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References for Galaxy Clusters Database

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Abstract. A bibliographic database will be constructed with the purpose to be a general tool for searching references for galaxy clusters. The structure of the database will be completely different from the available now databases as NED, SIMBAD, LEDA. Search based on keyword system will be performed through web interfaces from numerous bibliographic sources – journal articles, preprints, unpublished results and papers, theses, scientific reports. Data from the very beginning of the extragalactic research will be included as well.

References for galaxy clusters (RGC) is continuation of a previous project for collecting all published information for galaxy clusters. There are neither previous attempts nor projects for compiling such database for galaxy clusters and our effort will be to include into the database all of the available bibliography through our system of keywords until the end of 1999. Now over 3,000 entries are included into the preliminary version of the database.

1. Introduction

Clusters of galaxies are the largest gravitationally bound systems in the Universe. They are the most effective tracers of the large scale structure of the Universe, as well as of the formation history and evolution of the largest mass scales.

About 16,000 clusters of galaxies are known at present and there is a large amount of observational data for about 2–3,000. It is true that some information on clusters (catalogs, lists, etc.) can be retrieved from any astronomical data center, but it is impossible more specific information to be obtained. The only exception is NASA/IPAC Extragalactic Database (NED). But despite of the tens of thousands references stored in NED, there is no easy way to find where, e.g., photometry is published for a given cluster.

The main aim of our project is to give the opportunity for queries where data for any observation or theoretical consideration is published or stored. It is reasonable to test the basic concepts which will be incorporated in the database using A/ACO clusters of galaxies (Abell 1958; Abell, Corwin, & Olowin 1989). And this work concerns mainly the data for these clusters.

2. Catalogs of clusters of galaxies. Identifications

The first catalog of clusters of galaxies was published by Abell (1958) for $\delta \geq -27°$ and extended by Abell et al. (1989) for $\delta \leq -17°$. Thus both catalogs are unique in their coverage of the entire sky. We denote the clusters from these catalogs with prefix "A" (which is not the same as in NED). There are A1 ÷ A4076 numbers, about 4050 different clusters. Moreover, ACO contains about 1150 supplementary (S) southern clusters which are either not rich enough or at a great distance to be included in the main catalog.

Many clusters are found by Zwicky et al. (1961, 1963, 1965, 1966, 1968a, 1968b) but for $\delta \geq 0°$. Their total number is 9133 (denoted with prefix "ZC"). Other lists of groups and clusters are presented in the following table.

Table 1. Lists of groups and clusters.

Reference	Prefix	Number of Objects
	Visual procedure	
Klemola (1969)	Kl	44
Sersic (1974)	Ser	several tens
Rose (1976)	Ro	124
Duus & Newell (1977)	DN	710
Snow (1970)	Sn	29
Braid & MacGillivray (1978)	BMc	~ 400
Quintana & White (1990)	QW	267
	Semi-automatic algorithm	
Shectman (1985)	Sh	646
	Abell-like automatic algorithm	
Lumsden et al. (1992)	ED	737
Dalton et al. (1997)	APM	957

Various visual searching procedures for clusters result in a subjective catalogs. While the catalog of Shectman is the first one where a "blind" computer search was performed among the famous Lick counts of galaxies (Shane & Wirtanen 1967; Seldner et al. 1977).

The Abell-like algorithm catalogs are entirely automated and so they are entirely objective. Clusters of galaxies are found also by Jackson (1982), Gunn, Hoessel, & Oke (1986), Willick (1991) and Postman et al. (1996).

Some designations of clusters are proposed and used before A/ACO catalog publication and some of them have clear correspondence to the objects in the A/ACO catalog. For example, A3266 = Ser040/6 = DN0431-616 = APM510 and references for all these objects must point to A3266. So it would be impossible to retrieve the information available for a given A/ACO cluster without making first a cross-identifications of clusters among all available catalogs or lists. Some identifications are presented in the original ACO catalog with some misprints or errors.

New cross-identifications between A/ACO clusters and the other clusters are performed. Abell–Zwicky cross-identifications are taken from Kalinkov, Valtchanov, & Kuneva (1997, 1998).

3. Two ways to retrieve references

The basic idea is to assign two lists to each reference – the first contains the A/ACO clusters and the second contains the keywords describing observational data or results.

Two ways for references retrieval for any cluster are possible – using a glossary of keywords or using a thesaurus which is created for that particular need of clusters of galaxies.

The present version of this project operates with a glossary. Using a thesaurus of the kind compiled by Shobbrook & Shobbrook (1993) would be convenient but it is very hard to create a new thesaurus for such a narrow field like clusters of galaxies. If a usual thesaurus is available then it would be quite simple to find any reference assigned with a narrower term. But it is not possible to use a narrower terms for clusters of galaxies, when there are hierarchical structures (double galaxies, groups, superclusters, substructures and so on).

4. Current status

1. 3000 references are included – journal articles, workshops, symposia, colloquia papers, thesis works.
2. References for all A/ACO clusters of galaxies, together with their cross-identification may be retrieved at present. There are about 5200 clusters.
3. The glossary contains about 300 keywords.

5. Future developments

1. Actualizing the references. At the end of 1999 we expect to entry about 12,000 titles.
2. Including non A/ACO clusters – about 16,000 objects.
3. Extending the glossary.
4. Creation of thesaurus oriented to the field of clusters of galaxies.
5. Free web access to the database

The full version of the paper is available at astro-ph/9811328.

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