The remarkable role of hydrogen in conductors with copper and silver nanoparticles by mixed convection using viscosity Reynold's model

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Abstract. This article includes an analysis of the influence of mixed convection and variable viscosity under the effect of a transverse magnetic field on a stretching surface. Nano-fluid viscosity is supposed to be dependent on temperature. The effect of variable viscosity on the transversal magnetic field and hybrid convection can be seen by using Reynold's model. The resulting nonlinear system of partial differential equations is transformed into a nonlinear system of first-order ordinary differential equations by the Lobatto IIIA approach, simplifying physical flow problems. Moreover, the impact of different parameters on temperature and velocity is shown graphically and tabulated results are also presented. The numerical findings obtained in this study are validated and very well in line with some previous literature findings. This research has helped to minimize the fluid flow and increases the fluid temperature and associated thermal boundary thickness by increasing the amount of Hartmann (parameter). In addition, the effect of the mixed convection and applied magnetic transverse fields are studied.

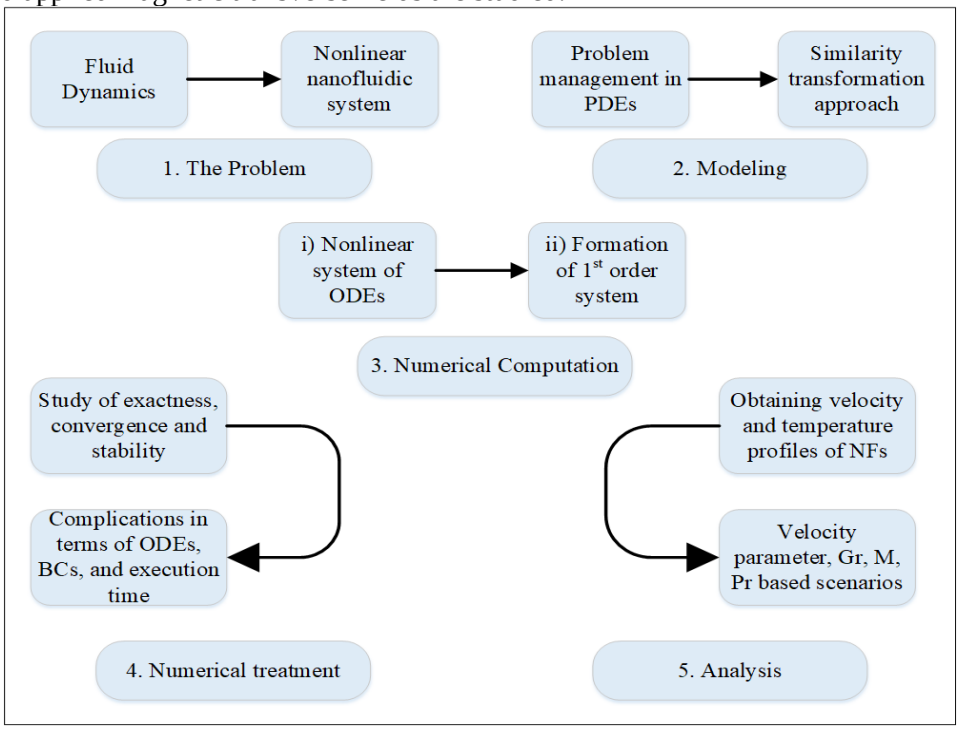

Figure 1: Graphical abstract of the proposed problem

Introduction

A numerical investigation by utilizing the novel numerical approach is implemented for the variable viscosity and mixed convection under the effect of a transverse magnetic field on a stretching surface. The numerical computation is performed, including the Exactness, convergence, and stability study. The numerical results are performed with various cases on velocity, parameter stretching ratio, GR, M, PR based scenarios and are presented in a tabular and graphical manner. A repeated scheme for the most effective solution of the implicit equation which is related to the and 6^{th} order is the Runge-Kutta Lobatto IIIA method. The graphical abstract presented in figure 1 highlights the entire numerical process carried out in the proposed research. Lobatto IIIA method provide the most effective way for the quantitative solution of the non-linear stiff systems [1].

Results and discussion

This paper examines the influence of coupled temperature and convection-dependent viscosity on magnetic hydrodynamic Nanofluids (NFs) stagnation point movement towards a more expanding surface. Copper and silver nano-particles are considered in rigorous correlative research. Vogel's and reynold's models are used to investigate the influence of viscosity. In addition, the fluid flow is accelerated by the mixed convention. The base fluid's thermal conductivity is improved as the volumetric proportion of nanoparticles increases.

References

[1] Ahmad, I., Hussain, S.I., Raja, M.A.Z. and Shoaib, M., 2022. Transportation of Hybrid MoS2–SiO2, SiO2/EG Nanofluidic System Toward Radially Stretched Surface. *Arabian Journal for Science and Engineering*, pp.1-14.