

The Buffer Zone Model of Natural Conservation Area

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1. Introduction

In the Kii mountainous region in the south Kinki area, there are preserved beautiful forest and river. However, the area faces problems of sustaining local industries as number of successors was declining due to the decrease of birthrate which is the major problem of Japanese society. Especially the decline of population and competitiveness of local industries are serious problems.

The 'Sacred Sites and Pilgrimage Routes in the Kii Mountain Range' are registered under the World Heritage Site in July 2004. This is the second example of linear type World Heritage Site. The first Site was the 'Camino de Santiago', which means the 'Way of St. James' in northern Spain.

The buffer zone of the 'Sacred Sites and Pilgrimage Routes in the Kii Mountain Range' is set as fifty meters from the center of the trails for both sides. This fifty meters' buffer zone was set without theory in terms of conservation of the environment around the World Heritage registered area.

The core area of the 'Camino de Santiago' is linear type as well. It connects cultural monuments, cathedrals and beautiful nature sites in Spain and in France. The buffer zones of the area was set for thirty meters from the center of the trails for both sides. However, if considering the visibility of the Pyrenees mountainous areas, wider area should be covered as buffer zone. As there are no standard criteria for the buffer zone setting that the study aims to develop GIS, which can determine the appropriate buffer zone.

2. Purpose of Report

In this report, we tried two studies; one was to survey the visibility of forest with plants laser measurement device. Secondly, the study achieved the method to describe the forest model in digital format. As for the further step, we will analyze the relationship between the result of the survey and the model. Based on the data we obtained, we will try to make a model to set buffer zone for conservation area.

3. Analysis

The analyzed area of this report is Koyasan Cyoichi-michi trail in the 'Sacred Sites and Pilgrimage Routes in the Kii Mountain Range' World Heritage Site. We surveyed several points using 3D laser scanner. The points were determined based on the pre-survey by photo and conventional measured. The points we surveyed differ such as vegetation and geographical conditions. The typical vegetation was the cluster of plants of cryptomeria. On an average within the seventeen meters there were many obstacles, which disturb visibility (24.7%).

We also analyzed to application of the survey results to a model plantation area for the comparison. The artificial plantation model is created from the typical trunks of trees with locations and even distances, which make the model to be quantitative.

We set the viewpoint surface every one meters. We estimated that the visible area and invisible area can be determined by setting lines between human visions and trees within. It showed the difference between visible area and invisible area. The percentage of the transitivity of visibility is calculated based on the above results.

The model is set based on periodical growth of plants. The previous study indicated that statistically cryptomeria of forty to sixty years old is majority of plantation. We calculated the distances of transitivity (an average distance) based on the visible-invisible analysis using GIS system. Finally, we verified the results (photographs) at the actual sites.

4. Conclusion

The study found out the possibility of the method that make the model of the buffer zone related with real space. The model we established in this study can expect statistically reliable results from simple survey method and objective data. The study will fine-tune results in applying the detailed data. Simultaneously, we aim to develop criteria based on the differences of the part of trees, as well as other natural environment.

Keywords: buffer zone, world heritage, Sacred Sites and Pilgrimage Routes in the Kii Mountain Range, GIS