One method of solving the issue of scaling the data from observations was to plot the measured magnitudes of matched stars in the Double Cluster against the true magnitudes and fit a line of best fit to the trend, see Figures 1 and 2.

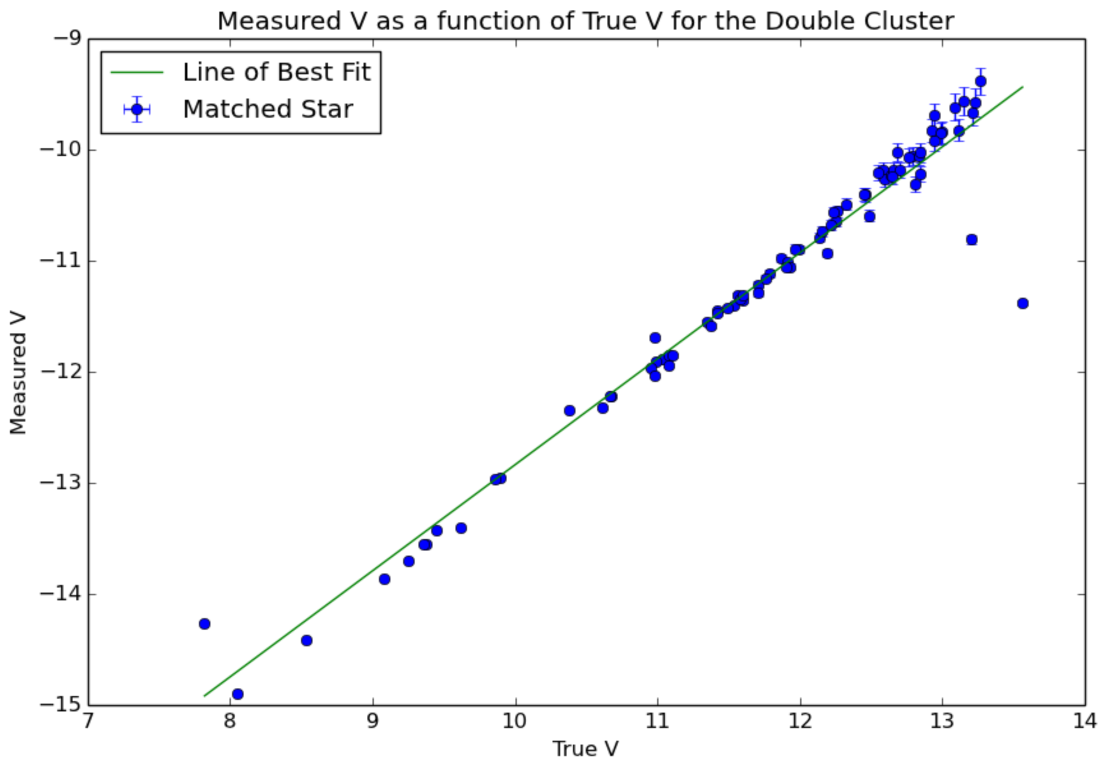

Figure 1: Measured visual values of magnitude vs. the true values (taken from Aladin) for each star matched between the two frames. The linear trend has been fitted with a line of best fit following the equation $y = mx + c$.

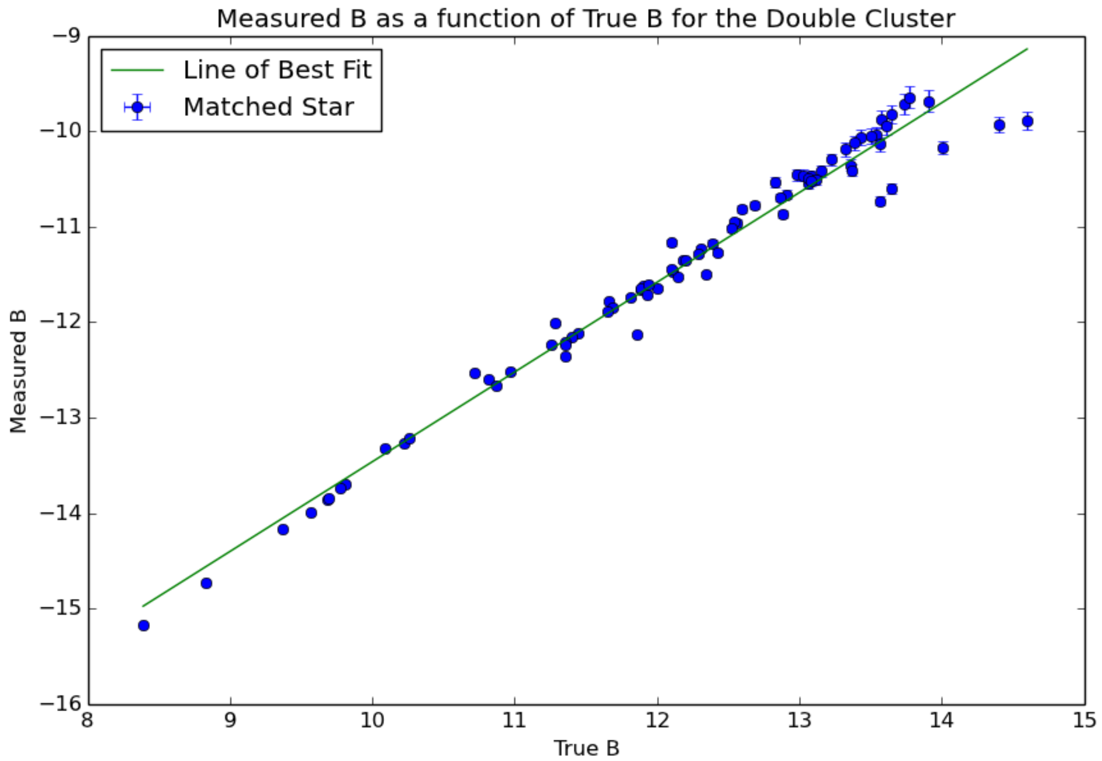

Figure 2: Measured blue values of magnitude vs. the true values (taken from Aladin) for each star matched between the two frames. The linear trend has been fitted with a line of best fit following the equation $y = mx + c$.

From the fit a gradient g and offset c could be calculated using $m_{\text{measured}} = gm_{\text{true}} + c$ and rearranging to $m_{\text{true}} = (m_{\text{measured}} - c)/g$. Therefore each measured magnitude can be scaled correctly and replotted on the HR diagram, as in Figure 3. Both the gradient and the offset have an associated error which must be propagated through to the final scaled magnitude error Δm_{scaled}; the gradient and offset values and their errors are shown in the table below.

Table 1: Parameters and their errors from the fitted line to stars matched in the Double Cluster.

	Gradient	Offset
B	0.9400 ±0.0003	-22.86 ±0.04
V	0.9540 ±0.0006	-22.38 ±0.09

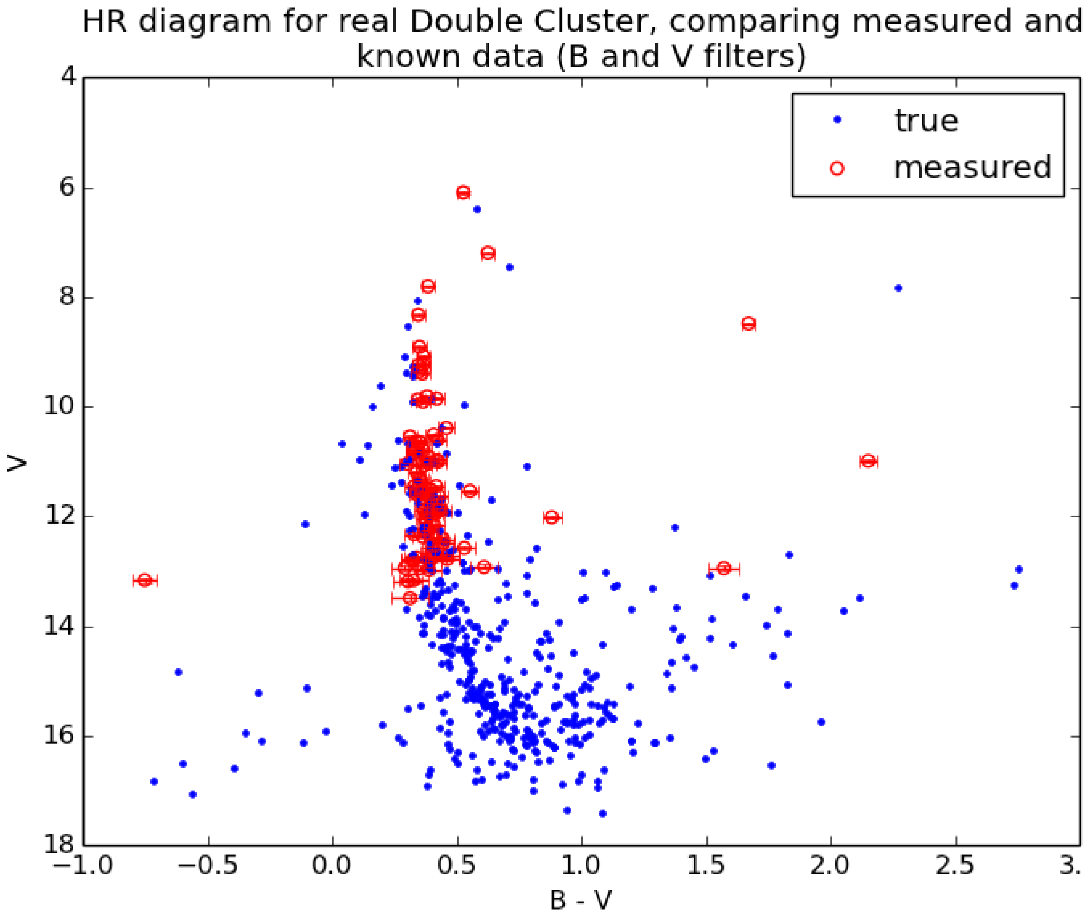

Figure 3: The HR diagram for the Double Cluster using a single 40 s exposure with the blue filter and a single 20 s exposure with the visual filter. All stars matched between the measured data and true data are plotted as red circles.

Using the equation for m_{true}, the scaled magnitude error is as follows,

$$\Delta m_{\text{scaled}} = m_{\text{scaled}} \sqrt{\frac{\Delta m^2 + \Delta c^2}{(m-c)^2} + \frac{\Delta g^2}{g^2}}, \tag{1}$$

where Δm represents the raw measured value, before scaling. These propagated errors in the blue and visual magnitudes are also shown in Figure 3.