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## A Modified Nonlinear Galerkin Method for Solving Ginzburg-Landau Equation

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For solving the Ginzburg-Landau equation  $u_t - \nu u_{xx} + \kappa u^3 - \gamma u = f$ ,  $u(0, x) = u_0(x)$ , we introduce a kind of modified nonlinear Galerkin method as follows:

$$\begin{aligned}\frac{dy_m}{dt} + \nu Ay_m + P_m \{ \kappa (y_m^3 + 3y_m z_m^2) - \gamma y_m \} &= P_m f, \\ \nu Az_m + z_m^{(2)} + (P_{2m} - P_m) \{ \kappa (y_m + z_m^{(1)})^3 - \gamma (y_m + z_m^{(1)}) \} &= (P_{2m} - P_m) f, \\ \nu Az_m^{(2)} + (P_{2m} - P_m) \{ 3\kappa (y_m + z_m^{(1)})^2 - \gamma \} [P_m f - Ay_m - P_m (\kappa y_m^3 - \gamma y_m)] &= 0 \\ \nu Az_m^{(1)} + (P_{2m} - P_m) (\kappa y_m^3 - \gamma y_m) &= (P_{2m} - P_m) f, \\ y_m(0) &= P_m u_0\end{aligned}$$

The convergence of the modified method is analyzed and some numerical examples are shown in the article.

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