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Measurement System Analysis of VS Lite

Ghazirah Mustapha[1, a *], M Saiful Aizat Shafie[2,b], Nur Hayati M Yahaya[1,c] and Jamaluddin Mahmud[1,d]

[1]Faculty of Mechanical Engineering, Universiti Teknologi MARA, Malaysia

[2]School of Mechanical Engineering, Universiti Sains Malaysia, Malaysia

[a]ghazirah@yahoo.com, [b]saiful_aizat@yahoo.com, [c]asyati21@yahoo.com, jm@salam.uitm.edu.my[d]

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Abstract. Virtual Sensei Lite (VS Lite) is an inexpensive user-friendly motion analysis system. As an alternative motion analysis system, it is a must for VS Lite's user to assess the accuracy of the measurement system capability. To date, such analysis to observe the reliability and accuracy of VS Lite has not been reported. Therefore, this study proposes a procedure for assessing the accuracy and capability of the Virtual Sensei Lite using ANOVA Gage Repeatability and Reproducibility (Gage R&R) designed experiments. In this procedure, a gage R&R study is conducted to obtain replicate measurements on nine parts by three operators. The total variation due to measurement error is then observed to identify the accuracy of measurement. The study able to demonstrate on the accuracy of VS Lite as the value of total variation due to measurement error is within 10%-30%.

Introduction

Recently, Motion Capture (MoCap) Systems like the Vicon (U.K) and Eva Real Time (U.S.A) is available to serve the need in biomechanics study of human performance [1]–[3]. The system requires expensive high-speed digital cameras in order to capture the motion performed by subjects [4]. Factors mentioned lead to the exploration towards low cost and portable solution [5], [6]. Virtual Sensei Lite (VS Lite), a low-cost 3D motion analysis system to quantify the complex movements in martial arts is identified as an alternative motion tracker [7] to the established Motion Capture System [8].

VS Lite is able to track the motion and could automatically provide the three dimensional position data. This feature allows the software to visualise and analyse the kinematic characteristic and kinetic energy of the subjects. Moreover, it could track the human motion and directly provide the three dimensional positioning data that is required for the post processing and visualisation of the mechanic (kinematic & kinetic) characteristics experienced by the limbs of the martial arts practitioner [8]. Fig. 1 indicates the GUI and data visualisation by Virtual Sensei Lite. The Virtual Sensei Lite automatically determined the positions of fifteen body landmarks while the subject performs the calibration posture.

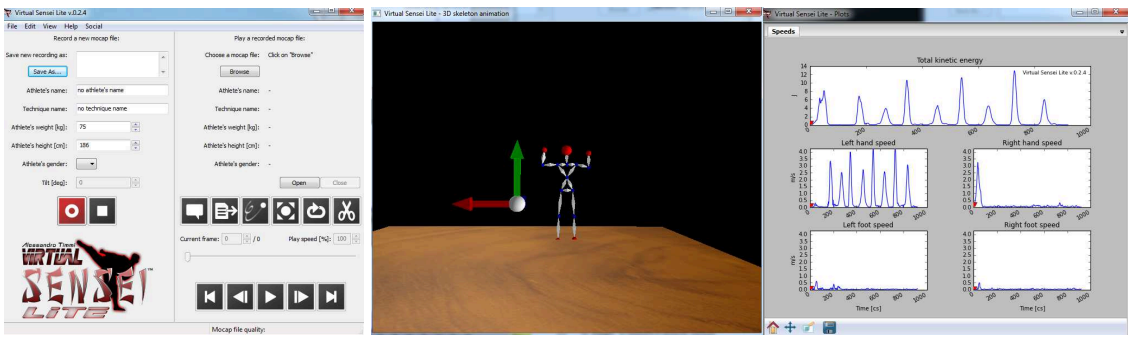

Fig. 1: VS Lite GUI and data visualization