LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah	:	Very High Thoughput WLAN System for Ultra HD 4K Video Streaming		
Jumlah Penulis	:	3 orang (Wahyul Amien Syafei, Kurosaki, M., Ochi, H.)		
Status Pengusul	:	Penulis Utama		
Identitas Prosiding	:	a. Judul Prosiding	:	The 1st International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE) 2014
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Very high throughput WLAN system for ultra HD 4K video streaming

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Abstract

We have been developing a very high throughput WLAN system based on IEEE802.11ac's criteria. It combines MIMO and OFDM technology to provide throughput over 1 Gbps for 150 feet propagation distance by using 80MHz of bandiwdth on 5GHz frequency band. 4 by 5 antennas MIMO is set to get

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Keynote Speech :

Prof. Hiroshi Ochi
(Kyushu Institute of Technology, JAPAN)

Keynote Title :

Multi-User MIMO Wireless System -From Theory to Chip Design

Speaker's Biography:

Hiroshi Ochi is a professor in Computer Science and Electronics of Kyushu Institute of Technology in Fukuoka, Japan.Dr. Ochi is a cofounder of Que-Wave.He received Ph.D. from Tokyo Metropolitan University in 1990.He has been engaged in researches and developments of digital communication systems and signal processing areas at an academic environment since 1986.He brings over 17 years of experience and knowledge of electronics engineering to Que-Wave.One of the reasons he founded QW is he has felt to need more useful and high-performance devices than ever. And then, he decided to focus on producing useful tools and services from an engineer's point of views.

KEYNOTE SPEAKER 2

Keynote Speech :

Prof. Dr. Trio Adiono
(Institut Teknologi Bandung)

Keynote Title :

Challenges and Opportunities in Designing Internet of Things

Speaker's Biography:

Trio Adiono is faculty member of the School of Electrical Engineering and Informatics of Institut Teknologi Bandung (ITB) and the head of IC Design Laboratory of Microelectronics Center ITB. He obtained his Ph.D. degree in VLSI Design from Tokyo Institute of Technology (Titech), Japan. From 2002 to 2004 he was a research fellow of the Japan Society for the Promotion of Science (JSPS) in Titech. In 2005, he was a visiting scholar at MESA+, Twente University, Netherlands. He has developed several microchips for video processing, smart card, NFC, and WiMax Baseband Chip. He received the "Second Japan Intellectual Property (IP) Award" in 2000 from Nikkei BP for his research on "Low Bitrate Video Communication LSI Design".

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Keynote Title :

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1991 – Current President Director of PT Pasifik Satelit Nusantara
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1994 – Current Chairman and CEO of ACeS
1999 – 2008 Chairman of Indonesian Institute of Corporate Governance
2005 – 2006 Expert Staff for BRR
2007 – 2012 Member of Board of Commissioner of PT Garuda Indonesia
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TABLE OF CONTENTS

Very High Throughput WLAN System for Ultra HD 4K Video Streaming

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***Abstract*—**

We have been developing a very high throughput WLAN system based on IEEE802.11ac's criteria. It combines MIMO and OFDM technology to provide throughput over 1 Gbps for 150 feet propagation distance by using 80MHz of bandiwdth on 5GHz frequency band. 4 by 5 antennas MIMO is set to get 2^{nd}-order diversity gain to maintain high throughput and performance. Greenfield preamble with novel phase rotation is employed to mitigate the overhead problem while reducing the peak to average power ratio of the signals. Run test to broadcast the ultra high definition video which resolution 4096×1714 pixels/frame with 30 frame/second under in-door channel model demonstrates an excellent performance of the developed system.

Keywords—very high throughput, WLAN IEEE802.11 ac, MIMO, OFDM, Low PAPR, Ultra HD Video Streaming

I. Introduction

In line with the exponential increment of the demand of high throughput wireless communication, the IEEE802.11 work group have been discussing to increase the system throughput based on user's experience. Although the maximum throughput of WLAN 802.11n is 600Mbps by using modulation coding scheme (MCS) 31 with short guard interval (GI) on 40MHz of bandwidth [1], it still can not accomodate modern multimedia communications which need very high throughput wireless system. The IEEE802.11 very high throughput (VHT) task group (TG) or known as TG-802.11ac (TGac) is formed for this purpose, i.e. to define the standard of new WLAN system that can provide at least 1 Gigabit of throughput. [2]. One of the points to be considered in developing this VHT system is the usage models, i.e. the kind of applications that can be supported by VHT system, such as high definiton (HD) video streaming, high-speed data transfer, etc. [3], [4].

In this paper, we propose a very high throughput (VHT) wireless system based on IEEE802.11TGac's criteria and examine its performance through ultra HD 4K video streaming. It combines MIMO and OFDM technology to provide throughput over 1 Gbps for 150 feet propagation distance by utilizing 80MHz bandwith on 5Ghz frequency band. Greenfield format is employed due to its compact form to endorse the throughput. Novel phase rotation is employed to get low peak to average power ratio (PAPR) of the OFDM signals on each stream. Four transmssion streams which are received by five receive antennas contribute 2^{nd}-order diversity gain. This configuration is set to maintain both high throughput and performance. [5] Run test for streaming ultra HD video which has resolution of 4096×1714 pixels/frame with 30 frame/second demonstrates an excellent performance of the developed system. The test is conducted under in-door channel which is a modification of channel model B of IEEE TGn [6]

This paper is organized as follows. The developed VHT WLAN system with greenfield preamble is briefly explained in section 2. Section 3 deals with the scenario of performance examination by streaming the ultra HD video. In section 4, System performance, link budget, and video quality due to wireless transmission errors are analyzed. Finally, we draw some conclusions and future works in section 5.

II. The VHT Wireless LAN system with Greenfield Preamble

Block diagram of transmitter and receiver of the developed system which based on IEEE802.11TGac's criteria is shown in Fig. 1 and 2. Three options of modulation coding scheme (MCS) which define the parameteres to calculate the data rate of this system is summarized in Table I. The timing related constants used in this system is listed in Table II. 1.2 Gbps throughput is accomplished by using 400ns GI on MCS K-3, where R is the data rate, N_{BPSC} (i_{ss}) is number of bit per sub carrier of i-th spatial stream, N_{SD} is number of data subcarrier, N_{SP} is number of pilot symbol, N_{CBPS} is number of coded bit per OFDM symbol, N_{DBPS} is number of data bit per OFDM symbol, N_{SS} is number of spatial stream, and GI is guard interval length.

Since the aim is boosting the throughput, greenfield (GF) format preamble is the only choice. GF has efficient frame format which consists of a VHT-short training field (VHT-STF), VHT-long training fields (VHT-LTF), and a VHT-Signal (VHT-SIG) field before the data portion (VHT-Data).

Each preamble field has 8μs duration, except the VHT-LTFs that are used for channel estimation purpose has 4μs duration for each. The duration of data fields may vary depend on the intended data rate. The placement of these fields and theirs time boundaries is shown in Figure 3.

A. Signal Description

In the VHT GF format, the transmitted signal on each transmit chain $i_{TX}, i = 1, 2, 3, 4$ is:

Enhancement of DRAMs Performance Using Resonant Tunneling Diode Buffer

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***Abstract*—DRAM industry has gained most of the interest in the memory chip industry in the last decades for its high density (due to its simple structure) and lower power consumption. As the density of DRAM chips increased, the bit-line parasitic capacitances increased and many problems appeared such as increased power consumption and larger read/write access times which gave great attention to improve the design of the CMOS sense amplifier used in the memory chip for its great effects on memory access time, overall memory power dissipation and chip density.**

In this paper, we introduce one of the most effective solutions to increase the performance of the advanced high density DRAMs by replacing the sense amplifier circuit with a specially designed logic buffer circuit based on Resonant Tunneling Diode (RTD) that can be fabricated in Nano-scale and exhibit higher operation speed with lower power consumption and higher chip density. The proposed design improves the Power Delay Product (PDP) by about 36% compared with that in conventional RTD-CMOS sense amplifier and 15% compared with that in conventional CMOS sense amplifier. The 45nm CMOS technology is used in this paper.

Keywords—Access time; CMOS; DRAM; Logic circuits; Power Delay Product (PDP); Resonant Tunneling Diode (RTD).

I. INTRODUCTION

DRAM cell has a very simple structure shown in Fig.1, which makes it easily implemented in arrays, this simple structure made DRAMs widely used in most of recent applications. It consists of a cell capacitance (C_s) and an access transistor (M_{access}) between the bit-line (BL) and the cell capacitance which is controlled by the word-line (WL). The bit-line is connected to a differential sense amplifier to sense the voltage stored in the cell capacitance and pulls the bit-line to V_{DD} or ground according to the value of the sensed voltage [1, 2].

Sense amplifiers are one of the most essential circuits in the periphery of DRAMs. They sense the voltage stored in the bit-line that results from the charge sharing between the cell capacitance and the bit-line capacitance. According to this value it pulls the bit-line up to the supply voltage (V_{DD}) or down to ground.

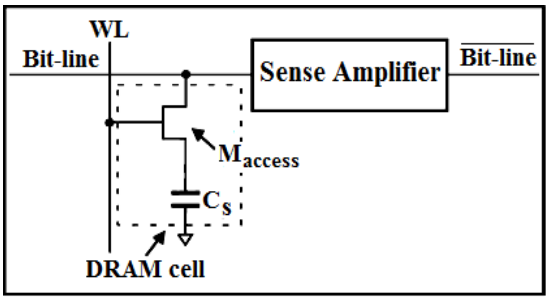

Fig. 1. DRAM cell [1].

The voltage shared must be sufficient enough for the sensing operation to work correctly; it can be expressed as follows [2, 3]:

$$\Delta V = \frac{C_S}{C_S + C_{BL}}\left(V_{CS} - \frac{V_{DD}}{2}\right) \quad (1)$$

Where C_S and C_{BL} are the cell and bit-line capacitances respectively, V_{CS} is voltage stored in the cell and V_{DD} is the operating voltage. Usually C_{BL} is much greater than C_S, thus equation (1) can be reduced to [2, 3]:

$$\Delta V \cong \frac{C_S}{C_{BL}}\left(V_{CS} - \frac{V_{DD}}{2}\right) \quad (2)$$

In this paper, the value of ΔV is assumed to be equal to 5mV as a worst case for a very small charge sharing produced. To obtain this value; the cell capacitance (C_s) will be equal to 10fF and the bit-line equivalent capacitance (C_{BL}) will be equal to 500fF.

The CMOS sense amplifier design is facing many problems that greatly affect the performance of the memory chip. One of these problems is the CMOS technology scaling; it results in a significant increase in the leakage current of the CMOS devices which increases the power consumption. Also, the increased parasitic capacitances that come with advanced high density CMOS memories increase the power consumed and the read/write access times [6,7].

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Development of Microcontroller-based Stereoscopic Camera Rig Positioning System

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***Abstract*—A camera rig operator of stereoscopic camera system mostly adjusts a pair of camera manually when trying to make a 3D video that has good image depth. However, the process of this cameras positioning is cumbersome and time-consuming. In this paper, in order to solve those problems we develop a semiautomatic stereoscopic camera system; different from other works where a microcontroller, which considered low-cost and affordable, is employed to handle automation process of the system. Nevertheless, the camera rig operator is still required to carry out some manual processes such as inserting required parameters. In this system, the object distances approach is utilized; some object distance parameters, which obtained by a laser range finder, are entered into mathematical expressions in order to obtain correct positions of two cameras.. Based on experimental results, our proposed system enhances the process of the video capture process. In other words, it reduces the time required for every single scene capture process.**

Keywords—Semiautomatic stereoscopic camera system; microcontroller; automation process; object distances approach

I. INTRODUCTION

Stereoscopic camera system is a method to create three dimensional (3D) video. This technique actually adopts human visual system where there are two identical cameras used to represent two human eyes. Thus, the two captured videos, which are fused, can deliver depth of perception for presenting 3D illusion to human eyes. Furthermore, the two images must be aligned properly, including with correct disparity to avoid visual discomfort that could lead to eyestrain and visual fatigue to viewers. As such, to obtain the proper 3D videos, the cameras must be placed on a holder horizontally called stereoscopic camera rig. By using the camera rig, the alignment and the disparity of the cameras can be adjusted easily.

In recent years, the demand of the 3D video format is increasing. Herein, the 3D video can be watched not only in cinema theaters like many years ago, but anywhere as a lot of consumer devices such as 3D television, monitor, handphone, etc. are able to play 3D video format. However, from 3D video production point of view, the process is still cumbersome and time-consuming. A common way to adjust the position of the cameras is manually by a camera rig operator. In this case, a skilled camera rig operator is required. Big 3D movie companies enhance the production by using 3D live monitor equipment to assess the 3D effects during 3D video capture process [1], [2]. Another way is by optimizing the video combination process in post-production step [3].

In our opinion, optimizing the 3D video production during the video capture process could reduce workloads of video editing in post-production step and reduce the time required of video capture process itself since it is very dependent on assessment result of the camera rig operator. For example, even skilled camera rig could make a mistaken perceived depth of 3D images or videos that can cause visual fatigue to the viewers. In this case, the 3D images or video must be corrected and reevaluated in post-production step. Furthermore, dependent on subjective assessment of 3D video or image quality is obviously more time-consuming instead of objective assessment. Our laboratory had already evaluated about relationship between stereoscopic camera position and 3D image quality based on several objects position [10]; thus by following the same path, subjective assessment could be omitted and reduce time consumption. Several approaches in order to optimize video capture process have been proposed by utilizing a field programmable gate array (FPGA), and a programmable logic controller (PLC) [2], [4]. In this paper, we propose an automation system for the stereoscopic camera rig positioning by utilizing a microcontroller.

Microcontroller is a combination of central processing unit (CPU), memory, and input or output that integrated into small form integrated circuit (IC). It usually has lower price than FPGA or PLC and is intended to be used for low cost electronic system.

II. STEREOSCOPIC CAMERA SYSTEM OVERVIEW

There are several methods to create 3D video have been proposed. The cheaper method is by reconstructing 3D video through 2D-to-3D video converter [5], [6]. 2D video manipulation is the essential technique in this method so as to extract the depth information of the video. This kind of method is very useful to remake the old time 2D movies into 3D format. However, since the 3D effects desired from the 3D movies are basically the effects that people want to feel like in real life; therefore, the stereoscopic camera system is more preferred instead of 2D-to-3D video conversion.

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Training Support for Pouring Task in Casting Process using Stereoscopic Video See-through Display

- Presentation of Molten Metal Flow Simulation Based on Captured Task Motion -

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***Abstract*—The work support technology using augmented reality has been researched in the field of manufacturing. It is the technology that can present appropriate instructions to a worker. Thereby, the worker performs a task requiring an advanced skill even if she/he is not an expert. In this technology, most of work instructions are presented while the worker is working. However, there are many manufacturing tasks that is difficult to be retried when it fails. In order to deal with such tasks, a training support technology that a worker can train tasks beforehand using augmented reality is proposed. This technology can present simulated task results according to the motion of the worker. As a simulation result, for example, the worker can see internal state of the work object. And she/he can train as many times as she/he wants. Therefore, her/his skills can be improved through trial and error. In this paper, a concept of task training support technology is introduced. To realize the concept, the pouring task in casting process is selected as a target task and the prototype system is constructed. Then, the evaluation results of pouring task training using the prototype system are reported.**

Keywords- Training support, Work support, Casting, SPH, Augmented reality, Virtual reality, Video see-through display, High resolution, HMD

I. INTRODUCTION

In the manufacturing field, there is a problem with shortage of experts because of aging. In order to cope with this, the work support technology has been developed[1][2]. It is a technology that a worker can perform tasks efficiently even if she/he is not an expert by presenting the appropriate instructions corresponding to the situation at that time. In this technology, the work instructions are presented while the task is actually being executed. However, there are many manufacturing tasks that can not be retried if a worker fails, or that has a risk of large loss of cost. For such tasks, it is preferable that the task training is performed beforehand. In order to realize it, we propose the training support technology so that workers can practice in advance and their skill levels are expected to be efficiently improved. Fig. 1 shows the concept of task training support. A worker is looking at a work object through an image presented from the display device such as video see-through display. And the worker can practice by seeing not only the computer graphics but also practical work objects, and work tools that are used in the actual tasks. When the task operation is carried out by using work tools, the task motion is recorded. The simulation is executed on the basis of the recorded motion.

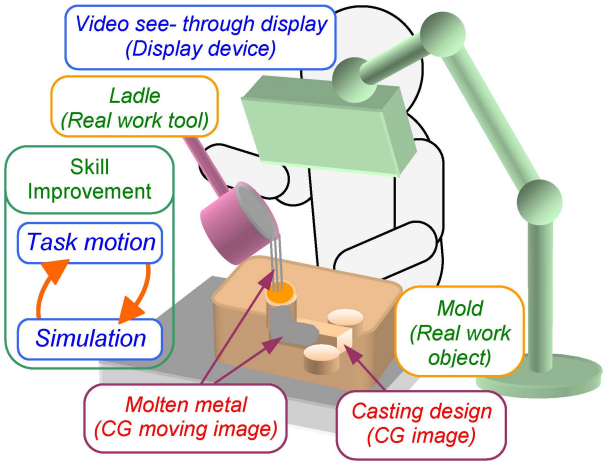

Fig. 1. Concept of task training support
Example of application to pouring task in casting process

Then, computer graphics (CG) of the simulation results is superimposed on the work object using augmented reality and the superimposed moving image is presented to the worker. As an example of the moving image, the worker is able to observe the molten metal flows into the mold as shown in Fig. 1. In this technology, the simulation result is changed according to the task motion. Therefore, through the moving image, the worker can evaluate whether the worker's previous task motion had gone well or not. Here, only simulation is performed on this training, and the actual task is not performed. Thus, the worker can practice it repeatedly through trial and error and it is expected her/his skills are improved. However, depending on the target task, it is necessary to appropriately choose the method of the motion detection and the simulation and so on.

As similar studies in manufacturing field, the assembly operation and maintenance that uses augmented reality are also studied[3][4]. They can also be used for the task training. Furthermore, the training system for the welding task is developed[5]. It can analyzed and evaluated the workers operation. However, the systems that can present the simulated task results according to the worker's motion such as the task training support we propose are hardly developed.

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