



ASAP

USER MANUAL

AUTOMATED SOLAR ACTIVITY PREDICTION
VERSION 1.0.0

SPACE WEATHER RESEARCH

<http://spaceweather.inf.brad.ac.uk/index.html>

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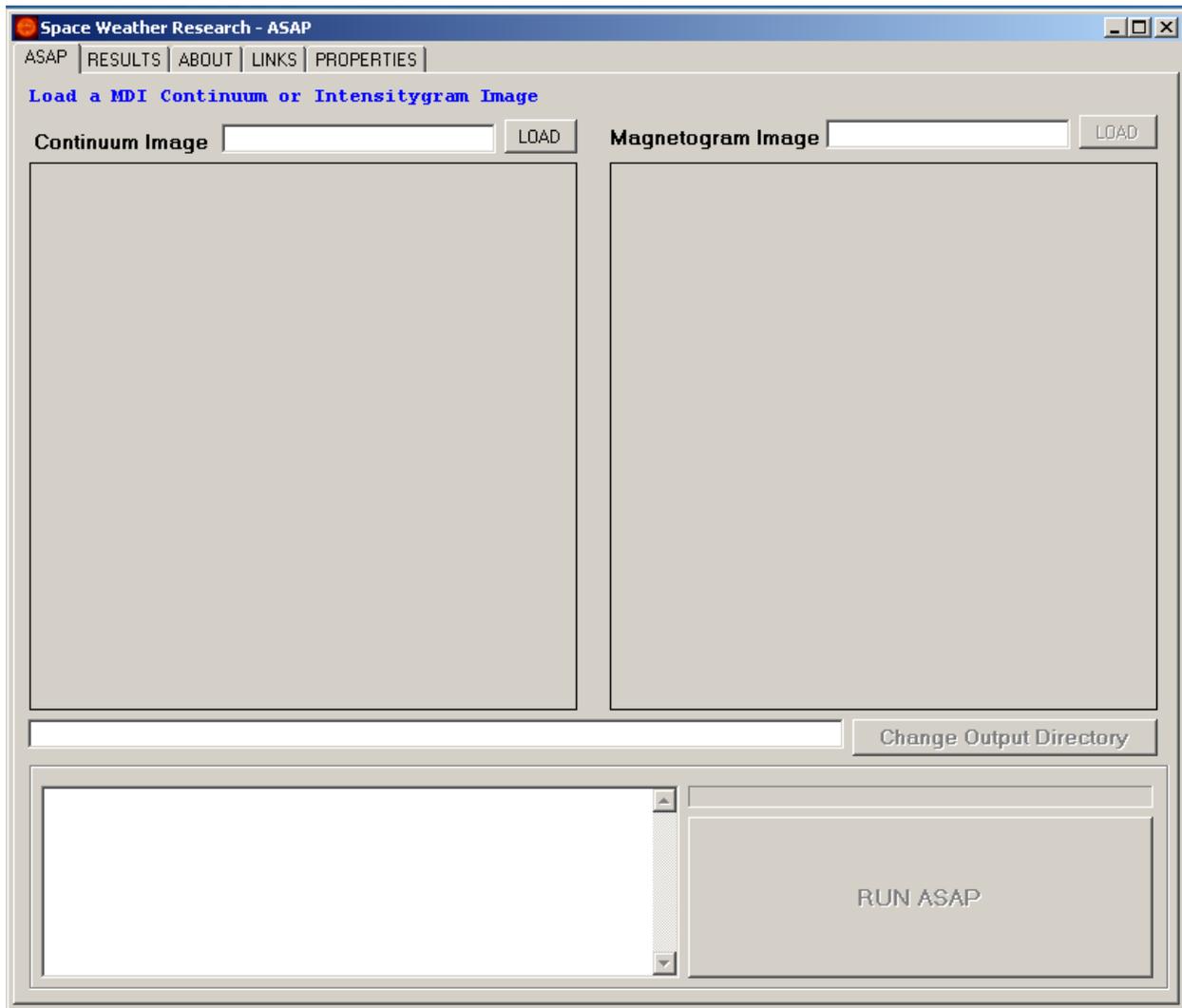
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1. INTRODUCTION

ASAP is a program that uses SOHO/MDI Continuum and Magnetogram images to automatically detect sunspots, group them and classify them based on McIntosh classifications [Colak and Qahwaji, 2008]. These Classifications are then fed into the learning models, which were previously created in [Qahwaji and Colak, 2007], to provide prediction for the possible occurrence of solar flares.

2. START THE PROGRAM

To start the program, go to: *Start -> All Programs -> Space Weather Research – University of Bradford*. At this point, you should have ASAP started, as on the screen below, and ready to use.



3. RUN ASAP

ASAP uses two types of images, MDI Continuum (or Intensitygram) and Magnetogram images. In order to run ASAP, only one image for each type needs to be loaded to the program. The following steps explain how to load images and run ASAP:

3.1. LOAD CONTINUUM IMAGE

To load a Continuum image, click on *LOAD* button, against the Continuum Image label. On the opened window, select the Continuum image that you would like to process.

3.2. LOAD MAGNETOGRAM IMAGE

To load a Magnetogram image, click on *LOAD* button, against the Magnetogram Image label. On the opened window, select the Magnetogram image that you would like to process.

3.3. CHANGE OUTPUT DIRECTORY

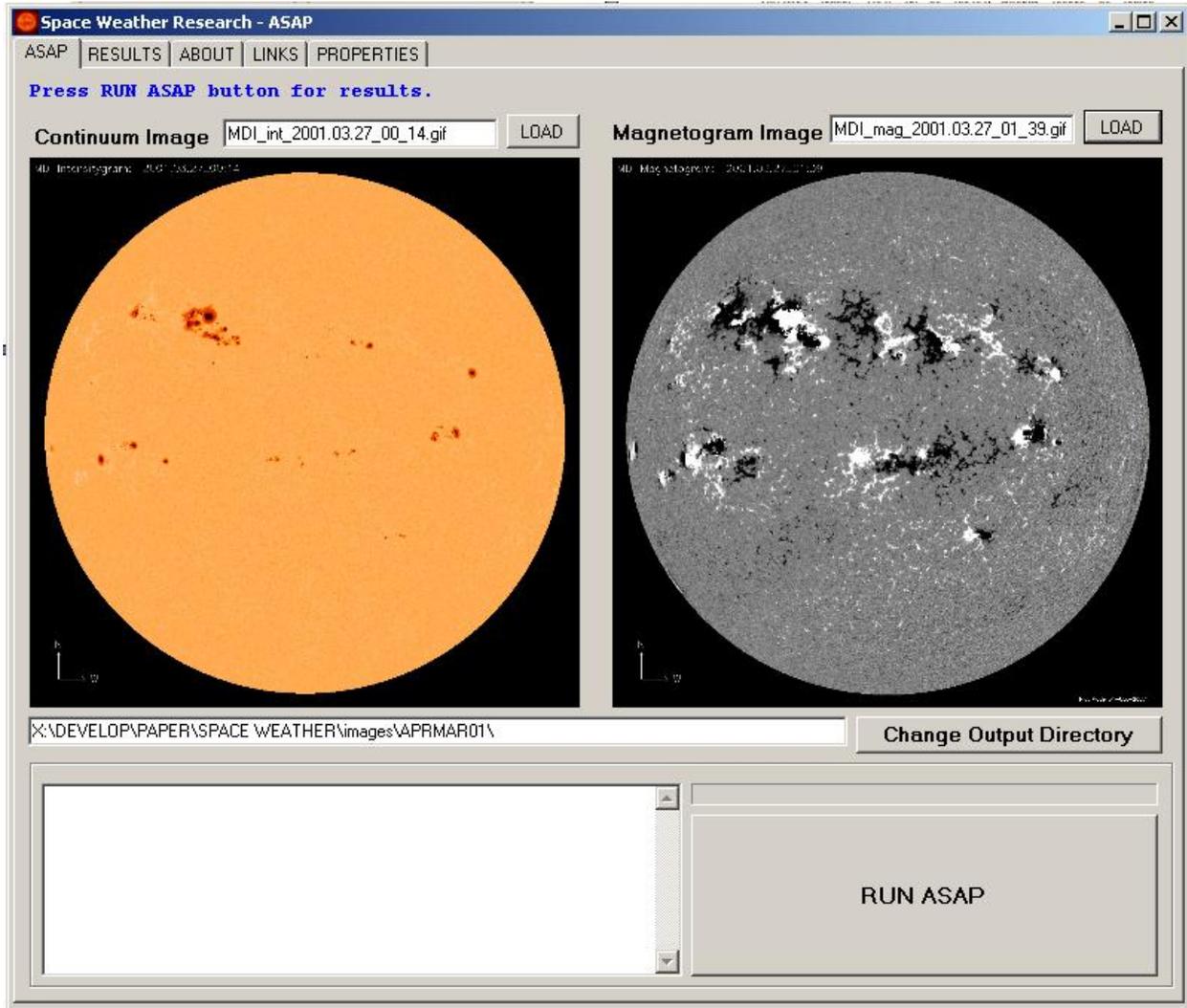
It is important to choose where you would like to store the output files. By default, the output directory will be assigned to the same directory where the images have been loaded from. However, it is recommended to change the output directory. You can do so by clicking on *Change Output Directory* button. Then, on the opened window, choose the output directory that you would like to assign.

The screen on the next page shows ASAP after applying the previous steps and ready to run.

3.4. RUN ASAP

After loading a Continuum image and Magnetogram Image, and specifying the output directory. You should be ready to run the program. All you have to do is click on *RUN ASAP* button and ASAP will start to process the loaded images. The process will not take long and you can see the progress on the progress bar.

Note: Generally, solar observatories capture various types of solar images at different times each day. As mentioned previously, ASAP uses two types of images (Continuum and Magnetogram). Therefore, it is important to be careful when you load these images as the time difference between the captured images has to minimum.



Note: If you already have Continuum and Magnetogram images, you can go ahead and use ASAP to process them. Otherwise, if you do not, do not worry, we have considered that. ASAP provides links to SOHO (Solar & Heliospheric Observatory) website and you can download SOHO MDI images by date and you can use them with the program. These links are available on *LINKS* tab.

4. RESULTS

When ASAP complete processing, the program will automatically show the RESULTS tab. This tab shows the created output files which are located on the right hand side on the window, as shown on the screen below. These files are stored on the same directory that you have specified before running the program.

FLARE MONITOR <http://spaceweather.inf.brad.ac.uk/>
 Generated by ASAP
 27/ 3/2001 0:14
 ! BETA !

NO	CLS	M	X
01	FKC	64%	68%
02	EKO	0%	0%
03	EAO	0%	0%
04	DAO	0%	0%
05	CSO	0%	0%
06	CRO	0%	0%
07	AXX	0%	0%
08	EKO	0%	0%
09	EHO	0%	0%
10	AXX	0%	0%
11	FSO	0%	0%
12	CAO	0%	0%
13	BXO	0%	0%
14	DAO	0%	0%

Created Files

- 27.3.2001_0_14_gray.png
- 27.3.2001_0_14_sunspots.png
- 27.3.2001_1_39_maggrayscale.png
- 27.3.2001_1_39_magshifted.png
- 27.3.2001_1_39_ar.png
- 27.3.2001_0_14_actspotreggrows.png
- 27.3.2001_0_14_activelog.txt
- 27.3.2001_0_14_actspotregdec.png
- 27.3.2001_0_14_actspotregcom.png
- 27.3.2001_0_14_symmetrylog.txt
- 27.3.2001_0_14_maturitylog.txt
- 27.3.2001_0_14_penumbras.png
- 27.3.2001_0_14_spotregions.txt
- 27.3.2001_0_14_spotsdetected.png
- 27.3.2001_0_14_flaremonitor.png
- ASAPDATABASE.txt

LOW PROBABILITY HIGH

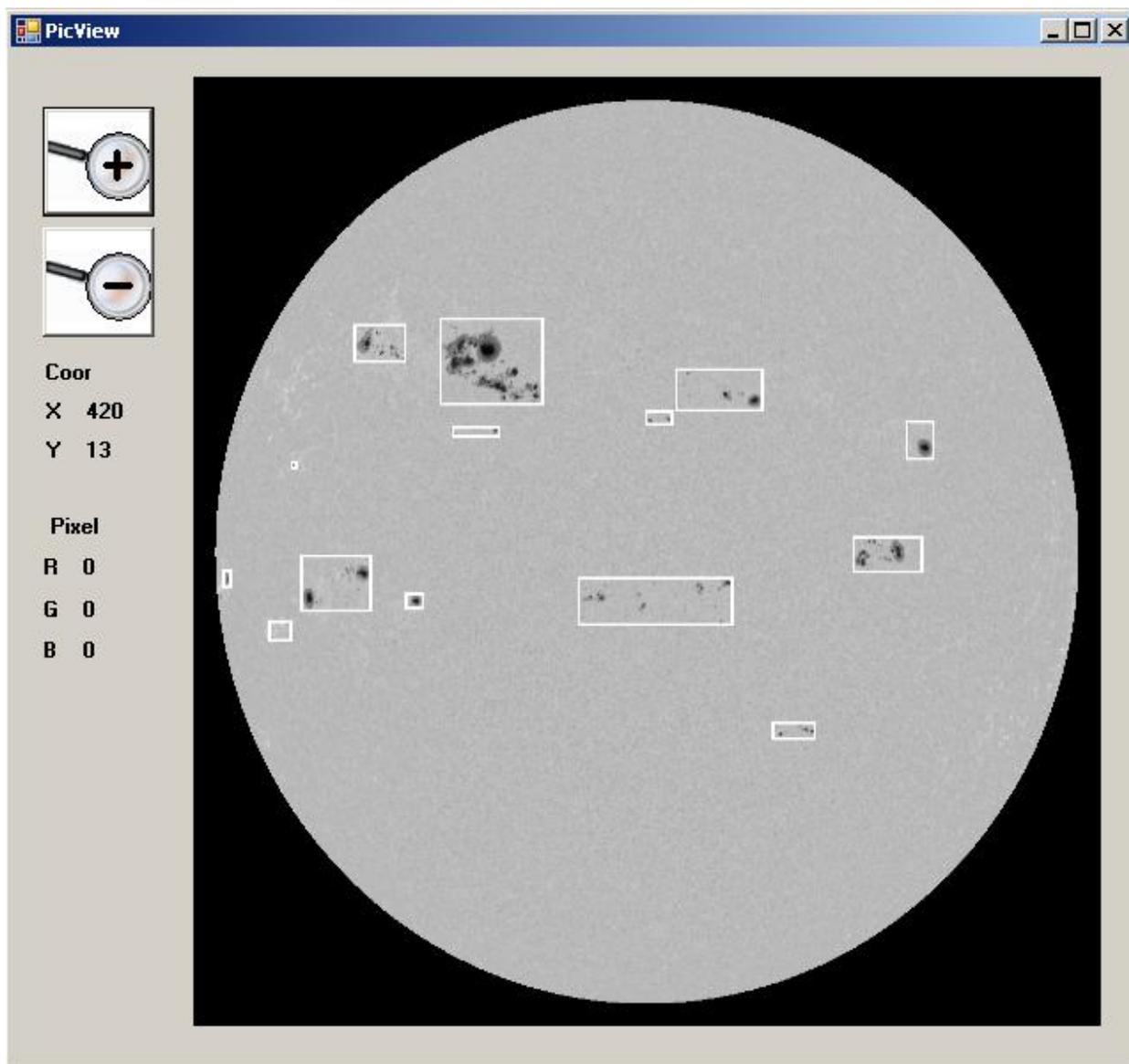
20010327	0014	0	335	306	N18E22	FKC	19	1071	161592
20010327	0014	1	209	286	N22E42	EKO	12	214	424
20010327	0014	2	592	337	N14W10	EAO	11	113	1059
20010327	0014	3	524	367	N10W 1	DAO	2	5	5
20010327	0014	4	819	391	N 9W39	CSO	5	98	99
20010327	0014	5	318	382	N 8E23	CRO	6	6	264

Each of the created files can be displayed depending on its type. To display file contents, simply click on the file name on the list followed by a click on SHOW button. If the file is an image, then it will be displayed on the left side on the window, otherwise, if it is a text file then it will be displayed on the bottom side on the window.

Text files can be also opened externally with Notepad. This is by clicking the text file name and then clicking on OPEN FILE IN NOTEPAD button.

Images also can be viewed externally that is by click on the image itself on the left side of the window. That will open another window, as shown on the screen on the next page. The new opened window allows you to zoom in and zoom out the image, as well as showing the (x, y) coordinates and giving the RGB pixels values.

Another useful feature that ASAP provide is if you run ASAP twice to process the same image, then the created output files names will be preceded by the word *previous*. This is a good feature for comparing the output files avoiding confusion. As previously mentioned, these files can be accessed on the output directory that has been given by you before running ASAP.



5. PROPERTIES & UPDATING

Properties tab on ASAP is only for advanced user and it can be used to update the machine learning agents or main engine of the program manually. If you want more information how to improve the program using this tab please contact us. ASAP checks for updates every week when you close the program and these files will be updated automatically during this process.



6. REFERENCES

T. Colak and R. Qahwaji, "ASAP: A Hybrid Computer Platform Using Machine Learning and Solar Imaging for Automated Prediction of Significant Solar Flares," SUBMITTED to SPACE WEATHER Journal, 2008.

T. Colak and R. Qahwaji, "Automated McIntosh-based classification of sunspot groups using MDI images," Solar Physics, DOI: 10.1007/s11207-007-9094-3, 2008. [Available on Line](#)

R. Qahwaji and T. Colak, "Automatic Short-Term Solar Flare Prediction Using Machine Learning And Sunspot Associations," Solar Physics, 241, pp. 195-211, 2007.