Study of Cotton gravity and its spherically symmetric solutions

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We have found and studied the general spherically symmetric static solution to the vacuum equations of Cotton gravity, a newly suggested alternative theory of gravity [1]. The obtained metric exhibits interesting properties, notably the presence of singularities on the photosphere, which seem to prevent the formation of Schwarzschild-radius stellar black holes. This suggests that, within the framework of Cotton gravity, black hole solutions may significantly deviate from the predictions of General Relativity, potentially addressing problems such as finding realistic interior metrics. The solution is characterized by two integration constants, whose values can be constrained by association with the Hubble horizon. Finally, we examine the diverse features of the solution, including long-range modifications to Newton's force through the incorporation of a velocity-squared repulsive term to model dark energy.

References

[1] J. Harada, "Emergence of the Cotton tensor for describing gravity," *Phys. Rev. D,* vol. 103, 2021.

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