Efficacy of Gaia DR2 as a VRI Source

Johnson-Cousins Conversion formulas were taken from the GAIA Data Release Documentation (Author: Josep M. Carrasco), Photometric Relationships with other Photometric systems, Section 5.3.7, Table 5.8:

		$G_{BP} - G_{RP}$	$(G_{BP} - G_{RP})^2$	σ
$G - V$	-0.01760	-0.006860	-0.1732	0.045858
$G - R$	-0.003226	0.3833	-0.1345	0.04840
$G - I$	0.02085	0.7419	-0.09631	0.04956

Such That (SS formulas):

V = G-(-0.0176-0.00686*(BP-RP)-0.1732*(BP-RP)^2)
R= G-(-0.003226+0.3833*(BP-RP)-0.1345*(BP-RP)^2)
I = G-(0.02085+0.7419*(BP-RP)-0.09631*(BP-RP)^2

The same conversions are also included in the following paper: Gaia Data Release 2 Photometric content and validation, D.W. Evans, et al*, Astronomy & Astrophysics,* 2018.

A total of 81 stars from Henden Data were compared with Gaia DR2 data. 41 of the stars were from the M67 FOV while the other 40 stars were random from 6 different RA's. Henden V ranged from 10.040 – 19.103 while Henden B-V ranged from -0.62 – 1.279.

Average Difference From Henden Data (absolute values):

Gaia DR2

V = 0.017
R = 0.021
I = 0.030

All data is contained in the spread sheet: GAIA DR2 V,R &I vs Henden – Final

At the faint end it is recommended that for both conversions V & R = >19BG

Practical Range of Converted Data: ~ 10 V – 18.8 V

Closing Remarks

It is to be recognized that the number of stars involved are a relatively small sample. Other FOV's with differing number of observations and seeing will probably produce different data.

I am surprised that the conversion formulas produce good useable sequence VRI data. With a lack of B data, however, I would recommend that this source only be considered when no other source of BVRI data is available.

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