Research improves real-time visualization of trees in 3-D videogames

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The work developed in the Interactive Visualization Centre provides faster and more efficient vegetation design systems.

A study developed in the Universitat Jaume I (UJI) will improve the realism of trees in 3-D video games thanks to the advance in the geometric representation of leaves of different forest species. The Interactive Visualization centre (CEVI), a research group led by Miguel Chover, professor of the Department of Computer Languages and Systems, has developed the work that has been published in the journal *Entropy*.

The conclusions obtained in this research "result in trees and plants with very few leaves that maintain the similarity with the original, thus enabling the creation of multi-resolution models in real time," says Chover.

"By reducing the number of leaves, systems can go much faster than if you had to draw the whole tree, so it is possible to use it in real time," says researcher Cristina Gasch. "In addition, by maintaining the similarity with the original tree, this method allows that as players move away from the tree or the plant in a video game, these elements can have their leaves reduced without users to realize."

The new method can also be used to reduce the cost of drawing a tree or plant that is partially hidden by walls or fences, among other obstacles. "Having covered leaves, these are the ones that first are eliminated," says the Professor of Computer Languages and Systems of the UJI Miguel Chover.

The work consisted of designing a new method of simplification of plants and trees that allows a great improvement in visual appearance. Cristina Gasch explains, "The element is placed inside a geometric figure and an image is obtained from each corner of the figure. Depending on the geometric figure, the number of images obtained is greater or lesser. Then a leaf is removed from the tree or plant and the images are obtained again." The next step is to compare the new images

with the previous ones and give a value to that difference, which is called the "error." Then the removed leaf is added again and another is eliminated, repeating the process, and so on, with each one of the element's leaves.

When the system obtains the error of all the leaves, it looks at the smallest one, which indicates that it is the leaf that, when eliminated, modifies the element to a lesser extent. When found, the leaf is definitively eliminated and the nearest leaf is scaled so that the leafiness of the plant or tree is not affected. Finally, the process is repeated until the element has been simplified to the extent required.

More information: Cristina Gasch et al. Viewpoint-Driven Simplification of Plant and Tree Foliage, *Entropy* (2018). DOI: 10.3390/e20040213

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