A method of estimating the p-adic sizes of common zeros of partial derivative polynomials associated with a complete cubic form

ABSTRACT

Let x =(x1,x2,é ,xn) be a vector in the space Q n with Q field of rational numbers and q be a positive integer, f a polynomial in x with coefficient in Q. The exponential sum associated with f is defined as S(f;q)=Ʃxmodqe((2if(x))/q), where the sum is taken over a complete set of residues modulo q. The value of S(f;q) depends on the estimate of cardinality |V|, the number of elements contained in the set V={xmodq|fxſ 0modq} where fx is the partial derivative of f with respect to x. To determine the cardinality of V, the p-adic sizes of common zeros of the partial derivative polynomials need to be obtained. In this paper, we estimate the p-adic sizes of common zeros of partial derivative polynomials of f(x,y) in Qp[x,y] with a complete cubic form by using Newton polyhedron technique. The polynomial is of the form f(x,y)=ax3+bx2y+cxy2+dy3+32ax2+bxy+12cy2+sx+ty+k.

Keyword: Exponential sums; Cardinality; P-adic sizes; Newton polyhedron