Erratum

Technical Note: The Parametrically Excited Multi-Pendulum

ROBIN S. SHARP

School of Mechanical Engineering, Cranfield University, Bedford MK43 0AL, U.K.

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With reference to my Technical Note, I write to correct a mistake included in it, with apologies.

The purpose of my article was to enhance the previous work of Kane and Levinson, *Multibody System Dynamics* **3**(3), 287–299, by repeating their analyses, confirming their results and illustrating how such problems could be solved using relatively simple contemporary software modules that are commonly available.

I described my findings as “generally confirmatory” and “substantially confirmatory”, referred to “small but definite differences” and to “marginally but detectably different” results.

Before I submitted my paper to the journal originally, I did contact Professor Kane by e-mail to see if he had any idea why my results might be just a little different from his but I see now that I did not supply enough information for him to see why it might be.

Now the paper is in print, he has kindly pointed out my mistake – the inclusion of a zero x -inertia for each pendulum, instead of the symmetric term, $ML^2/12$ – and I have re-run all the computations with the error corrected. There are now no differences between my results and those of the Kane–Levinson paper.

Certain other details have changed from those given in my Note. They are listed as follows:

The expressions for G_{FA1} and G_{FA2} on page 308 should read:

$$\begin{aligned}
 G_{FA1} = & -M(GLS_2(0.5 + C_3(0.5 + C_3)) + S_3(-1/2(LU_2)^2 - 1/2(LPA_{MP} \\
 & \cos(PT)C_2C_3)^2 + L(-LU_1U_2 + GS_2S_3) + (0.5 + 1/3C_3)(LP \\
 & A_{MP} \cos(PT)S_2)^2 - (LPA_{MP} \cos(PT)C_2)^2(1/3C_3 + 1/2S_3^2)) \\
 & + C_2(1/2 GLS_3 - S_2(4/3(LPA_{MP} \cos(PT)C_3)^2 + (LPA_{MP} \cos(P \\
 & T))^2(1/3 + 1/2 C_3(1.0 + C_3^2)) + (2/3 + 1/2 C_3)(LPA_{MP} \cos(PT) \\
 & S_3)^2))), \\
 G_{FA2} = & -M(S_3(1/2(LU_1)^2 + (0.5 + 1/4 C_3)(LPA_{MP} \cos(PT)S_2)^2 - C_3
 \end{aligned}$$

$$\begin{aligned}
& (1/3(LPA_{MP} \cos(PT)C_2)^2 - 1/12(LPA_{MP} \cos(PT)S_2)^2)) + S_2 \\
& (1/2 GLC_3 - C_2(1/12(LPA_{MP} \cos(PT)C_3)^2 - 1/12(LPA_{MP} \\
& \cos(PT)S_3)^2)) + C_2(1/2 GLS_3 - S_2(1/2(LPA_{MP} \cos(PT))^2C_3 \\
& + 1/4(LPA_{MP} \cos(PT)C_3)^2 - 1/4(LPA_{MP} \cos(PT)S_3)^2))).
\end{aligned}$$

Operation counts change as follows:

120 / 29 / 16 become 142 / 32 / 19

50 / 25 / 4 become 123 / 47 / 23

34 / 6 / 3 remain the same

22 / 10 / 0 become 17 / 13 / 4

On page 309, we should have:

$$\begin{aligned}
U'_2 &= -(G(-12/7 Q_2 + 33/7 Q_3)/L - Q_3(PA_{MP} \cos(PT))^2), \\
U'_1 &= -(G(3/4 Q_2 + 3/16 Q_3)/L + 5/16 U'_2 \\
&\quad - (Q_2 + 5/16 Q_3)(PA_{MP} \cos(PT))^2)
\end{aligned}$$

and the numerical matrix should be

$$\begin{bmatrix}
1.05092 & 0.0251036 & 0.0638425 & 0.000525327; \\
0.0334823 & 0.98395 & 0.000700349 & 0.0624423; \\
1.64322 & 0.803792 & 1.05115 & 0.0251094; \\
1.07175 & -0.500648 & 0.0334778 & 0.984175]
\end{bmatrix}$$

with eigenvalues: 1.4188, 0.7048, $0.9733 + 0.2295j$, $0.9733 - 0.2295j$.

On page 310, 1.4628 should be 1.4637, 1.4040 should be 1.4152 and 1.2651 should be 1.3095.

My corrected Figures 2–5 are indistinguishable from the corresponding ones of Kane and Levinson.