2. Tumanov V.I. On finite lattices having no independent bases of quasi-identities // Math. Notes. –Vol. 36. – 1984. – P. 625-634.

ON SMOOTHLY APPROXIMABLE ACYCLIC GRAPHS

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We deal with pseudofinite countably categorical structures [1]-[4], in particular, countable acyclic graphs [6,7].

Theorem 1. [7] Let Γ be an arbitrary countable graph in which each component contains a finite number of cycles. Then Γ is countably categorical if and only if Γ is bounded and finitely many 1-types are realized in it.

A. Lachlan introduced the concept of *smoothly approximable* structures to change the direction of analysis from finite to infinite, that is, to classify large finite structures that appear to be *smooth approximations* to an infinite limit.A more general approach is developed in [8].

Definition. [2] Let L be a countable language and let M be a countable and ω-categorical L-structure. L-structure M (or $Th(M)$) is said to be *smoothly approximable* if there is an ascending chain of finite substructures $A_0 \subseteq A_1 \subseteq \cdots \subseteq M$ such that $i \in \omega A_i = M$ and for every i, and for every $\acute{a}, \acute{b} \in A_i$ if $tp_M(\acute{a}) = tp_M(\acute{b})$, then there is an automorphism σ of M such that $\sigma(\acute{a}) = \acute{b}$ and $\sigma(A_i) = A_i$, or equivalently, if it is the union of an ω-chain of finite homogeneous substructures; or equivalently, if any sentence in $Th(M)$ is true of some finite homogeneous substructure of M.

Smoothly approximated structures were first examined in generality in [2], subsequently in [4]. The model theory of smoothly approximable structures has been developed very much further by G. Cherlin and E. Hrushovski [1].

Recall the following class defined in [5] for acyclic graphs.

Let $\mathrm{G_{fin}}(\lambda)$, for arbitrary cardinality λ, be the family of all infinite acyclic graphs consisting of λ connected components of bounded in aggregate diameters.

Theorem 2. [5] Theory T of any infinite acyclic graph Γ from the class $\mathrm{G_{fin}}(\lambda)$, for arbitrary cardinality λ, is pseudofinite.

Let us distinguish a subclass $\mathrm{G_{cc}}(\lambda)$ of the class $\mathrm{G_{fin}}(\lambda)$ as the class of all countably categorical acyclic graphs.

Theorem 3**.** Any theory $\mathrm{Th}(\Gamma)$, $\Gamma \in \mathrm{G_{cc}}(\lambda)$ is smoothly approximable.

This research was partially supported by RFBR (project No. 20-31-90003), and Committee of Science in Education and Science Ministry of the Republic of Kazakhstan (Grant No. AP08855497, AP08855544).

References

1. Cherlin, G., and E. Hrushovski, Finite Structures with Few Types, vol. 152 of Annals of Mathematics Studies, Princeton University Press, Princeton, 2003

2. Kantor W.M., Liebeck M.W. and Macpherson H.D., $\aleph_0$-categorical structures smoothly approximated by finite substructures, *Proceedings of the London Mathematical Society*, 1989, vol. 59: P. 439–463. https://doi.org/10.1112/plms/s3-59.3.439

3. Kruckman, A. Disjoint n-Amalgamation and Pseudofinite Countably Categorical Theories. *Notre Dame J. Formal Log.*, 2019, vol. 60, no. 1, pp. 139–160. https://doi.org/10.1215/00294527-2018-0025

4. Macpherson, D. (1997). Homogeneous and Smoothly Approximated Structures. In: Hart, B.T., Lachlan, A.H., Valeriote, M.A. (eds) Algebraic Model Theory. NATO ASI Series, vol 496. Springer, Dordrecht. https://doi.org/10.1007/978-94-015-8923-9_7

5. Markhabatov N. D. Approximations of Acyclic Graphs. *The Bulletin of Irkutsk State University. Series Mathematics*, 2022, vol. 40, pp. 104–111. https://doi.org/10.26516/1997-7670.2022.40.104

6. Nurtazin, A. T. (2007). Graphs and models with finite chains. Sibirskie Ehlektronnye Matematicheskie Izvestiya [electronic only], 4, 238-248.

7. Ovchinnikova E.V., Shishmarev Yu.E. Countably categorical graphs. Ninth All-Union Conference on Mathematical Logic. Leningrad, September 27-29, 1988: dedicated to the 85th anniversary of Corresponding Member of the USSR Academy of Sciences A.A. Markov: abstracts, p.120

8. Sudoplatov S. V. Approximations of theories, *Siberian Electronic Mathematical Reports*, 2020, vol. 17, pp. 715-725. https://doi.org/10.33048/semi.2020.17.049

PERFECT JONSSON VARIETIES AND QUASIVARIETIES

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Definition 1. A is an algebraically prime model of theory T, if A is a model of $T$and A may be isomorphically embedded in each model of the theory$T$.

Definition 2. The inductive theory T is called the existentially prime if:

1) it has a algebraically prime model, the class of its AP (algebraically prime models) denote by AP_T;

1) classE_T non trivial intersects with class AP_T, i.e. $AP_T \cap E_T \neq \emptyset$.

Definition 3.The theory T is called convex if for any its model A and for anyfamily $\{B_i | i \in I\}$ of substructures of A, which are models of thetheory T, the intersection$\bigcap_{i \in I} B_i$is a model of T , provided it isnon-empty. If in addition such an intersection is never empty, then$T$ is called strongly convex.

Definition 4.Model C of Jonsson theory T is called semantic model, if it is ω^+-homogeneous-universal.

Definition 5.The center of Jonsson theory T is called an elementary theory of the its semantic model. And denoted through T^*, i.e. $T^* = Th(C)$.

Definition 6.Jonsson theory T is called a perfect theory, if each a semantic model of theory T is saturated model of T^*.

Definition 7.Let T be the Jonsson theory. A companion of a Jonsson theory T is a theory $T^\#$ of the same signature that satisfies the following conditions:

1) $(T^\#)_\forall = T_\forall$;
2) for any Jonsson theory T', if $T_\forall = T'_\forall$, then $T^\# = (T')^\#$;
3) $T_{\forall\exists} \subseteq T^\#$.

The natural interpretations of the companion$T^\#$are T^*, T^0, T^f, T^M, T^e.

Definition 8.A set X is called a Jonsson set, if hold the following conditions:

1) X is a definable set by some existential formula $\varphi(\bar{x}, \bar{y}) = \exists \bar{y} \psi(\bar{x}, \bar{y})$;
2) $cl(X) = M, M \in E_T$.

Let K be the class of structures of countable signature σ.

Definition 9. We call a K - Jonsson variety if

1) K is a variety in the usual sense [2; 269];
2) $Th_{\forall\exists}(K)$is a Jonsson theory.

Definition 10. We call a K - Jonsson quasivariety if

1) K - is a quasivariety in the usual sense [2; 269];
2) $Th_{\forall\exists}(K)$is a Jonsson theory.

Consider the $JSpV\ (K)$ - Jonsson spectrum of the Jonsson varieties of class K, where K is the Jonsson variety:

$JSpV\ (K) = \{T / T$is a Jonsson theory, $T = Th_{\forall\exists}(N)$; $N \subseteq K$; N is a subvariety of $K\}$.

Consider the $JSpQV\ (K)$ - Jonsson spectrum of the Jonsson quasivarieties of the class K, where$K$ is the Jonsson quasivariety:

$JSpQV\ (K) = \{T / T$is a Jonsson theory, $T = Th_{\forall\exists}(N)$; $N \subseteq K$; N is a subquasivariety of $K\}$.

Then $JSpQV\ (K)/_{\bowtie}$ is denoting the factor set of the Jonsson spectrum of Jonsson quasivariety of the class K by the relation $\bowtie$.