論文の内容の要旨

論文題目 **Forest Resources Assessment for the Renovation of Historical Wooden Buildings in China**

（中国における歴史的木造建造物の修復のための森林資源の評価）

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Environmental protection has become one of the most urgent contemporary issues. To manage the relationship between humans and nature, the wooden cultural world heritage, a global concern, is becoming the most important wealth for human's who constantly reflect on their roles in nature. Surviving historic wooden buildings, as evidence of ancient people's wisdom and craftsmanship, are of practical significance in exploring the sustainable use and restoration of renewable forest resources.

The International Council On Monuments and Sites (ICOMOS) under the United Nations Educational, Scientific and Cultural Organization (UNESCO) established "principles for the preservation of historic timber structures" that includes preservation of the "same tree species", "tree quality", and "building techniques". The Chinese renovation laws for historic buildings have outlined that the materials used for restoring these buildings should be the same as the original material as much as possible. In this light, maintaining Chinese traditional wooden buildings requires accurately ascertaining what type of wood and how much would be used, as well as the availability of timber in the market.

In ancient times, construction and renovation of buildings in China consumed a large amount of natural forest resources, and caused tremendous damage to these forests. Recently, a precipitous decrease in the production of large-diameter, high-quality wood has occurred as a result of social and economic changes. In 1998, the Chinese government implemented the Natural Forest Conservation Projects (NFCP) policy in an effort to promote forest management activities that prevent further deterioration of these resources. This policy, which emphasizes protecting existing natural forests from excessive cutting, has been applied in 18 provinces and several autonomous regions. While benefiting ecological preservation, the NFCP policy has also affected domestic timber production. The challenge of promoting conservation while seeking to acquire large volumes of wood from natural forests for historic renovation is not unique to China, but is also experienced in countries such as Japan and Sweden.

This study combines the knowledge of three different majors – architecture, forest management and remote sensing technology to solve the renovation problem related

to historic wooden buildings in China; an assessment system on the existing forest resources is created. The result shows that large size larch resources cannot fully satisfy the requirement from building site.

The three main steps are: 1) the large wooden parts on Shenyang Imperial Palace are measured and analyzed. A timber volume prediction model is created based on module theory of "Ying Zao Fa Shi" and "Kung-ch'engtso-fatse-li". By applying this model, the wooden parts volume of Shenyang Imperial Palace is estimated. 2) An efficient upper tree diameter identification method is developed based on the natural forests in Mt. Changbai area, North-East China. By applying this method, the wooden parts information from building site is transferred into DBH information of standing trees. Furthermore the standing trees resources for the renovation purpose of Shenyang Imperial Palace are estimated. 3) Remote sensing technology is applied for generating individual tree crown areas. An algorithm conducts about 55% user's accuracy of good individual tree crown delineation. Large size tree resources in whole study area (25km2) are assessed by developed algorithm. The result shows that extremely large size larch resources is rare, it may not fully satisfy the renovation purpose for now. This study can be treated as a systematic forest resources assessment method for the renovation issue on historical wooden buildings in China.