Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **31 (2024)** 39-61

PRINCIPLES OF IDE THEORY

A short summary

Ray Brown

EEASI Corporation
Houston, Texas

Abstract. This paper summaries the basic principles of Infinitesimal Diffeomorphism Equation (IDE) Theory. It answers seven foundational questions: (1) What is an IDE? (2) What is the relationship of IDE theory to the Theory of Ordinary Differential Equations (ODE)? (3) What is the mathematical basis of IDE theory? (4) What is the IDE analog of the unilateral shift (ULS)? (5) What are the elementary building blocks of IDE theory? (6) How are elementary IDEs combined to construct complex IDEs? (7) How are complex IDEs deconstructed into elementary IDEs?

Keywords. Chaos, natural science, complexity,

AMS (MOS) subject classification: 37D45.

1 Introduction

The Theory of Infinitesimal Diffeomorphism Equations (IDE) provides a method of analyzing ODEs based on their local, as opposed to their global dynamics.

This paper summaries the basic principles of Infinitesimal Diffeomorphism Equation (IDE) Theory. It answers seven foundational questions:

• (1) What is an IDE?

• (2) What is the relationship of IDE theory to the Theory of Ordinary Differential Equations (ODE)?

• (3) What is the mathematical basis of IDE theory?

• (4) What is the IDE analog of the unilateral shift (ULS)?

• (5) What are the elementary building blocks of IDE theory?

• (6) How are elementary IDEs combined to construct complex IDEs?

• (7) How are complex IDEs deconstructed into elementary IDEs?

IDE theory originated from using a special form of an ODE to analyze global dynamics. However, the IDE methods used to analyze global dynamics extend well beyond the analysis of ODEs to include bounded linear operators on Hilbert space.