

BELARUSIAN PROJECT “ASTROBLOKNOT” (ASTRONOMICAL NOTEBOOK) AND DATA MINING: RESULTS OBTAINED IN THE CONSTELLATION OF EQUULEUS

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ABSTRACT. Many photometric sky surveys are currently available on the open-access web-sources. The Northern Sky Variability Survey (NSVS), the All Sky Automated Survey 3 (ASAS-3) and the Catalina Real-Time Transient Survey (CRTS) are the most popular among them. In February 2013, Belarusian amateur astronomers made the decision to carry out a search for new variable stars using the CRTS dataset.

We were motivated by the following considerations: the mentioned survey is the most large-scale by many criteria, namely: the survey depth reaches up to 21 magnitudes; the photometry is available for 500 million objects (with around 300 light curves for most of them); the survey has been conducted for more than 9 years already; the photometry is high-precision.

To improve the detection efficiency, the software for data loading, filtering and processing was written. The main data filter criteria are the ratio of the amplitude of the brightness variation to the measurement error and the limiting magnitude (up to 18 magnitudes). After the

preliminary processing of the photometric arrays, at the second stage of data filtering the CSS programme for searching the period or cycle of brightness variations in the photometric sequences by the Lafler-Kinman method, which is similar to the simplified programme by Vitaliy Goranskiy.

At the final stage the physical parameters of new variable stars were specified and recorded in the VSX database.

The constellation of Equuleus (area of 71.6 square degrees) was selected as the first experimental target of the project. Before February 2013 there were about 300 variable stars recorded in that constellation.

During May-August 2013 we have processed about 700 thousand of candidate variables in the mentioned constellation, and eventually, the number of known variable stars in the constellation Equuleus increased by 371.

The irregular and semiregular variable stars detected by us have still been studied and their cycles and characteristics are specified.

| Type of variability | Number of variables | The link to one of the variables of the indicated variability type that were detected by us |
|---------------------|---------------------|---|
| AGN | 5 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318346 |
| BY | 6 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318530 |
| CEP | 1 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318232 |
| DSCT | 2 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318302 |
| EA | 57 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318149 |
| EB | 23 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318467 |
| ELL | 1 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=322914 |
| EW | 175 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=322709 |
| GCAS | 5 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318345 |
| HADS | 9 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318117 |
| I | 28 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318480 |
| L | 1 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318453 |
| ROT | 2 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318406 |
| RRAB | 21 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318371 |
| RRC | 26 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=317888 |
| RRD | 5 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318375 |
| RS | 3 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=318383 |
| SRD | 1 | http://www.aavso.org/vsx/index.php?view=detail.top&oid=317894 |
| Total | 371 | |

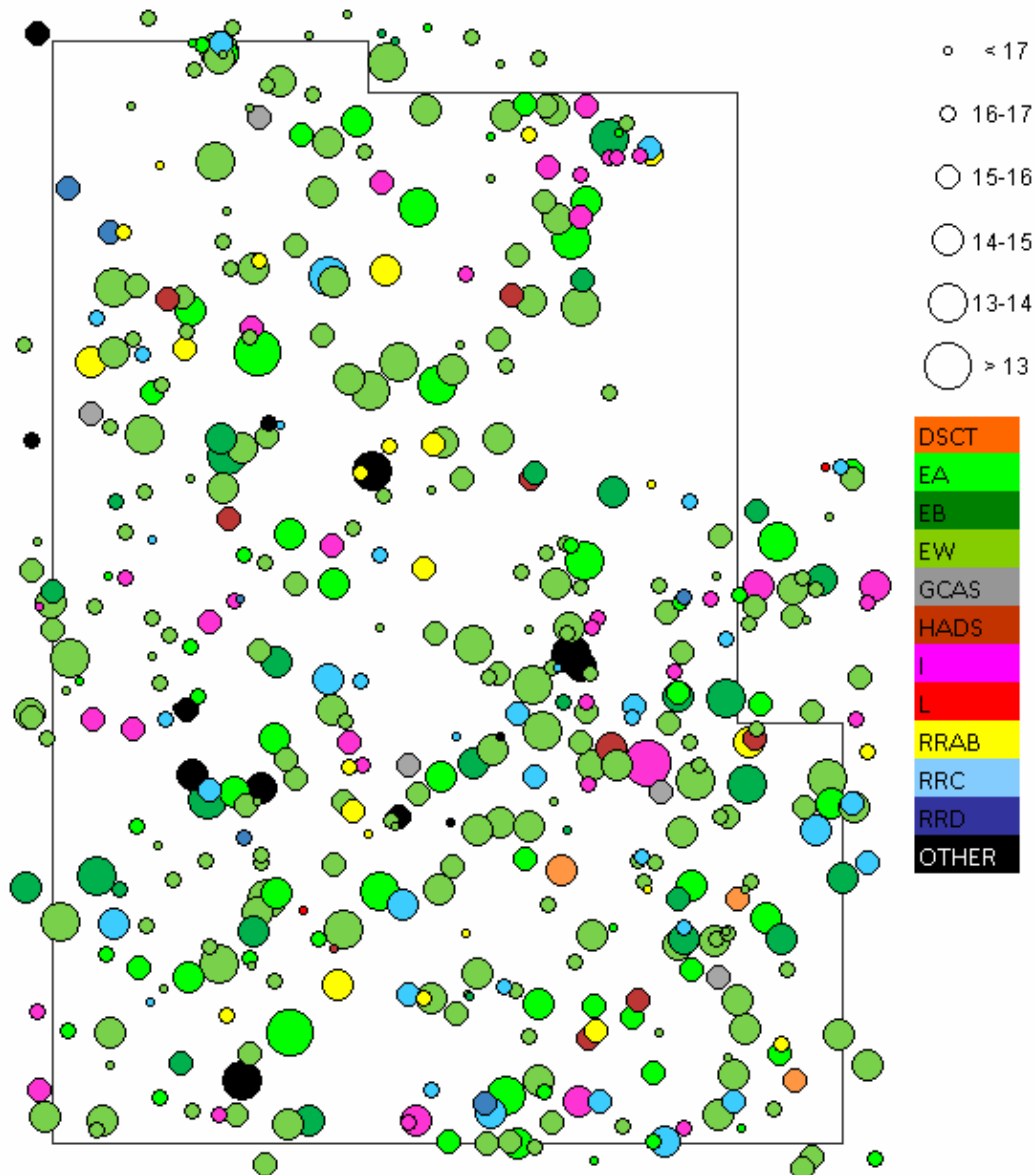


Figure 1: The chart of variable stars that have been detected during May-August 2013 within the framework of Data Mining project (“Astrobloknот” project); the colour of the stars correspond to certain variability types.

At present the investigations are proceeded in the constellation of Pegasus while alternative further studies have been discussed with the CRTS project developers (A. Drake et al., 2012)

Besides, it would be rather interesting to study a series of variables by measuring their brightness using historically valuable photographic plates from Odessa photographic glass plate archive in the B and V band.

The following specialists participated in the Data Mining project (“Astrobloknот” project), being responsible for the indicated activities:

- S. Dubrowski and A. Pobiacha were responsible for the writing of the software and the preliminary processing of data;

- I. Sergey, who initiated the search of new variable stars in the CRTS dataset, and I. Baluk, who detected the

largest number of variables within the CRTS project experiment, were responsible for searching and recording new variables.

The scientific advisers of the Data Mining project within “Astrobloknот” project were I. S. Bryukhanov and I. L. Andronov.

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References

Drake A.J., Djorgovski S.G., Mahabal A. et al.: 2012, *New Horizons in Time-Domain Astronomy, IAU Symp.*, **285**, 306.