

Terrestrial Point Cloud for Forest Modelling

Instructors:

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Target audience: Graduate university students in the fields related to geomatics and environmental studies; staff from national forest inventory agencies; public authorities and interested parties involved in terrestrial data collection and processing.



Introduction: Forest field data are conventionally collected through manual measurement, e.g. by destructive measurements in many cases, which is labor-intensive and time-consuming and requires more effective measurement solutions. Terrestrial laser scanning (TLS) became practically available approximately twenty years ago, which documents three-dimensional (3D) environment with millions to billions of 3D points. The major advantage lies in its capability to digitize the forest accurately, automatically and in millimeter-level of detail. Terrestrial point cloud for forest modelling has experienced a rapid growth in the last two decades. New systems became capable of producing point clouds at a comparable level as TLS, e.g., from mobile laser mapping systems (MLS) and consumer cameras (through Structure from Motion, SfM), having their own advantages, e.g. with high speed or low cost. Research continuously demonstrates new potentials of applying terrestrial point cloud in forest modelling. Nowadays, terrestrial point cloud is anticipated to be a practical data source for the future forest mapping and national forestry inventories.

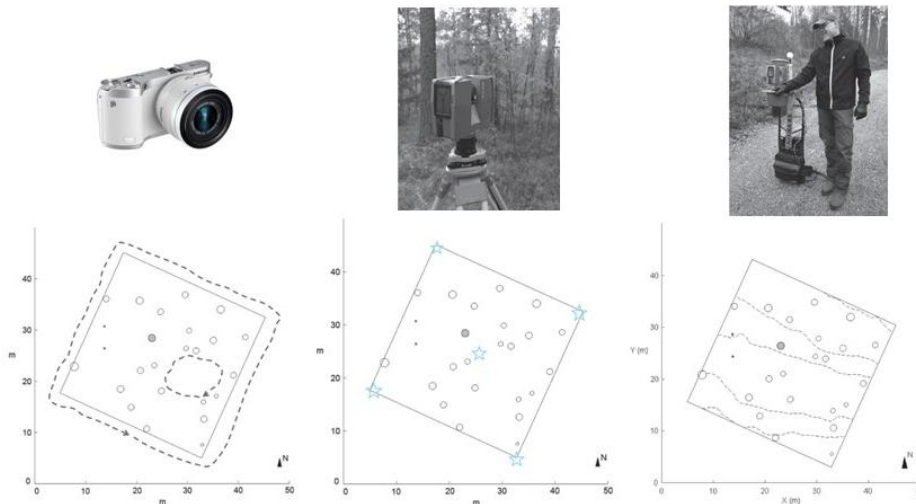
Course objective: The course reviews various systems for terrestrial point cloud data collection, e.g. TLS, MLS, SfM, and their performances for individual tree mapping and modeling. The basic principles of data acquisition and processing methodologies will be introduced. Exercises will also be executed to investigate point cloud generation, individual tree mapping and 3D modeling. The participants will get insights of the advances and the challenges of applying terrestrial point clouds in forest environment.

Course outline: The pre-course seminar in Technical University of Braunschweig will provide an overview on the status quo of different terrestrial point clouds and their applications in forest modeling. The e-learning part of the course will give basic theoretical

concepts of different systems as data sources of terrestrial point clouds, followed by step by step instructions and exercises that will guide the students through data collection, data pre-processing, and individual tree mapping and modeling. Introductory materials and exercise materials will be published online for the students. Support from the instructors will be available through e-communications.

Module 1. Principles of terrestrial point cloud

The module introduces the basic concepts of terrestrial point clouds, e.g., the instrument, the measurement principles and the potential applications, discusses the advantages and disadvantages of different measurement principles.



Module 2. Progresses of applying terrestrial point cloud in forest modeling

The module reviews the the research progresses of the applications of terrestrial point cloud in forest modelling. The module will also summarize the latest statues of applying TLS in practical forest environment. The pros and cons will be discussed in details.

Module 3. Feature extraction

The module will present the fundamental steps in the data processing chain, e.g. noise reduction, tree detection, tree modelling and parameter estimations.

