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Flat Evaluations of Tebranuvchan Integrals

Amonova Sharofat Nurmahmatovna
Samarkand region, Urgut district 34th general secondary school
Mathematics teacher

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ABSTRACT

In this article, the idea of oscillating integrals is discussed and their smooth evaluations are analyzed. One of the important tasks is the development of research on the nature of vibrating integrals. This is exactly the issue discussed in the article.

INTRODUCTION

Many scientific and practical researches carried out on a global scale, in most cases, lead to the study of oscillating integrals, i.e., integrals of rapidly oscillating functions. The method of trigonometric integrals introduced in the second half of the 20th century and the expression of the asymptotic characteristics of these integrals by trigonometric integrals became the basis for the development of the theory of oscillating integrals. One of the most important areas for the study of oscillating integrals is the application to analytic number theory. There are two aspects of studying the characteristics of such integrals, one of them is related to trigonometric sums, and the other is related to trigonometric integrals. One of the important tasks is the development of research on the nature of vibrating integrals.

Today, the problem of boundedness of Fourier transforms for surfaces is considered one of the urgent issues of modern harmonic analysis. It should be noted that this problem is closely related to the case of a special class of oscillating integrals defined by Fourier transformations. In particular, the smooth estimation of multi-phase oscillating integrals is of great importance. In this regard: proving the invariant values of the oscillating integrals whose phase is the sum of the linear function of the third degree unisex polynomial with two variables; Scientific studies aimed at finding the exact vibrational indicators of the phase two variable third order unisex polynomial oscillatory integrals are calculated.

LITERATURE ANALYSIS AND METHODOLOGY

Oscillating (trigonometric) integrals first appeared in the works of Fresnel and Eyre related to the study of the intensity of light. Stationary phase method was used to study the characteristics of oscillating integrals by Kelvin and Riemann. In his scientific work, Poincaren widely used vibrating integrals in the study of the intensity of light. In particular, he proved the phase shift of light passing through caustic. By Pearce, Ludvíg, Ursell, Connors, oscillating integrals with simple properties were applied to mathematical and physical problems.

In the works of I.M. Vinogradov, integrals corresponding to the number of solutions of the Diophantine system of equations (called Vinogradov integrals) were studied. Hua Lo Gen posed the problem of finding the minimum *p number* of trigonometric integrals corresponding to the appropriate $L^p(R^n)$ *space*. This problem was solved in the work of G. Í. Arkhípov, VN Chubaríkov, AA Karasubalar for multiple oscillating integrals, and a high value for multiple trigonometric integrals was found by them.

Í.A.Íkromov, D.D.Torakulov's scientific papers estimate the Fourier transformations of smooth Borel measures embodied in convex hypersurfaces of Euclidean space and prove the optimality of these estimates for three-dimensional convex analytic hypersurfaces in Euclidean space. In the scientific works of I.A.Ikromov, G'.A.Khasanov, smooth values were found for oscillatory integrals with arbitrary analytical smooth phase and even amplitude discontinuities. In the scientific researches of I.A.Ikromov, M.Kempe and D.Müller, the decreasing order of measurement Fourier transformations for arbitrary surfaces of three-dimensional space and the maximal operators corresponding to the surface of this decreasing order, which were put by Ye.M.Stein, were shown to be bounded. The confirmation of the hypothesis about the relationship with the indicator has been proven.

The theory of special features of differential accelerations, the theory of analytical functions, and asymptotic methods of analysis were used in the research work.

ANALYSIS AND RESULTS

It is necessary to prove the notion of measure of the representation of the set of values of the function that is smaller than some positive number and the generalization of Fongstein's result . These estimates are necessary to study the case of oscillating integrals with phase two variables and three-dimensional polynomials.

Let's look at this integral

$$J(p,q) := \int_a^b \frac{dx}{|x^3 + px + q|}\delta$$

where $0 < \delta < 1$.

The following theorem is a generalization of the Fong-Stein theorem for polynomials of the third degree.

Theorem 1. (1) The following assertions apply to the integral:

1) if $\frac{1}{2} < \delta < \frac{1}{2}$, then

$$|J(p,q)| \leq \frac{c_\delta}{\left(\frac{|p|^3}{27}+\frac{q^2}{4}\right)^{\frac{3\delta-1}{6}}}$$

2) if $\frac{1}{2} < \delta < 1$, then

$$|J(p,q)| \leq \frac{c_\delta}{|D|^{\delta-\frac{1}{2}}\left(\frac{|p|^3}{27}+\frac{q^2}{4}\right)^{\frac{2-3\delta}{6}}}$$

is equal to , where is $D = \frac{p^3}{27}+\frac{q^2}{4}, x^3+px+q$a positive number depending $c_\delta$only on the δdiscriminant of the polynomial.

The definition below describes the vibrational integral.

Definition 1. Oscillating (trigonometric) integral with phase *f* and amplitude is called the integral shown below.φ

$$J(\lambda, f, \varphi) = \int_{R^n} e^{i\lambda f(x)} \varphi(x) dx$$

where *f*:R ^{n} →R, φ: R ^{n} →C - has smooth functions and φa compact carrier,λ –real parameter.

CONCLUSION

In this article, estimates of oscillating integrals expressed by smooth, classical group invariants, invariant estimates of double oscillating integrals whose phase is a homogeneous polynomial of the third degree, the summation problem for these integrals, and summation of polynomials of the third degree and the first degree is devoted to the problems of invariant estimates of doubly oscillating integrals with index. Based on the scientific results obtained in the article, the following conclusions were reached:

1. The coefficients of the oscillating integrals in the polynomial view of the phase model are the coefficients in the space through the norm . i fodalan i sh i muk i n; These estimates are improved with phase and amplitude functions , special sets , and sets not intersecting each other .

2. Measurements embodied in some pers _ It is sbotted and these values show that pulses are not oriented in space . _ _ _ _ _

3. The invariance of the estimate of the oscillating integrals of the three-variable polynomial of phase three is proven. It is shown that the optimal value of such oscillating integrals cannot be expressed by invariants of affine exchanges in the plane.

REFERENCES:

1. Arkhípov G.Í., Karatsuba AA and Chubaríkov VN, Trigonometric integrals. Изв. Acad. Nauk USSR Ser. Matt. 43(5), 971-1003 1197 (Russian); English translation into Math. USSR-Ízv., 15(1980), pp. 21-239.

2. Arnold V. Í., Gusen-zade SM, Varchenko AN, Singularities of differentiable maps, Part Í, M.: Nauka, 1982.
3. Erdös, L'. and Salmhofer, M., Decay of the Fourier transform of surfaces wíth vanishing curvature. Math. Z. 257 (2007), no. 2, 261–294.
4. Fedoryuk M.V., Perevals method, M.: Nauka, 1977.
5. Hörmander L., Analisis of linear partial differential operators, part I, Distribution Theory and Fourier Analysis, Second edition, Springer-Verlag, 1989.
6. Ikromov I. A., Damped oscillatory integrals and maximal operators, Mathematical noteses, vol. 78, pages 833-852, 2005.
7. Ikromov I. A., Müller D., Kempe M., Damped oscillatory integrals and boundedness of maximal operators associated to mixed homogeneous hypersurfaces, Duke Math.J. vol. 126, No.3, pages, 471-490, 2005.
8. Ikromov, I. A., Müller, D.,Fourier restriction for hypersurfaces in three dimensions and Newton polyhedra, Princeton University press, Annals of Mathematics Study, No. 194, Princeton, 2016.
9. Lebedev V.V., On Fourier transform of charakteristic functions of domains with − 1 C smooth boundary. Funkts. Anal. Prilozhen. 2013, V. 47, No. 1. p. 33-46.
10. MalgrangeB., Ideals of differentiable functions, Tata Institute, Bombay, and Oxford University Press, 1966.
11. Palamodov V. P., Generalized functions and harmonic analysis, Modern problems of Mathematics, Fundamantal directions, V. 72, M. 1991, p. 5-134.
12. Duistermaat J.J., Oscillatory integrals, Lagrange immersions and Unfoldings of singularities. Comm. Pure Appl. Math., 1974, V. 27, No. 2, p. 207-281.
13. Popov D. A., Estimates with constant for some classes oscillating integrals. UMN., Vol. 52, No. 1(313), 1997, pages 77-148.
14. Randol B., On the asymptotic behavior of the Fourier transform of the indicator function of a convex set. Trans. AMS, 139, (1970), 279-285.
15. Stein E. M., Harmonic Analysis Real-Valued Methods, Orthogonality, and oscillatory Integrals, Princeton, Princeton Univ.Press, 1993.
16. Stein E. M., Singular Integrals and differentiablity properties of functions, Princeton, Princeton Univ.Press, 1970.
17. Varchenko A.N., Newton polyhedra and estimates for oscillatory integrals. Funkts. Anal. Prilozhen. 18. No. 3. (1976), 175–196.