

J. of Ramanujan Society of Mathematics and Mathematical Sciences
Vol. 10, No. 2 (2023), pp. 161-176

DOI: 10.56827/JRSMMS.2023.1002.12

ISSN (Online): 2582-5461

ISSN (Print): 2319-1023

**LINEAR AND NON-LINEAR WAVELET APPROXIMATIONS OF
FUNCTIONS OF LIPSCHITZ CLASS AND RELATED CLASSES
USING THE HAAR WAVELET SERIES**

Susheel Kumar

Department of Mathematics,
Tilak Dhari P. G. College Jaunpur,
Uttar Pradesh - 222002, INDIA

E-mail : susheel22686@rediffmail.com

(Received: May 16, 2023 Accepted: Jun. 26, 2023 Published: Jun. 30, 2023)

Abstract: In this paper, linear wavelet approximation of a functions f belonging to $\text{Lip}\xi$, and $\text{Lip}(\xi, p)$, $1 \leq p < \infty$, have been determined by using Haar scaling function and Haar wavelet series. A non-linear wavelet approximation of function belonging $L^2(\mathbb{R})$ and $\text{Lip}\alpha$ class has been obtained. The comparison of the order of linear and non-linear approximations have been studied. It is observed that a non-linear approximation error is better and sharper than linear approximation error.

Keywords and Phrases: $\text{Lip}\alpha$ class of functions, $\text{Lip}(\alpha, p)$ class of functions, $\text{Lip}\xi$ class of functions, $\text{Lip}(\xi, p)$ class of functions, Multiresolution analysis, Scaling function ϕ , Linear approximation, Non-linear approximation.

2020 Mathematics Subject Classification: 40A30, 42C15, 42A16, 42C40, 65T60, 65L10, 65L60, 65R20.

1. Introduction

Wavelet analysis plays a vital role in Functional Analysis, Numerical Analysis, Signal Processing, Engineering and Modern Technology. The roles of target functions and approximating functions are often observed in modern analysis. The fundamental approach applicable in the approximation theory is to resolve the target function into the suitable approximates. A certain function is expressed in the