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# The Method of Particular Solutions using Trigonometric Basis Functions

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## Abstract

In this paper, the method of particular solutions (MPS) using trigonometric functions as the basis functions is proposed to solve two-dimensional elliptic partial differential equations. The inhomogeneous term of the governing equation is approximated by Fourier series and the closed-form particular solutions of trigonometric functions are derived using the method of undetermined coefficients. Once the particular solutions for the trigonometric basis functions are derived, the standard MPS can be applied for solving partial differential equations. In comparing with the use of radial basis functions and polynomials in the MPS, our proposed approach provide another simple approach to effectively solving two-dimensional elliptic partial differential equations. Five numerical examples are provided in this paper to validate the merits of the proposed meshless method.

Keywords: method of particular solutions, trigonometric functions, particular solution, meshless methods, collocation method

## 1 Introduction

During the past half century, the developments and applications of numerical schemes for boundary value problems have made significant progress. Various novel numerical methods have been proposed and successfully applied to realistic engineering applications. The finite difference method [1], the finite element method [2], the finite volume

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