

## A NEW CLASS OF GENERALIZED MONOTONE MAPPINGS AND VARIATIONAL INCLUSION PROBLEMS IN BANACH SPACES

N. K. Sahu<sup>1</sup>, R. N. Mohapatra<sup>2</sup>, C. Nahak<sup>3</sup> and N. K. Mahato<sup>4</sup>

<sup>1</sup>Dhirubhai Ambani Institute of Information and Communication Technology,  
Gandhinagar, India

<sup>2</sup>University of Central Florida, Orlando, FL. 32816, USA

<sup>3</sup>Department of Mathematics, Indian Institute of Technology, Kharagpur - 721302, India

<sup>4</sup>PDPM Indian Institute of Information Technology, Design and Manufacturing  
(IIITDM) Jabalpur, India

**Abstract.** With the aim to solve a new type of variational inclusion problem, we have introduced a new class of generalized monotone mappings. The new type of generalized monotone mapping named as  $H(.,.)$ -Co-monotone mapping is the sum of a symmetric cocoercive mapping and a symmetric monotone mapping. The generalized resolvent operator associated with the  $H(.,.)$ -Co-monotone mapping is defined. Applying the generalized resolvent operator technique the new type of variational inclusion problem is solved in 2-uniformly smooth Banach spaces. An iterative algorithm is developed to approximate the solution. Finally, the convergence analysis of the proposed algorithm is accomplished.

**Keywords.** Variational inclusion, Generalized resolvent operator,  $H(.,.)$ -Co-monotone mapping, 2-uniformly smooth Banach space, Semi-inner product space.

**AMS (MOS) subject classification:** 47J22, 47J20, 46C50

## 1 Introduction

Variational inclusion problem can be perceived as a natural generalization of variational inequality. It is a convenient unified approach for the study of optimal solutions in many optimization related areas such as mathematical programming, variational inequalities, complementarity problems, equilibrium problems, game theory, mathematical economics, etc. These applications stipulated significant interest in studying variational inclusion problems and their solution methods. General projection methods can not be extended and modified for solving the variational inclusions. The resolvent operator technique is very efficient and robust method to solve the variational inclusion problems. Essentially, by using this technique the variational inclusion problem can be transformed into a fixed point type of problem. This alternative equivalent formulation has played very crucial role in developing very