)). \quad (3)$$

$$A_{\delta} = \frac{\text{Vol}_{\delta}}{2\delta}; \quad (4)$$

$$A_{\delta} = \frac{\text{Vol}_{\delta} - \text{Vol}_{\delta-1}}{2}. \quad (5)$$

$$D = 2 - \frac{\log_2 A_{\delta}}{\log_2 \delta}. \quad (6)$$

Алгоритм:

Алгоритм вычисления.

1. Разбиваем изображение на n квадратных ячеек размера $N \times N$.

2. Для каждой ячейки строим функцию градации серого F .

3. Определяем u_0^k и b_0^k как $u_0^k(i,j) = b_0^k(i,j) = F(i,j)$, $k=1, \dots, n$.

Для $\delta = 1, 2$.

4. Вычисляем u_{δ}^k , b_{δ}^k по формулам (1) и (2).

5. По (3) вычисляем объемы δ -параллельных тел для поверхностей, построенных над ячейками.

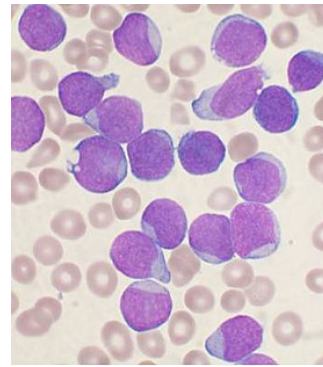
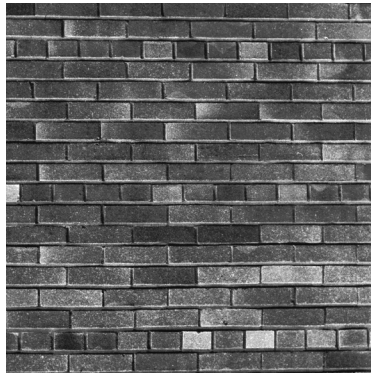
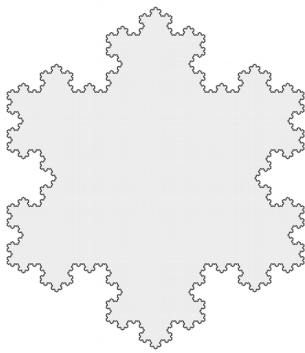
6. Определяем площади A_{δ}^k по формуле (5).

7. Суммируем полученные площади по всем ячейкам:

$$A_1 = \sum_{k=1}^n A_1^k, \quad A_2 = \sum_{k=1}^n A_2^k.$$

Из формулы (6) определяем фрактальную размерность документа.

Исходные изображения (в масштабе):



THE NEW YORK TIMES **OP-ED** TUESDAY, AUGUST 5, 1997

Our Chance for Healthier Children

By Hillary Rodham Clinton

The historic balanced budget bill that the President is set to sign today offers hope that as many as five million uninsured boys and girls will receive the health care they need, from checkups to antibiotics to complicated surgery. As the largest expansion in children's health coverage since Medicaid's creation 33 years ago, the bipartisan legislation could move the United States closer to shedding its status as the only Western industrialized nation that does not provide basic health benefits to all children. Even as we celebrate this progress, we should recognize that passage of a bill, no matter how historic, does not guarantee success. Whether this legislation fulfills its promise depends on how hard we are willing to work in the months ahead.

Finding uninsured children who are scattered across the country, and then insuring them, will not be easy. As successful as Medicaid has been, an estimated three million eligible children are still not enrolled, because their parents don't know about the program, are unclear about whether they qualify, are reluctant to accept "government" help or are confused by complex eligibility rules. Millions of other uninsured children have working parents who are employed by businesses that don't

For this new bill to fulfill its promise, states first have to agree to participate and build on successful efforts that many have already made. While \$24 billion in Federal aid over five years should be a significant incentive, dollars alone may not induce participation across the board. That's why our most urgent task is to educate citizens, especially parents, about what is at stake, and to encourage state officials to join the program and assure adequate benefits for all children.

Meeting this challenge will require a joint effort involving the Federal Government, states, localities, advocacy groups, foundations, health care providers, insurers and businesses — all of whom will have to work to inform families about insurance options for their children. The Federal Department of Health

and Human Services, for example, will offer guidance to state officials by helping to interpret key portions of the law and provide technical assistance to states with little or no experience in children's health programs.

Health care providers and insurers, who will benefit from a population of newly covered patients, can play a pivotal role in designing high-quality health plans and enrolling uninsured children who come to the hospital or emergency room for care.

Finally, states will have to meet the law's requirement that new dollars not be used to replace or supplant existing coverage. Otherwise, the legislation could have the perverse effect of reducing current public and private commitments to children's health.

Luckily, many states have already taken the lead in enrolling children in health plans. Florida works through schools to educate parents about signing up. Pennsylvania has adopted outreach efforts that help eligible families find the program best suited to their needs. Minnesota has chosen to use Federal dollars to expand its successful Medicaid program.

Parents will have the most significant role of all. They will have to

A big step toward insuring all Americans.

Полученные результаты:

../koch.png : 1.798
../bricks1.png : 1.682
../leukemia.jpg : 1.798
../textpaper.jpg : 1.763

Исходный код: на платформе GitHub

https://github.com/kseniadumpling/fractal-analysis-labs/blob/master/lab4_minkowski/main.py