Control and algorithmic supervision for preventing collisions

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Inspira Crea Transforma

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Designed Data Structure
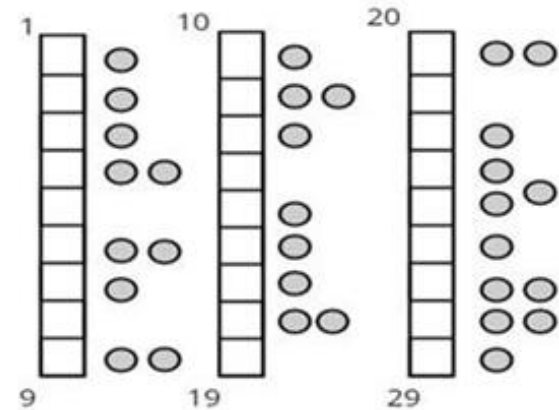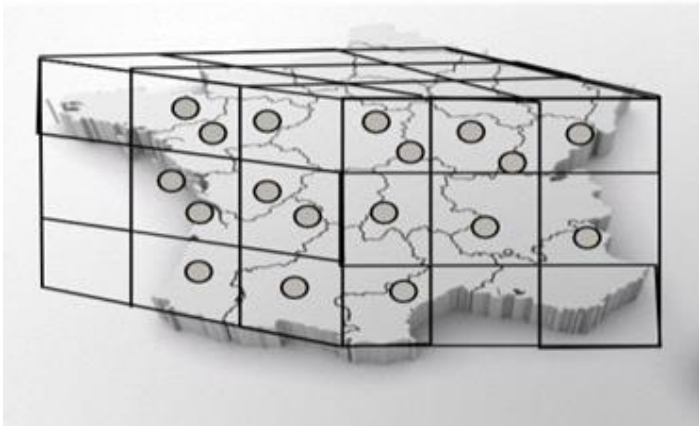
Three dimensional Matrix

Figure 1-2: Representation of the matrix designed for Bello and the classification of bees.

Operations of the Data Structure

- **Create the cells:** we use this to define the cells in which the bees will be found. In each cube will be found the bees stored in a stack, these bees being the same cube are the ones that are at collision risk.
- **Detect collision:** given the coordinates of a bee it will be added to a certain stack with those bees that are at risk collision.
- **Adjacent bees:** determines which bees are adjacent cubes and end up being at collision risk.

Method	Complexity
areaDeUbicacion()	O(n)
abejasAdyacentes()	O(m)
detectarColisiones()	O(n + m)

Table 1: Complexity

Design of the data structure

- The complexity must be less than O(n^2)
- Inserting and removing from a stack is O(n).
- The 3D matrix represents an space.
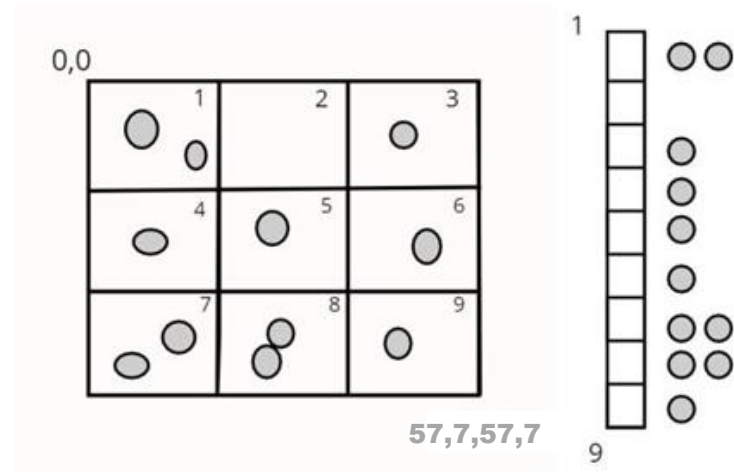- While two bees are at risk, do not have to analyze the others.

Figure 3: 2D approach

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Time and memory used

Método	Tiempo promedio(ms)						
	Número de abejas						
	4	10	100	1.000	10.000	100.000	1'000.000
areaDeUbicacion()	0,6	3,6	3,6	11,6	28,4	275,8	3.315,2
detectarColisiones()	0	4,2	11	8,2	37,8	131,8	673,6
guardarArchivo()	1,6	3,2	7,4	5	112,8	770	6.060,2

Número de abejas	Memoria
10	1
100	2
1000	4
10000	15
100000	80
1000000	245

Table2-3: Time in ms and memory in MB and results

Software

Number of bees	Resultados
4	4
10	4
100	24
1000	279
10000	9546
100000	99184
1000000	1000000

Table 4: obtained results

$$X = \frac{(Max - Min) * 111111}{\frac{100}{\sqrt{3}}}$$

Equation 1: size of the axis

$$D = \frac{(x - Min) * 111111}{\frac{100}{\sqrt{3}}}$$

Equation 2: clasiffication of bees

REFERENCES

[1]. Liu, B. and Su, X. An Anti-Collision Algorithm for RFID Based on an Array and Encoding Scheme. Information, 2018, 2078-2489. Accessed August 25, 2018 from Universidad EAFIT: https://bit.ly/2PEzPhx [2]. Dinas, S. and Bañón J. M. A literature review pf bounding volumes hierarchy focused on collision detection. Ingeniería Competitiva, 2015, 49-62. Accessed August 25, 2018, from Universidad EAFIT: https://bit.ly/2BMI9sD

[3]. Nevala, E. Introduction to Octrees. GameDev.net, 2018. Accessed September 23, 2018: https://bit.ly/2pxAzJa

[4]. Spatial hashing implementation for fast 2D collisions. The mind of Conkerjo, 2013. Accessed September 23, 2018: https://bit.ly/2xHprNK

[4]. How to efficiently remove duplicate collision pairs in spatial hash grid? Stack Overflow, 2015. Accessed September 23, 2018: https://bit.ly/2O2PPvG