**STAR CLUSTER 1 Group Management**

Group Members: Ryan Begley, Keir Fraser (joined 2nd semester), Liam Robertson, Etienne Sadeghpoor, Luke Stevens

Agenda 6th October 2017

1. Discuss Suitable Star Clusters.
2. Read up on Star clusters through learn page.

Minutes 6th October 2017

Present: Liam, Ryan, Etienne

Group member to take minutes and be in charge of group management - Etienne

Suitable star clusters to fit following criteria

1. +50 to +75 degrees due to location (Edinburgh).
2. Looking at ones 30 arcmintues or less so it’s a good size for CCD.
3. Making sure V magnitude is of a good order so cluster chosen can easily be observed with filters used.
4. Consider#] distant to star cluster and number of stars in cluster so when calculating variables later we have enough data points.

Potential Star Cluster Candidates for Project

NGC 869 h Persei 02 19.0 +57 09 134.6 -3.7 4.3 18' 200 7180 6780 Per

NGC 884 Chi Persei 02 22.4 +57 07 135.1 -3.6 4.4 18' 150 7500 7650 Per

NGC 1502 04 07.7 +62 20 143.7 +7.7 5.7 8' 45 3100 2680 Cam

NGC 188 00 44.4 +85 20 122.8 +22.5 8.1 17' 120 5060 6680 Cep

Col 463 01 48.4 +71 57 127.4 +9.6 5.7 30' 40 1960 2290 Cas

NGC 1027 02 42.7 +61 33 135.8 +1.5 6.7 20' 40 3260 2520 Cas

Agenda 9th October 2017

1. Meet with Philip Best to discuss an observing night and from shortlist what star cluster is most suitable to observe.

Minutes 9th October 2017

Present: Liam, Luke, Etienne

1. Detailed explanation of group project aims given by Philip Best.
2. Cluster chosen – persei pair, observe both at same time since they are near one another and use one as a backup option.
3. Decided literature-based graphs and observation prep can be split amongst group members.

* Etienne/Luke – Locate Standard Stars (2 required but have backups) – consider our star cluster position and remember difference in height of Standard Stars so a full variation of atmospheric extinction can be determined.
* Liam/Ryan – Literature based values of g-absolute versus (g-r) for our given cluster to be graphed using Pleiades literature data.

1. Agreed weekly meetings so everyone is up to date.

Agenda 17th October 2017

1. Completed tasks from last meeting to be shared and discussed.
2. Decide how to distribute remaining prep work for observing and literature-based work which can be done without observational results – will help to speed up process once data is taken.
3. Think about a potential observing night and when group members are free, so a decision can be made quickly when opportunity for an observing night is given to us.

Minutes 17th October 2017

Present: Liam, Luke, Ryan, Etienne

Tasks Completed

1. Standard Stars – BD 62 & Hilt 233 looking like most suitable stars to observe.
2. g-absolute vs g-r graph plotted.
3. u-g vs g-r graph plotted.

Actioned Tasks

1. Print images of star cluster and night sky for area we will be looking at, and images for our chosen standard stars, so we know where they are in comparison to rest of the night sky. - Etienne
2. Agreed as a group we are ready for an observing night. Go over Pleiades data and practice data reduction tasks on Pleiades data set as practice. – everyone.

Agenda 24th October 2017

1. Meet with Philip Best to get more insight into how to find the reddening vector.
2. Discuss observation nights doable this week.
3. Plan in detail for observing night, array of pointings and when frames should be taken etc.

Minutes 24th October 2017

Present: Liam, Luke, Ryan

1. Detailed explanation of reddening, fitting polynomials and data analysis process given by Philip Best.
2. Discussion of when to observe. Possible to observe anytime Wednesday-Sunday depending on weather except for Saturday since winds are too high.
3. Best standard stars decided to be stars 1 and 3, BD 62 & Hilt 233 respectively.
4. Target observations set (standard stars, core plus radial array of cluster) to be finished by 1am at the latest since the telescope will be flipped around at that time due to rotation of earth with respect to sky meaning our data will be flipped as well.
5. Decided that overlapping frames to be used when observing so no stars are missed out as sky moves over the course of our observation night.

Actioned Tasks

1. Agree to meet on Monday to begin working on project as a group rather than splitting up tasks in preparation for observing night so everyone knows plan of action.
2. Need to apply coding to literature data so a polynomial can be fitted from which a reddening vector can be found once observations are made.

Agenda 30th October 2017

1. Group discussion on how best to proceed with coding to fit polynomiols to Pleiades literature data graphs.
2. Discuss observation nights doable this week.

Minutes 30th October 2017

Present: Luke, Liam, Ryan, Etienne

To fit polynomial need to code the following:

* Bin data along x-axis and take means and standard deviations of y-values in each bin.
* Append data so only point left within mean plus or minus standard deviation are kept.
* Repeat this process N times until a smooth defined curve is achieved on graph for which a polynomial can be fitted.

Minutes 2nd November 2017

Present: Liam, Ryan, Etienne

1. Although no longer having formal weekly meetings with an Agenda discussed beforehand, members of the group are meeting several times a week to work on project.
2. Disscussed again doable observation nights for group members.

Work achieved on the code:

* Binned data along x-axis and found relevant means and standard deviations.
* Started work on deleting points outwith plus or minus sigma from the mean.

Minutes 8th November 2017

Present: Liam, Ryan, Etienne

Work achieved on the code:

* Managed to delete data points outwith plus or minus sigma for 1 run.
* Struggled to do this for N steps due to amounts of arrays, so still working on getting a well defined smooth line.

Observation Night – 11th November 2017

Present: Liam, Ryan, Etienne

1. All relevant observational data was collected including twilight flats.
2. BD62 & Hilt233 were the standard stars observed.
3. Core image of our cluster was taken in g, r, u, filters with radial distribution taken in g & r.
4. All relevant darks for exposure times used were taken.
5. Decided to start data reduction of our images ASAP and put coding on hold.

Week Beginning 13th November 2017 – Week Beginning 8th January 2018 - Project Data Reduction Process

* group decided due to deadlines and Exams to not do group project work over December.

Reduction work divided between Liam – BD62, Hilt233 and 3 NGC869, & Etienne – rest of NGC869

1. Combining the darks – November 2017 – Liam, Etienne
2. Subtracting darks – November 2017 – Liam, Etienne
3. Combining the flats – November 2017 - Liam, Etienne
4. Normalizing the flats – November 2017 - Liam, Etienne
5. Dividing by the flats – November 2017 - Liam, Etienne
6. Aligning multiple images for stacking – 5th – 10th January 2018 – Liam, Ryan, Etienne
7. Combining multiple images – 5th – 10th January 2018 – Liam, Etienne

Week beginning 15th January 2018

Used astrometry.net to convert all final images to RA and Dec – Etienne

Used Topcat to match stars in list to correct stars in image in a numbered order. Also, made catalogues of stars using source extractor - Ryan

Finding Zero points for standard stars – Liam, Ryan, Etienne

1. Zero points for standard stars in g, r, u, found for corresponding angles from zenith.
2. Apertures used on final images of standard stars to find magnitude and sum in aperture required for zero points.
3. Plots of zero points vs airmass made for standard stars - graphs not as expected.
4. Redo data reduction from standard stars as some zero points vs airmass were off due to an increase in counts per pixel over data reduction process.
5. Standard stars - airmasses sec(theta) vs zero point in u,g,r for both stars - mainly correct slight problem with Hilt 233 r zero point but graphs looking better.

Work achieved on the code – Ryan & Liam

1. Fitted polynomial to literature data colour-colour plot

18th January 2018 – Liam & Ryan met with additional member Keir Fraser who joined our group this semester.

Week beginning 22th January

Work achieved on the Code - Ryan & Liam

1. Colour-colour plot of observation data (u-g) vs (g-r) - scattered appears to show no correlation.
2. Removed faintest stars - only need few bright stars for dereddening.
3. Removed reddest stars - redder stars less likely to be in cluster since cluster is young and mainly bluer in colour.
4. Removed stars radially too far from centre using arbitrary angular separation chosen by eye from image.
5. Chi squared values for Av0 - Av(max) plotted vs Av.
6. Reddening magnitude found by minimum Av in chi square plot.

Agenda 31st January 2018

1. Bring all group members up to date.
2. Discuss report and how best to divide group members to work on report & literature aspects while others work on code to achieve aims of project.

Minutes 31st January 2018

Present: Liam, Ryan, Luke & Etienne

Keir undertaking literature review work

Ryan and Liam working on coding to produce final results

Etienne and Luke writing a report plan, intention to continue planning later in the week. Also Met with Philip Best to discuss presentation in more detail.

Agenda 9th February 2018

1. Discuss group report plan and layout options and assign tasks.
2. Talk about presentation – layout, abstract and who will do what.

Minutes 9th February 2018

Present: Ryan, Liam, Etienne

Report Assignments:

Grade Descriptors – Luke

Engagement with relevant literature section (Project performance & management) – Keir (Look what's needed for the highest grade)

Introduction/aim - Keir

Literature data (colour-colour plot, etc) – Luke

Observation night (pre planning to frames obtained) - Etienne

Data Reduction Process (IRAF) - Etienne

Source Extractor/catalogues - Ryan

Atmospheric extinction – Ryan/Liam

Reddening vector – Liam/Ryan

Distance/age of star cluster – Ryan/Liam

radial distribution, IMF – Liam

Various possible errors for project and where they come from – Etienne

Aim to get half your sections done by Wednesday 14th

Presentation Abstract Deadline – Friday 16th

Work achieved on the code – Ryan & Liam

1. Tried various polynomial fits to find best Av magnitude.
2. Remade catalogues for outer quadrants.
3. Calculated radial distribution function & initial mass function.
4. In process of making all images and tables report worthy.

Minutes 15th February 2018

Present: Ryan, Liam, Etienne

Discussion of group report sections first draft and format.

Presentation Abstract completed.

Presentation slide layout decided.

Decided to meet up over weekend to do presentation slides as a group – Ryan, Liam, Luke

Minutes 19th February 2018

Present: All members

Presentation slides completed & assigned amongst group members.

Practice presentations done, & slides uploaded to learn.

Decided 2nd drafts of report to be done by Friday 23rd February.

Minutes 20th February 2018

Present: All members

Presentation completed plus group discussion for report had to emphasise time constraints to all group members and importance of meeting set deadlines for drafts.

Decided group members would work on same parts for report as they spoke about in presentation, so work is distributed more evenly.

Minutes 26th February 2018

Present: Liam, Ryan, Etienne

Formatting group report and proof reading sections – Liam, Ryan, Etienne.

Report being put together using latex – Ryan.

Discussion – Liam.

Conclusion – Liam.

Minutes 27th February 2018

Present: Liam, Ryan, Etienne

Formatting group report and proof reading sections – Liam, Ryan Etienne.

Report being put together using latex – Ryan.

Bibliography – Etienne.

Abstract – Liam, Etienne.

Decided to print out and do online version of group management.