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Extraction and modeling of seasonal variation factor in green landscape

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Landscape simulations have been becoming popular to the public by evolution of geospatial information technology. Moreover, in the scheme of the beautiful country creation policy decided in 2003, it is one of the themes that the three-dimensional landscape simulation by using GIS is carried out for landscape comparison and analysis. Which are comparatively shorter than the period of landscape transition, have been considered as variation factors in landscape engineering. However, the effect of variation factors on landscape is not so clear. In this research, a green landscape showing a delicate change with a change of the time is intended as the object. The green changes its aspect such as flowering and leaves' coloring. They extract the green changing delicately such an aspect, and express the green landscape of every season by using CAD/CG after grasping the positional data.

At first, the city of Kyoto is selected as a case study area because the seasonal scenes there become tourist attractions. Next, the authors analyze in a large region in order to set the objective area and the viewpoint field. Finally, they grasp the vegetation changing in a scene landscape as a fundamental form of landscape. And they express changes in the green in every season visually by using CAD/CG.

They understand the status of vegetation around Kyoto in order to select the concrete study area. The existing vegetation map provided by the Biodiversity Center of Japan shows the Japanese maple and Japanese zelkova grow in groups in Arashiyama-Sagano district. Therefore, Arashiyama-Sagano district was selected as the study area, and the case study scenes and their viewpoints were selected by using the photo community website, too. As a result, two scenes were selected as the case study scenes. One is the scene which looks at the Togetsu Bridge against the background of Mt. Arashi, and another is the scene which looks at Mt. Arashi as a scenic backdrop from the Tenryu Temple.

In order to find the important tree in scenes, the visible-invisible analyses were conducted from two selected viewpoints. These analyses used DSM which made from DEM and LIDAR data. Because the ratio which the Japanese maple-zelkova community is seen in from two viewpoints is high, the vegetation distribution of the Japanese maple-zelkova community is understood in great detail.

The tree height is different approximately 10m between the Japanese maple and the Japanese zelkova. Therefore, the authors think that paying their attention to the surface of the Japanese maple-zelkova community can catch the distribution of the Japanese maple, which is in the layer of the near tall tree. Then, they has grasped the trees position located in the layer of the near tall tree by using contour lines made only from the first pulse of LIDAR data. Also the vegetation distribution of Arashiyama-Sagano district is expressed on TIN generated by every tree class and community. It is necessary to inspect whether a position of the Japanese maple which they extracted is right. So, the authors utilized the photogrammetry to verify the position of the Japanese maple. They combined the photo image taken on the spot with CG image rendered from 3D model. As a result, it could be confirmed that the Japanese maple leaves in the photo image had turned red at the same position as in 3D model made from LIDAR data.

Then, we utilize the geospatial information and estimate the position of the wild cherry trees. According to geometric characteristics and growth conditions of the wild cherry trees, they made 3D models for the wild cherry trees at the appropriate positions. And also they verified the positions of the wild cherry trees by the photogrammetry as well as the Japanese maple.

Finally, they made the entire 3D models by using CAD/CG to carry out the landscape simulation every season. As a result, utilizing LIDAR data and photo images specified the tree positions, and every seasonal scene could be modeled.

Keywords: green landscape, variation factor, vegetation