TECHNIQUES FOR CLASSIFYING HOPF ALGEBRAS AND APPLICATIONS TO DIMENSION p^3

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Abstract. The classification of all Hopf algebras of a given finite dimension over an algebraically closed field of characteristic 0 is a difficult problem. If the dimension is a prime, then the Hopf algebra is a group algebra. If the dimension is the square of a prime then the Hopf algebra is a group algebra or a Taft Hopf algebra. The classification is also complete for dimension $2p$ or $2p^2$, p a prime. Partial results for some other cases are available. For example, for dimension p^3 the classification of the semisimple Hopf algebras was done by Masuoka, and the pointed Hopf algebras were classified by Andruskiewitsch and Schneider, Caenepeel and Dăscălescu, and Ştefan and van Oystaeyen independently. Many classification results for the nonsemisimple, nonpointed, non-copointed case have been proved by the second author but the classification in general for dimension p^3 is still incomplete, up to now even for dimension 27.

In this paper we outline some results and techniques which have been useful in approaching this problem and add a few new ones. We give some further results on Hopf algebras of dimension p^3 and finish the classification for dimension 27.

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