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Waste heat recovery from exhaust gas of an engine by using a phase change material

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ABSTRACT

An increase in the economic rapid development worldwide creates a problem of shortage of energy and hence conservation of energy is the need of an hour. A recent survey shows that a considerable amount of energy is released in the form of waste heat from internal combustion engines which creates another issue of air pollution. According to the study, the conversion rate of energy supplied to an engine into useful power output that is mechanical work is around 30–40%. It means that the exhaust gases contribute to about 33% and engine cooling capacity about 30% to that of the energy supplied which results in an increase in entropy and other serious environmental problems. Indeed more and more energy should be converted into useful work. The present work consists of thermal energy storage from the exhaust gas of twin-cylinder four-stroke diesel engines with the help of sodium nitrate being used as the Phase Change Materials (PCM) and the energy available in exhaust gas without Phase Change Materials. The test of fuel used as diesel for both with and without PCM. The exhaust gases from the twin-cylinder four-stroke diesel engine without PCM contain 45.1% energy transferred to the atmosphere. The exhaust gases with a thermal energy storage system exchanging of heat to the PCM. The PCM stored thermal energy 5.5% of total energy from the exhaust during the charging process and reduced emission control by reducing energy transferred to the atmosphere form 45.1% to 39.5%. The thermal energy from the PCM discharged and used to generation of steam which can be used for different applications. The process without PCM gives more harmful gases and hazardous to humans and the environment, but the system with PCM gives minimum exhaust gas temperature which is minimum harmful to humans and the environment. The utilization of waste heat and its recovery reduces the fuel required to run the engine and lesser emission of greenhouse gases to the environment.

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1. Introduction

The high capacity diesel engines which run most commonly on the road energy requirement in India has increased more rapidly due to its economic and industrial growth. There are various energy sources available in nature; however, they create some uncertainty about their uses and thus, effective utilization of all the energy sustainable resources need to be done. One such energy resource is high capacity diesel engines which run most commonly on roads [1]. A recent study shows that in the case of an internal combustion engine, the heat carried away by the cooling water and exhaust gases is around 30% to that of the total input energy is supplied to run the internal combustion engine. This waste heat energy should be conserved through waste heat recovery systems. The combustion of fuel in the engine generates waste heat. The energy conservation of this waste heat may result in the saving of fuel. Nowadays, a modern technique of waste heat recovery from the engine exhaust is to store the heat in the form of thermal energy storage which later on can be used for numerous applications [2].

Out of the energy storage, the latent heat storage contributes more to store the energy in the thermal energy storage. It is because of its heat storage properties at constant temperature and the ability to ensure high energy storage density factor [3].

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33_Enhancing Uplink/Downlink Performance of Massive MIMO System Using Time-Shifted Pilot signal Transmission with Pilot Hopping (TSPTPH)

Enhancing uplink/downlink performance of massive MIMO system using time-shifted pilot signal transmission with pilot hopping

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Abstract: In Massive Multiple Input Multiple Output (MIMO) system, pilot signals are reused to accommodate exponential rise in user density. This contaminates the channel estimation for the intended user and affects the system performance. In the proposed Time-Shifted Pilot signal Transmission with Pilot Hopping (TSPTPH) system, pilot signal transmission is overlapped with downlink data transmission and pilot signal hopping is performed in each coherence interval. Hopping is achieved by switching user to a new pilot signal, this results in random change in interfering users. This changes the large-scale fading coefficient β, which is a function of radial distance between base station and user and thus improves the system performance. Proposed system enhances the uplink and downlink signal to interference plus noise ratio and data rate by estimating the channel with minimum mean square error estimation and reduces the uplink signal to noise ratio for data transmission for normalised spectral efficiency with rising number of antennas at the base station.

Keywords: channel estimation; pilot hopping; large-scale fading; pilot contamination; pilot sequence; small scale fading; transmission slot.

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1 Introduction

Wireless communication expanse is rising exponentially for the last 20 years. To meet the requirements of increased number of users, available frequency spectrum is reused in the neighbouring cells. This causes inter-cell interference, and thus constrains the quality of service provided to the users. Interference and fading are the two main challenges that must be given consideration while designing the wireless communication system. Fading restricts the coverage area and reliability of communication link while interference limits the re-usability of spectral resources such as time, frequency and codes. Introduction of Multiple Input and Multiple Output (MIMO) technology in cellular systems not only improves the data rate but also provides link reliability. In MIMO system, multiple transmitter/receiver antennas are used to transmit multiple data streams in parallel, which is referred to as spatial multiplexing. Though

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Prediction of Coronavirus Covid-19 cases using Linear Regression and Support Vector Machine

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Abstract—Numerous viruses like H1N1 Influenza in 2009 and Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) in 2003 are documented. Recently, MERS-CoV Middle East Respiratory system detected in Saudi Arabia in 2012.Now, a novel coronavirus was discovered in December 2019. It causes a number of pneumonia cases in China. It started spreading briskly, resulting in widespread throughout China, shadowed by an increasing number of cases in other countries all over the world. In February 2020, the WHO named it as COVID-19, which stands for coronavirus disease 2019. It took almost three months to reach the first ten thousand confirmed cases, and only in next 12 days it reaches to the next 1 lac cases, a sign that the speed of transmission is increasing. As a case study we have considered India for the evaluation of results of prediction. In India, as of March 27, 2020, according to the Ministry of Health & Family Welfare (MoHFW), a total of 724 COVID-19 cases are reported in 27 states/union territories. The death rate of the virus has fluctuated and since it is a new virus without a vaccine yet, it is difficult to confirm its behavior. The Government of India is taking all required steps to make sure that the country is ready to face the challenge and hazard posed by the increasing pandemic of COVID-19. In this situation, it is very important to predict the number of cases in future which will help the government to take necessary actions. In this research, we have designed a new system based on Linear Regression and Support Vector Machine that accurately predict the number of COVID-19cases in the forthcoming days, if precautions to prevent it are not followed. It is also observed that for the first 4-5 days predicted data is almost matched with an increase in the number of cases in India.

Keywords— *Pandemic, COVID-19, prediction, linear regression, support vector machine.*

1. INTRODUCTION

From the reports of the World Health Organization (WHO), viral diseases persist to arise and exemplify a critical concern to society wellbeing. Past 20 years, several epidemics like the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2003, and H1N1 influenza in 2009 and the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 were documented.

The first case of coronavirus was reported to the WHO on December 31, 2019.It was detected at Wuhan, China, and then the disease started spreading and brought a present day scenario of pandemic. WHO announced the disease's name as "COVID-19", which is an abbreviation of "Coronavirus Disease 2019", on February 11, 2020.This coronavirus appears to be very infectious and has rapidly scattered worldwide. On February 28, 2020, WHO mentioned the risk of COVID-19 to be extremely high-level. WHO declared COVID-19 a pandemicon

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Resolving the Interference in 5G Millimeter WaveThrough Scheduling Technique In Estimated Channel

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Abstract—**In this paper we describe the designing of MIMO(Multiple input and multiple output) system along with scheduling technology which schedule the beam depending on SINR ratio keeping it different from other scheduling techniques like RR and PF techniques. This paper describe the effect of scheduling to compare different parameter for the dynamic resource allocation.Now a days communication industry increasing spontaneously In this late century, use of mobile and cellular services are very common .In the proposed method of SINR scheduling technique signals are scheduled according to their signal to noise plus interference ratio. We tried to develop the effective scheduling technique that support the QPSK and implementing lower complexity into MIMO estimated channel. We resolve the inter cell interference between the base station and destination which causes a large effect system capacity. Intercellular interference become more problematic with the decrease in cell size**

Keywords—Mimo ,Millimeter Wave Scheudling Interferencece

I. INTRODUCTION

Incremental improvement in existing communication industry can not sustain a excess of use in application and service of future wireless communication. Most recent two research technology like using a small cell and millimeter wave communication are viral in recent technological world. we are living in the rising time of wireless research .Not only the technological innovation in this field increased but also the service provided by wireless technology have skilled the enormous boom.

The study of wireless communication integrated itself into a redundant industry for example intelligent transport system wireless power transfer ,cyber security system. In the circumstances of cellular communication ,extensive research, effort and standardization activities towards the 5G mobile system result to equip the mobile operator with the guidelines the dimension rules for the resource planning and design of network implementation producing a effective next generation mobile communication. Tremendous increase in he data traffic result in an unsupported incremental improvement in the communication industry. With The increase in the requirement of data ,no of connected devices and per link data rate requirement is also growing exponentially. Number of devices connected in the 5G system are increased extensively due to the variety of applications and services planned in the system.

Millimeter wave systems offer very high data rates on account of enormous data transfer limits ,anyway encounters from the poor link budget .Diverse examinations improving the signal strength is accounted for . Use of directional antenna guarantees better transport if LOS communication corresponds between transmitter and receiver the other elective arrangement is Multi Input Multi Output (MIMO) beam forming that uses the channel measurement to co-ordinate in this manner improving the multiplexing gain and beam forming gain

As of late, the advances in the silicon technologies have propelled broad research and industrial activities in wireless system in millimeter wave frequency range (30 -300GHZ)At millimeter wave frequencies ,bigger bandwidth is accessible and it can possibly support multi GBPS data rates. One of the most popular band is a unlicensed 60 GHZ band and several standards are in development , wireless personal/ local area network WPAN[08],WLAN[9] Ever increasing demand of high data rate service tends to innovate a communication industry. To achieve this we need to characterize a system performance through the following parameter.

A. Cell edge rate

It is worst case data rate that can be received . The target 5G cell edge data rate range from the 1000MBPS to 1 GBPS".

B. Peak physical data rate

It is a maximum data rate at a fix time.

C. Latency

Providing a ultra low latency is one of the important characteristics of 5G communication . It can be defined as end to end time required to data transfer. For 4G it is 10 to 20 ms. The future wireless technology like two way gamming ,tactile internet and virtual reality

D. Reliability

Another major characteristics is reliability. 5G system provide ultra reliable communication .In Nutshell, it provide a communication aim at the facilitating end to end successful communication of about 99.99%

E. Massive connect

In addition to supporting service , characterized by high data rate ,reliability, low latency one of the low complexity and low power .The advantage of this connectivity is increasing no of the devices wide area coverage and deep indoor penetration ex smart metering consist of large no of sensor to collect the data.

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Full Length Article

Ringing artifacts in wavelet based image fusion: Analysis, measurement and remedies

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ABSTRACT

In this paper, we investigate an issue of the ringing artifacts inherent to wavelet based image fusion. A thorough analysis of the ringing phenomenon, by experimenting with different types of images and different wavelet families, with varying lengths of filters and varying levels of decomposition is performed to obtain deeper insights of the ringing artifacts. It is experimentally shown that wavelet based fusion results in the modification of the intra- and inter-scale dependencies, with the inter-scale dependency being the dominating factor causing the ringing artifacts. Also, these ringing artifacts are localized in the Fourier domain. Subsequently, a quantitative measure using structural dissimilarity is proposed to measure the ringing artifacts due to wavelet based fusion. Two possible solutions to compensate for the ringing artifacts are then proposed. In the first strategy, a filtering based method is proposed to reduce these ringing artifacts. It takes advantage of the localized nature of the ringing artifacts. Furthermore, the intra- and inter-scale dependencies are modeled using order-zero entropy. A second strategy using the inter-scale dependency is then proposed to reduce the ringing artifacts. Experimental results show that both these methods are able to reduce the ringing artifacts significantly and have further scope for improvement. Another critical finding of this work is selection of the wavelet filter and its levels of decomposition for the process of fusion.

1. Introduction

Representation and understanding of an entity being studied can be improved significantly by fusion of multiple data sources. Image fusion aims to improve perceptual quality, not only for computer vision applications but also for the human visual system. Multiple input images having relevant and complimentary information are fused to achieve an output image with increased information content as compared to each of the input images. Wavelet based multi-resolution analysis is a crucial tool which can be used in image fusion problems. Decomposing the input image using the wavelet transform provides the flexibility of handling image features at various scales. Also, wavelet based analysis and synthesis is computationally efficient. However, it has a few limitations like artifact generation in the output image. The problem of compensation of unwanted artifacts in the general multi-resolution wavelet framework has been handled by very few researchers.

Fig. 1 shows an example of a fusion of visible and Near Infrared (NIR) images with a traditional mean-max wavelet based fusion. One can see the fused image produces sharp details of the foreground as well as of the distant mountains. At the same time, one can see spurious variations (marked with red ovals) of colors and shading at strong boundaries. These spurious variations are termed as *ringing artifacts* [1]. Fig. 2 shows another example of multi-exposure image fusion. The fused result is obtained by the weight map based wavelet fusion mechanism proposed by Malik et al. [2]. Even in a sophisticated algorithm like this, one can see the presence of the ringing artifacts.

Similar artifacts were observed when we tested for different wavelet based fusion algorithms. No matter how good the fusion mechanism is, these ringing artifacts are inherent to wavelet based fusion [1]. Very few efforts have been made in the literature to analyze such a critical issue. Few researchers [4–9] have indicated the presence of such artifacts in the fused images. Li et al. [10] and Fang et al. [11] have used sparse representation of the data for improved quality in remote sensing image fusion. However, apart from the work of Dippel et al. [1] and Fattal [12], not many insights are available in the literature on the analysis of the ringing artifacts in wavelet based fusion. Apart from indicating possible causes of the ringing artifacts, no further course of action is provided by Dippel et al. [1] and Fattal [12]. This opens up new opportunities to seek further insights and improve wavelet based fusion.

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