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A Study on Shear Field Test Method in Timber Shear Modulus Determination Using Stereo Vision System

Authors : Niaz Gharavi, Hexin Zhang

Abstract : In the structural timber design, the shear modulus of the timber beam is an important factor that needs to be determined accurately. According to BS EN 408, shear modulus can be determined using torsion test or shear field test method. Although torsion test creates pure shear status in the beam, it does not represent the real-life situation when the beam is in the service. On the other hand, shear field test method creates similar loading situation as in reality. The latter method is based on shear distortion measurement of the beam at the zone with the constant transverse load in the standardized four-point bending test as indicated in BS EN 408. Current testing practice code advised using two metallic arms act as an instrument to measure the diagonal displacement of the constructing square. Timber is not a homogenous material, but a heterogeneous and this characteristic makes timber to undergo a non-uniform deformation. Therefore, the dimensions and the location of the constructing square in the area with the constant transverse force might alter the shear modulus determination. This study aimed to investigate the impact of the shape, size, and location of the square in the shear field test method. A binocular stereo vision system was developed to capture the 3D displacement of a grid of target points. This approach is an accurate and non-contact method to extract the 3D coordination of targeted object using two cameras. Two group of three glue laminated beams were produced and tested by the mean of four-point bending test according to BS EN 408. Group one constructed using two materials, laminated bamboo lumber and structurally graded C24 timber and group two consisted only structurally graded C24 timber. Analysis of Variance (ANOVA) was performed on the acquired data to evaluate the significance of size and location of the square in the determination of shear modulus of the beam. The results have shown that the size of the square is an affecting factor in shear modulus determination. However, the location of the square in the area with the constant shear force does not affect the shear modulus.

Keywords : shear field test method, BS EN 408, timber shear modulus, photogrammetry approach
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