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INDIVIDUAL TREE PARAMETER EXTRACTION AT THE PLOT LEVEL IN TROPICAL FOREST USING TERRESTRIAL LASER SCANNING

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ABSTRACT

Forests are essential among the resources because they provide a source of wood as well as a means of protecting the hills, regulating streamflow, and minimizing soil erosion, among other things. Forests can only provide maximum advantages and benefits if they are managed appropriately. The quantity and quality of data available about the forest are crucial to effective forest management. If a renewable natural resource like a forest is to be managed reasonably and sustainably, basic data and information are essential. Forest inventories are the source of this data. This study aims to assess individual tree parameter extraction at the plot level in Tropical Forest using Terrestrial Laser Scanning (TLS). In order to achieve this study, there are two objectives of this research which are to establish the data collection of tree attributes such as tree species, tree height, diameter at breast height (DBH) using conventional method and terrestrial laser scanning and to identify the performance of Vision Lidar software and Cloud Compare software in generating the individual tree quantification. The method involved in the data processing used Vision Lidar and Cloud Compare software to process digital data and do the processing. This study will help the data of the tree characteristic to be kept updated using advanced technology. As a result, in terms of equipment purchase costs, staff skills and qualifications, data collecting working time, data recording accuracy, post-processing time, and labor expenses, one can select the most cost-effective approach for gathering forestry reference data. Although the application of TLS in forest inventory is a promising technology.

CHAPTER ONE

INTRODUCTION

1.1   Research Background

Forests and trees are essential elements of life on Earth to support basic human needs and contribute to culture and recreation. Other than that, they have a crucial function in the environment, such as providing a habitat for biodiversity, controlling climate, and purifying the atmosphere. Furthermore, forests play an important role in mitigating global warming caused by increased carbon dioxide (CO^2) levels in the atmosphere, and they hold 86% of all terrestrial plant carbon on the Earth (Wassihun et al., 2019).

However, forest inventory information has always been important to forest management. Forest inventory is a general characterization of the forest in terms of diameter at breast height (DBH) of trees, species, and their mean height. In other terms, a forest inventory is a systematic collection of data and information on forests for assessment and analysis (Khameneh, 2013).

Other than that, modern technologies such as Terrestrial Laser Scanner (TLS), which may determine the vertical and horizontal structure of a forest by scanning targets with laser pulses, are usually used nowadays (Jung et al., 2011). According to Liang et al. (2019), terrestrial laser scanning (TLS) has been proved to be an efficient technology for acquiring reliable information on tree inventories in forest sample plots over the previous two decades.

Since the last decade, the use of three-dimensional (3D) terrestrial laser scanning (TLS) data with the use of several algorithms for single tree extraction has been widely used in the field of forestry to reduce the time, manpower, and cost of conventional forest inventory method (Khameneh, 2013). In addition, the terrestrial laser scanner is a type of high-speed and high-precision data acquisition instrument that is increasingly being used in forest inventory studies.

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