Contact information

Denis Morozov
Department of Computer Science, National University of "Kyiv-Mohyla Academy", Kyiv, Ukraine
Email address: denis.morozov178@gmail.com

Key words and phrases. Finite-state automata, p-adic, conjugacy problem

On the A-$\mathfrak{F}$-hypercenter of finite groups

Viachaslau Murashka

All groups considered here will be finite. Let $\mathrm{Inn}G \leq A$ be a group of automorphisms of a group G and F be the canonical local definition of a local formation $\mathfrak{F}$. An A-composition factor H/K of G is called *A-$\mathfrak{F}$-central* if $A/C_A(H/K) \in F(p)$ for all $p \in \pi(H/K)$. The *A-$\mathfrak{F}$-hypercenter* of G is the largest subgroup of G such that all its A-composition factors are A-$\mathfrak{F}$-central. This subgroup always exists by Lemma 6.4 [**1**, p. 387]. It is denoted by $\mathrm{Z}_\mathfrak{F}(G, A)$. If $A = \mathrm{Inn}G$, then it is just the $\mathfrak{F}$-hypercenter $\mathrm{Z}_\mathfrak{F}(G)$ of G. If $\mathfrak{F} = \mathfrak{N}$ is the class of all nilpotent groups, then we use $\mathrm{Z}_\infty(G, A)$ to denote the A-hypercenter $\mathrm{Z}_\mathfrak{N}(G, A)$ of G.

Recall that $\mathrm{Syl}_p G$ is the set of all Sylow subgroups of G; *G satisfies the Sylow tower property* if G has a normal Hall $\{p_1, \dots, p_i\}$-subgroup for all $1 \leq i \leq n$ where $p_1 > \dots > p_n$ are all prime divisors of $|G|$. It is well known that a supersoluble group satisfies the Sylow tower property. Recently series of hereditary saturated formations of groups that satisfy the Sylow tower property have been constructed (see, [**2, 3, 4**]).

Theorem 1. *Let $\mathfrak{F}$ be a hereditary saturated formation, F be its canonical local definition and N be an A-admissible subgroup of G where $\mathrm{Inn}G \leq A \leq \mathrm{Aut}G$ that satisfies the Sylow tower property. Then $N \leq \mathrm{Z}_\mathfrak{F}(G, A)$ if and only if $N_A(P)/C_A(P) \in F(p)$ for all $P \in \mathrm{Syl}_p(N)$ and $p \in \pi(N)$.*

Author obtained particular cases of this theorem for $A = \mathrm{Inn}G$ and two formations of supersoluble type (for example, see [**5**]). Recall that a group G is called strictly p-closed if $G/\mathrm{O}_p(G)$ is abelian of exponent dividing $p-1$. We use $\mathfrak{U}$ to denote the class of all supersoluble groups.

Corollary 1 (R. Baer [**6**]). *Let N be a normal subgroup of G. Then $N \leq \mathrm{Z}_\mathfrak{U}(G)$ if and only if N satisfies the Sylow tower property and $N_G(P)/C_G(P)$ is strictly p-closed for all $P \in \mathrm{Syl}_p(N)$ and $p \in \pi(N)$.*

References

1. K. Dorek and T. Hawkes, *Finite soluble groups*, Walter de Gruyter, Berlin — New York, 1992.
2. A. F. Vasil'ev, T. I. Vasil'eva and V. N. Tyutyanov, *On the finite groups of supersoluble type*, Sib. Math. J., **51** (2010), no. 6, 1004–1012.
3. V. S. Monakhov and V. N. Kniahina, *Finite groups with $\mathbb{P}$-subnormal subgroups*, Ricerche mat., **62** (2013), 307–322.
4. I. Zimmermann, *Submodular subgroups in finite groups*, Math. Z., **202** (1989), 545–557.
5. V. I. Murashka, *On analogues of Baer's theorems for widely supersoluble hypercenter of finite groups*, Asian-European J. Math., **11** (2018), no. 3, 1850043 (8 pages).
6. R. Baer, *Supersoluble immersion*, Canad. J. Math., **11** (1959), 353–369.

Contact information

Viachaslau Murashka
Faculty of Mathematics and Technologies of Programming, Francisk Skorina Gomel State University, Gomel, Belarus
Email address: mvimath@yandex.ru

Key words and phrases. Finite group; supersoluble group; Sylow tower group; hereditary saturated formation; A-$\mathfrak{F}$-hypercenter.

Central charge and topological invariant of Calabi-Yau manifolds

Tetiana Obikhod

Supersymmetry plays a fundamental role in modern high-energy physics within the framework of the superstring theory and the D-brane theory. Continuing the work of Gauss, Riemann, Poincaré, mathematicians created abstract theorems and consequences that acquired physical meaning with the advent of spaces of extra dimensions in physics. One of the most interesting problems of modern high-energy physics is the calculation of topological invariants - analogs of high-energy observables in physics. In this aspect, symmetries and the use of the apparatus of algebraic geometry play an indispensable role. We considered orbifold as simplest non-flat constructions. For D3-branes on such internal space C^n/Γ the representations are characterized by gauge groups $G = \oplus_i U(N_i)$. In this case the superpotential is of N=4 $U(N)$ super Yang-Mills,

$$W_{N=4} = \mathrm{tr}X^1[X^2, X^3],$$

where X^i are chiral matter fields in production of fundamental representation $V^i \cong C^{N_i}$ of the group $U(N_i)$. Blow up modes of orbifold singularities can be considered as coordinates of complexified Kahler moduli space. Quiver diagrams are used for discribing D-branes near orbifold point. In this case it is possible to calculate Euler character defined as

$$\chi(A, B) = \sum_i (-1)^i \mathrm{dimExt}^i(A, B),$$

where $\mathrm{Ext}^0(A, B) \equiv \mathrm{Hom}(A, B)$ and A, B are coherent sheaves over projective space, P^N (general case), which are representations of orbifold space after blowing up procedure. These fractional sheaves are characterized by D0, D2 and D4 Ramon-Ramon charges, which have special type, calculated for C^3/Z_3 case. It is necessary to stress that BPS central charge could be defined through Ramon-Ramon charges and has the following expression for B-type D-branes

$$Z = \sum_p \frac{1}{(d-p)!} ch_p (B + iJ)^{d-p},$$

where the chern character ch_p is the 2p-form.

References

1. P.S. Aspinwall and M.R. Douglas, *D-brane, stability and monodromy*, JHEP 0205 (2002) 031.
2. D. Diaconescu and J. Gomis *Fractional branes and boundary states in orbifold theories*, JHEP 0010 (2000) 001, hep-th/9906242.
3. M. Abou Zeid and C.M. Hull, *Intrinsic geometry of D-branes*, Phys.Lett. B404 (1997) 264-270.