Response to comments by reviewer # 2

We would like to thank the reviewer for his report. It allowed us to make significant improvements to our paper by elucidating matters that are central to the usefulness of the software and to the validity of the way that mathematical, statistical and astrophysical concepts were incorporated. We addressed all of the comments as best we could. Our response to each comment is provided in red, below.

I have some serious reservations regarding this paper, which should only be accepted after a significant rewrite. The paper describes a software package that the authors have developed to compare instrumental (i.e. observed) magnitudes with catalogue values. A weighted least squares method is used to compute a linear relationship between the magnitudes, which can then used for a target star. A triangle matching routine is used to transform the pixel coordinates of stars in their field of view to celestial coordinates.

The authors use the term "Auto calibration" to mean calibration - it is not clear why they have to include the word "Auto", when all they are referring to is a calibration. There is nothing to indicate that the calibration process is automated. In fact, they are discussing a package that automates the calibration process, so they end up discussing an automated auto calibration.

1. Fair comment. We now use *calibration* rather than *auto calibration*.

The triangle matching algorithm they are using was developed and tested in the 1980s so there is nothing new in this. Section 2 of their paper, which is a substantial part of the document, is essentially a user manual for the software package they have developed.

2. I agree with the reviewer. This section was re-written. The step-by-step instructions on how to use the software has been replaced by a more general description of how it functions. Mention is made of the steps in the overall process that is still performed by IRAF packages. The re-written section is 2.1.

Presumably the package is available from the authors but they make no explicit mention of this.

3. Because the software was developed as part of a postgraduate study at a University, there are certain Intellectual Property issues related to the distribution of the software. We have no intention to commercialise the software and therefore had not discussed these issues with the University. If there happens to be any interest in the software, we will take it up with the University.

The user manual could be distributed with the software, it shouldn't make up the major portion of a scientific report.

4. Agreed. See point 2.

They claim that their programme is simpler and more robust than the faster and more efficient algorithms that are currently available, but give no references to these packages or why their package is simpler or more robust.

5. We did not claim that our programme is simpler or more robust, only that the algorithm implemented is simpler than newer ones, and that it is robust. Mention is now made of the robustness of the algorithm with respect to the user parameters, in section 2.1, and of the success rate of the algorithm in terms of calibrating frames, in section 4. We understand that simply computing a value is not an achievement for this kind of software. However, our results agree very well with previously published results for all eight of the fields tested, of which only one is discussed here.

Why should anyone use AutoCal rather than DAOPHOT, for example, which is a standard astronomical package. When someone develops their own package it always appears easier to use than someone else's package. Some objective criteria of why it is easier to use should be mentioned.

6. We re-wrote section 3 to place more emphasis on the advantages of our software. The main advantage is the interactive, graphical, outlier removal. The last paragraph of section 3 clearly illustrates how this aids the user to perform more accurate calibrations by providing an example where inaccurate results were calculated and published using IRAF routines. Additionally, the weighted least squares approach, which is not discussed in detail due to the length constraints of the article, results in more accurate and more statistically justifiable calibration values and error estimation than, for instance, the quadrature addition of calibration error approach described and used in reference [3].

The results of testing their application are extremely limited. They give results for only one star at one epoch.

7. We realise that the results reported here are limited. We decided to only include the results for one of the eight fields tested to illustrate the software and our testing process. The remaining results have been submitted elsewhere and it would thus be unethical to publish them here.

They get similar results but point out a slightly discrepancy between the J magnitudes. There is no discussion of why there is this difference or why their result should be better than the value from the literature.

8. This is a fair remark and we now included a discussion of this in the last paragraph of section 3.

Tests should be done on a lot more fields to show that the algorithm works for a range of target star magnitudes and there should be some discussion of any differences found.

9. We now include some detail in the last paragraph of section 2.1 and in section 4, but as explained in point 8, we cannot include the specific results for the remaining fields.

Some discussion of what catalogues they are using to get their coordinates and magnitudes would be useful.

10. Now included. See the second paragraph of section 3 and reference [9].

In section 2.2, in the list of steps that AutoCal follows: point 4: the coordinate system of the catalogue is fixed, e.g. it uses equatorial coordinates for J2000.0. The coordinate system of the FITS frame, which might be calibrated into roughly equatorial coordinates but is essentially a pixel map, is transformed into the catalogue system.

11. Agreed and inserted.

point 8: weights are assigned according to the uncertainties - it would be useful to know exactly how these weights are calculated. Put in a formula.

12. Agreed. Formula inserted.

There is no discussion of how the instrumental magnitudes are calculated. Presumably this is done via aperture photometry but what are the details of this process. Is this part of the automatic process or is this done using a standard IRAF package?

13. This is now stipulated in the second paragraph of section 3.