Developments of Algebraic Combinatorics, a personal view

Eiichi Bannai

In this talk, I would like to give an explanation on the developments of algebraic combinatorics from a very personal viewpoint. First, I will recall the days when I was at the Ohio State University in the 1970’s and 1980’s. I would briefly mention the work of Yoshimi Egawa in two papers [13] and [14] done when he was at the Ohio State University in the earlier stage of the development of algebraic combinatorics. Then, I would like to explain, how and in what directions the algebraic combinatorics has been developed into the present stage. In particular, I would like to mention the developments in the following topics:

(i) Finite permutation groups and graphs, in particular rank 3 permutation groups and strongly regular graphs.
(ii) Moore graphs, distance regular graphs, and association schemes.
(iii) The classification problem of P- and Q-polynomial association schemes, Askey-Wilson polynomials and Leonard’s theorem.
(iv) Delsarte theory on codes and designs in association schemes.
(v) Classification problems of perfect codes and tight designs in various association schemes.
(vi) Algebraic combinatorics on spheres and its generalizations, in particular on spherical t-designs and Euclidean t-designs.
(vii) The similarity between the theory of Euclidean t-designs and the theory of relative t-designs in association schemes.

The aim of this talk is not to give a precise talk on these topics, but just to convey the flavors of the developments of algebraic combinatorics, aiming at the non-specialists of algebraic combinatorics.

References


*Department of Mathematics, Shanghai Jiao Tong University, 800 Dongchuan Road, Shanghai, 200240, China. E-mail:bannai@sjtu.edu.cn

[5] 坂内英一・坂内悦子・伊藤達郎 (Eiichi Bannai, Etsuko Bannai and Tatsuro Ito), 代数的組合せ論入門 (Introduction to Algebraic Combinatorics), 出版予定 (to be published) 共立出版 (Kyoritsu Shuppan).


