



Correction to : Estimating Measurement Uncertainty on Stress-Strain Curves from SHPB

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Equation (12) in the original article [1] gives the strain from the measured voltage on a full bridge configuration of the four strain gages. The full-bridge is intended to measure tension-compression strain (type III full-bridge), the correct equation is therefore [2]

$$V_r(t) = \frac{e(t)}{V_{ex}} \quad (1)$$

$$\epsilon_{III}(t) = \frac{2V_r(t)}{\kappa[(1+\nu) - V_r(t)(1-\nu)]} \quad (2)$$

and not

$$\epsilon_{II}(t) = \frac{2V_r(t)}{\kappa(1+\nu)} \quad (3)$$

which corresponds to a type II full-bridge for bending measurements (see table 12.2 in [2]). κ is the gage factor, V_r the bridge output and V_{ex} the excitation voltage.

The measurement uncertainty on the strain was given as (see equation (13) in [1]):

$$\left[\frac{u(\epsilon_{II}(t))}{\epsilon_{II}(t)} \right]^2 = \left[\frac{u(\kappa)}{\kappa} \right]^2 + \left[\frac{u(\nu)}{1+\nu} \right]^2 + \left[\frac{u(V_{ex})}{V_{ex}} \right]^2 + \left[\frac{u(e(t))}{e(t)} \right]^2 \quad (4)$$

which holds only in case of type II full-bridge (Equation 3). For type III full-bridge, from Equation 2 and the rules for expressing uncertainty (see [3]), the uncertainty in the strain is:

$$\left[\frac{u(\epsilon_{III})}{\epsilon_{III}} \right]^2 = \left[\frac{(1+V_r)\nu}{(1+\nu) - V_r(1-\nu)} \right]^2 \left[\frac{u(\nu)}{\nu} \right]^2 + \left[\frac{u(\kappa)}{\kappa} \right]^2 + \left[\frac{1+\nu}{(1+\nu) - V_r(1-\nu)} \right]^2 \left[\frac{u(e)}{e} \right]^2 + \left[\frac{1+\nu}{(1+\nu) - V_r(1-\nu)} \right]^2 \left[\frac{u(V_{ex})}{V_{ex}} \right]^2 \quad (5)$$

□

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A first order asymptotic approximation of Equation 2 gives

$$\epsilon_{III} = \frac{2V_r}{\kappa(1+\nu)} (1 + o(V_r)) \quad (6)$$

Finally, the order of magnitude of V_r during the experiments was of a few thousandth. The consequences of the bridge type error on the results (i.e. strain and measurement uncertainty on the strain) are therefore negligible.



References

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