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4. So, due to proven convexity of squares and from norm properties, we obtain:

$$\begin{aligned} I(v) = \|\alpha Bu(v_1) + (1 - \alpha)Bu(v_2) - z\|^2 &\leq \|\alpha Bu(v_1) + (1 - \alpha)Bu(v_2)\|^2 \leq \\ &\leq (\|\alpha Bu(v_1)\| + \|(1 - \alpha)Bu(v_2)\|)^2 \end{aligned} \quad (5)$$

5. From (5), going to scalar product form and estimating, we finally obtain:

$$\begin{aligned} I(v) = \|\alpha Bu(v_1) + (1 - \alpha)Bu(v_2) - z\|^2 &\leq \|\alpha Bu(v_1) + (1 - \alpha)Bu(v_2)\|^2 = \\ &= (\alpha Bu(v_1) + (1 - \alpha)Bu(v_2), \alpha Bu(v_1) + (1 - \alpha)Bu(v_2)) < \alpha I(v_1) + (1 - \alpha)I(v_2) \leq \\ &\leq \frac{1}{2}I(v_1) + \frac{1}{2}I(v_2) = \min I. \end{aligned} \quad (6)$$

So, assuming two minima v_1, v_2 existence, we got *contradiction* (for somewhat v , value $I(v)$ is less than global minimum of I , which is impossible). The contradiction proves the theorem, Q.E.D.

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THE STEADY STATES AND TRAVELING WAVE SOLUTIONS OF THE MODIFIED HEISENBERG EQUATION

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The steady states and traveling wave solutions of the Heisenberg and M-I spin systems were recently studied in [1], where the steady states and traveling wave solutions of the 1+1 Heisenberg spin system were obtained using spherical coordinates on the unit sphere. Analogous solutions for the M-I 2+1 spin system were also discovered in [1]. We then studied the extension of the Heisenberg system to the corresponding 2+1 Landau-Lifshitz-Gilbert (LLG) equation, which includes a dissipation term with a small parameter λ [2,4]

$$\vec{S}_t = \vec{S} \times \vec{S}_{xx} + \lambda(\vec{S}_{xx} - (\vec{S} \cdot \vec{S}_{xx})\vec{S}), \quad \vec{S} = (u, v, w), u^2 + v^2 + w^2 = 1 \quad (1)$$

Equation (1) is the isotropic case of LLG equation, for which it is known that it can be mapped to a damped, non-local nonlinear Schrödinger equation [2]. Proceeding in a manner analogous to [1] we have also obtained steady states and traveling waves for the the LLG equation. As

in [1], the graphs of these solutions can be constructed by plotting u, v, w variables as functions of x , or $\eta = x - vt$, respectively. Thus, including the damping parameter the graphs of these solutions can be similarly obtained and graphically illustrated.

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