VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI, KARNATAKA-590 018

MINI PROJECT REPORT

ON

"CHANNEL ESTIMATION ANALYSIS IN MIMO-OFDM WIRELESS COMMUNICATION"

Submitted as partial fulfillment required for the award of

BACHELOR OF ENGINEERING

in

ELECTRONICS & COMMUNICATION ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the Mini Project entitled is **"CHANNEL ESTIMATION ANALYSIS IN MIMO-OFDM WIRELESS COMMUNICATION"** a bonafide work carried out by **Chandan Kumar N S(USN:1SK20EC008), Lakshmi H(USN:1SK20EC023), Monika N S(USN:1SK20EC026), Yogitha J(USN:1SK20EC055)** of **VI Semester B.E**, in partial fulfillment as a requirement for the award of degree of **Bachelor of Engineering** in **Electronics and Communication Engineering** of the **Visvesvaraya Technological University (VTU)**, Belagavi during the academic year **2022-2023**. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The Mini Project report has been approved as it satisfies the academic requirement in respect of the Mini Project described for the Bachelor of Engineering degree.

Signature of the Guide   Signature of the HOD   Signature of the coordinator
  (Dr. Nagesh R)   **(Dr. Nagesh R)**   **(Dr. Leelavathi G)**

Name of the Examiners: **Signature with Date:**

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DECLARATION

We, **CHANDAN KUMAR N S (USN: 1SK20EC008), LAKSHMI H (USN: 1SK20EC023) MONIKA N S (USN: 1SK20EC026)** and **YOGITHA J (USN: 1SK20EC055)** Students of **VI** semester BE in Electronics and Communication Engineering, Government SKSJ Technological Institute, Bangalore, hereby declare that the Mini Project entitled **"CHANNEL ESTIMATION ANALYSIS IN MIMO-OFDM WIRELESS COMMUNICATION"** submitted to Visvesvaraya Technological University during the year **2022-23**, is a record of an original work done by us under the guidance of **Dr. Nagesh R**,HOD of the department, Department of Electronics and Communication Engineering, Government SKSJ Technological Institute, Bangalore. This Mini Project is submitted in partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Electronics and Communication Engineering, the result embodied in this Mini Project have not been submitted to any other university or institute for the award of Degree.

Date:

Place: Bengaluru

ACKNOWLEDGEMENT

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We would like to thanks, **Dr Leelavathi G**, Project Co-coordinator, Department of Electronics and Communication Engineering, for her suggestions and support.

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ABSTRACT

Channel estimation is a critical component in modern communication systems, enabling reliable information transmission over channels accurate channel estimation technique are essential to mitigate the impact of noise, interference and other impairments that affect transmission quality. in recent years, various channel estimation algorithms have been proposed to enhance the performance of wireless communication systems. However, designing and inefficient channel estimation algorithms remain a challenging task due to the complexity of wireless channels and limitations of the hardware. Channel estimation is an important task in wireless communication systems and to enhance the performance, we have made use of channel equalizers. In this project, we provide a comparison of two different techniques. Least Square Estimation (LSE), Minimum Mean Square Estimation (MMSE) and plot Bit Error Rate vs Signal to Noise Ratio (SNR) for a NtxNr Multiple Input Multiple Output system (MIMO) systems. The plots are obtained for Nt (Number of Transmitter Antenna) and Nr (Number of Receiver Antenna) being 2. We observed that MMSE approach outperforms LSE in channel. The statistical analysis of channel estimation using these algorithms in mat lab provides the behavior of the channel and its quality is estimated based on the trade-offs between SNR and BER.

MATLAB is a high-level programming language and environment designed for numerical computation, visualization, and algorithm development. It stands for "MATrix LABoratory" and was developed by Math Works. MATLAB allows you to perform various mathematical and scientific calculations efficiently and provides a wide range of tools for data analysis, modeling, and simulation. The LSE technique estimates the channel by minimizing the discrepancy between the received and transmitted pilot signals. On the other hand, the MMSE technique leverages statistical information about the channel to achieve more accurate estimation. By comparing the performance of these two techniques, valuable insights can be gained regarding the trade-offs between computational complexity and estimation accuracy

Using MATLAB, the channel estimation algorithms are implemented, and extensive simulations are conducted to evaluate the system's performance. The SNR is considered as a key parameter to assess the quality of channel estimation, while the BER is determined to evaluate the impact of channel estimation on overall system performance.

The obtained results from the simulations allow for a comprehensive analysis of the LSE and MMSE techniques for channel estimation in a MIMO-OFDM wireless system. This analysis provides insights into the advantages and limitations of each technique and facilitates an understanding of the trade-offs between estimation accuracy and complexity. Ultimately, this study contributes to the optimization of channel estimation algorithms in MIMO-OFDM systems, leading to enhanced reliability and efficiency. The Least Square Error (LSE) and Minimum mean Square (MMSE) approaches are frequently employed for channel estimation. Both the LSE and MMSE offer precise channel estimations. However, MMSE approach outperforms the LSE method in various channels because of its capacity to manage the effect to interference induced by the Line-of-Sight (LOS) component.

TABLE OF CONTENTS

LIST OF FIGURES