

## The Evaluation of Static Deficiencies of Lower Limbs with the Use of Non-Contact Measurement

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**Abstract:** The purpose of this paper is to develop a procedure of the lower limbs volumetric modelling using the laser measurement arm and the evaluation of defects, which can cause disorders in the field of locomotion. The procedure is presented based on the analysis of two specimens: woman (age 22) and man (age 23), whose lower limbs are fully formed. The method includes the laser scanning and the lower limbs regularity evaluation based on the characteristic lines, which were identified during palpation examination of the skin and bones characteristic points or during the radiological examination. The valgus knee and the knee joint hyperextension were determined for the woman's case and no deficiencies for the man's case. Presented procedure has a screening application and can support the rehabilitation process. The advantage is that the developed method is noninvasive and the diagnostics can be performed while muscles are active in the natural standing position. The SL method was verified by the Laser Tracker system. On the group of 55 students with the average age of 10.4 years, the measurements were performed in order to define the influence of BMI on the correctness of the results, which were achieved while using the proposed method of the evaluation of the static deficiencies. No relevant influence of BMI on errors occurring in the determination of defects valgus and varus of the lower limbs.

**Keywords:** Laser scanning; 3D modelling; Valgus; Varus; Characteristic points; Baseline; BMI