# Supra-convergence of Shortley-Weller method for Poisson equation

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**ABSTRACT**

The Poisson equation is of primal importance in many physical problems, especially in fluid flows with incompressible condition. Both the supra-convergences of solution and its gradient are important. Actually in incompressible fluid flows, that of gradient is more important. Each of Shortley-Wellers, Gibous, and Purvis is one of the most popular methods for solving Poisson equation and their supra-convergence properties have been numerically observed and verified through numerous trials. Compared to their importances, mathematical foundation for understating the properties are far short. In this talk, we review the analysis for supra-convergence of Shortley-Weller method which is not a simple copy but serves a basic foundation to go toward the yet undiscovered analysis for other supra-convergences. Also, we introduce a new symmetric implementation of Shortley-Weller method in one dimension, and then we present a partial result for supra-convergence for the gradient of solution. Though partial, this work serves an introduction and mathematical setting for the analysis.