3. RESULTS AND DISCUSSION

In the study, a single tree was scanned by using TLS to obtain high accuracy tree parameters. Then, registered and filtered point cloud data of tree was analyzed in SimpleTree software. According to analyses results, diameter of breast height of measured tree was calculated as 26.572 cm while tree height calculated as 13.978 meter (Table 2) (Figure 4). These calculated results are parameters that are the most considered in forestry studies which commonly measure with conventional measurement methods.

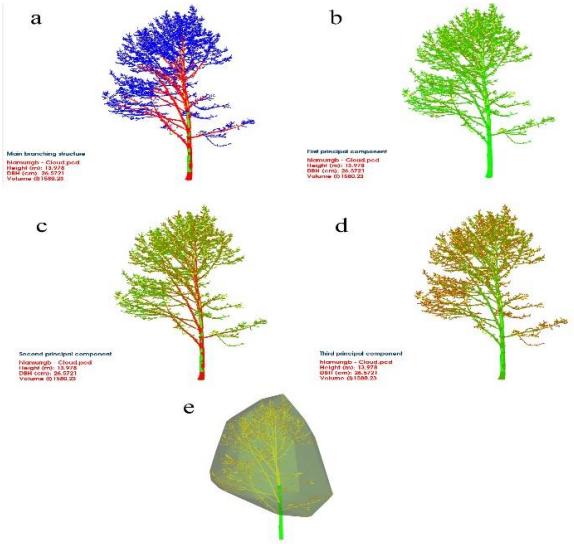

Figure 4. Extraction of branching order and tree components a) main branching order, b) first principle component, c) second principle component, d) third principle component e) 3D canopy modelling

Parameter	Value
Volume [m^3]	1.580
Solid Volume [m^3]	0.571
Stem Volume [m^3]	0.576
Height [m]	13.978
Length [m]	17.430
DBH [cm]	26.572
VolUntilFirstBranch [m^3]	0.310
VolUntilCrown [m^3]	0.310
Crown base [m]	0.863
CrownVolume [m^3]	52.855
CrownArea [m^2]	34.586
CrownProjectionArea [m^2]	70.838

Table 2. Detailed parameter of tree

Contrary to conventional forest inventory methods, the point cloud based data provide extra detailed parameters such as branch ordering and it's volume (Table 3), 3D canopy modelling, canopy parameters etc. And also TLS based 3D modelling result can be used in stem modelling (Figure 5) which will be used in timber volume estimation in forestry.

Branch order	Volume
1	0.575814
2	0.424947
3	1.128415
4	1.038678
5	0.382939
6	0.175417
7	0.000702

Table 3. Branch volumes of tree

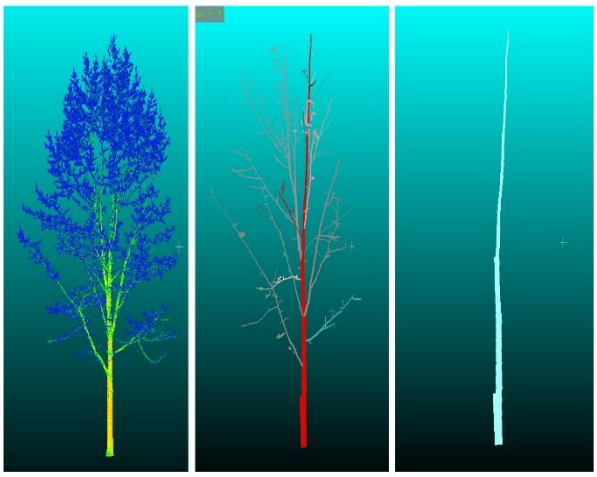

Figure 5. Extraction of main stem

The results indicated that, terrestrial laser scanner is an effective measurement tool to provide high accuracy and objective results for 3D modelling of tree structure parameters. One of the most important stage in modelling is noise cleaning. And also scan station number is important for right modelling. In the determining of scan station placement, users have to consider environmental obstacle which may be restrict scanning.

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