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## Investigation in determining the value of perturbation to enter in to the threshold of modified Korteweg-de-Vries(mKdV) solitons in plasma as means of continuum hypothesis from the regime of discrete KdV solitons

In the study of nonlinear waves in any medium, it is considered continuous under the continuum hypothesis though it is discrete but a crude assumption of course. In the studies of nonlinear waves like solitary waves in multicomponent plasma in general, perturbation method with perturbation parameter $\epsilon$ in the transformation $\xi=\epsilon^{(1/2)}(x-Vt),\tau=\epsilon^{(3/2)}Vt$ are employed to derive standard wave equations like KdV or mKdV or Schrodinger equation etc. To include higher-order nonlinearity in the investigation, it is necessary to change the order of perturbation in space and time coordinates under different scaling. But the measure or value of perturbation in connection to the representation of nonlinear solitary waves in plasma has never been explored except by the authors Kalita *et al.* In this endeavor, we have studied how to determine the measure or value of $\epsilon$ to generate solitary waves of specific amplitudes for the first time. This can be explored in non-relativistic/relativistic plasma model for information to researchers. Eventually, the nonlinear coefficient p of the KdV equation-

$\frac{\partial\phi}{\partial\tau}+p\phi\frac{\partial\phi}{\partial\xi}+q\frac{\partial^3\phi}{\partial\xi^3}=0$ is equated to zero nullifying the nonlinear effect. But changing the order of perturbation of the stretching coordinates as $\xi=\epsilon(x-Vt),\tau=\epsilon^3\,Vt,$ the mKdV equation $\frac{\partial\phi_1}{\partial\tau}+p'\phi_1^2\frac{\partial\phi_1}{\partial\xi}+q'\frac{\partial^3\phi_1}{\partial\xi^3}=0$ can be derived which admits solutions resulting mKdV solitons. This process correlates the discrete KdV soliton system to continuous mKdV solitons in plasmas as an outcome of the continuum hypothesis. Subject to the second set of transformations, the same phase velocity equation is obtained from the least order of perturbation quantities which is similar to the phase velocity equation derivable from the first set of transformation. But the next higher order perturbation produces the mKdV equation different from the KdV equation. There exists an insight problem of getting the same phase velocity equation from both the ends. This demands exploration of this new insight for benefit of researchers. Our objective is to determine the value of perturbation $\in$ from a comparison of the two sets and making use of the same phase velocity equation.

### Biography

Bhaben Chandra Kalita is an expert in Plasma Physics, Relativity and Graph Theory, MA in Mathematics and PhD from Gauhati University, Post Graduate teaching experience about 37 years as Assistant Professor, Associate Professor, Professor in Gauhati University. Professor Emeritus is awarded by the UGC, Govt. of India before retirement, published standard papers in Phys Plasmas, Astrophys and space sci., Journal of Plasma Physics, Physical Soc. Jpn, Canadian Journal of Physics, Plasma Physics Report, IEEE transaction on plasma sciences, Commun. Theoretical Physics. Author of several books.

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