DEVELOPMENT OF LASER RANGE FINDER USING 1550 nm WAVELENGTH

By

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Thesis Submitted to the School of Graduate Studies, University Putra Malaysia, in Fulfillment of Requirement for the Degree of Master of Science

October 2006

In the name of Allah, Most Gracious, Most Merciful

DEDICATION

To

My parents, Family & Friends

ABSTRACT

Abstract of thesis presented to the Senate of University Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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October 2006

Chairman: Syed Javaid Iqbal, PhD

Faculty: Engineering

This thesis presents a design for measuring distance using infra light at 1550nm. A lot of experience has been gained in amplifying optical signal at 1550nm, however, another kind of range finder is being presented. The wavelength of 1550nm is selected because it is not harmful to the human eyes; it has less atmospheric absorption which makes it performs better in free space. A 1550 nm has less attenuation in free space than 902 nm or 1064 nm. 1550 nm is also safer than 902 nm and 1064 nm laser. In our system a 1550 nm, pulsed laser is used. Pulsed power is amplified by Erbium Doped Fiber Amplifier (EDFA), which is pumped by 1480nm, getting a 53.15mW 1550nm signal laser. A portion of the power after passing through the 1550 nm coupler triggers the counter to start the count. Optical pulse is collimated before it propagates in a free space. The receiver detects the laser power reflected from the target. The reflected amplified signal is used to stop the counter.

The number of counts is proportional to time of flight. The resulting distance is calculated form the time of flight measured by the range finder. Since distance can be calculated this tends that, the velocity can be calculated.

From the results, it is observed that the error is due to the time delay of the photodetector, and using EDFA gave an advantage of power control.

ABSTRAK

Abtrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi sebahagian keperluan Ijazah Master Sains

MEMBANGUNKAN PENGESAN JULAT LASER MENGGUNAKAN GELOMBANG 1550 nm

Oleh

BASM ALTAHER MOLOUD ABUFELA

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Tesis ini menerangkan rekaan untuk mengukur jarak dengan menggunakan cahaya infarmerah pada gelombang 1550nm. Kebanyakkan eksperimen dibangunkan dengan menguatkan isyarat optik pada gelombang 1550nm. Gelombang pada 1550nm dipilih kerana tidak membahayakan mata manusia dan mengurangkan penyerapan atmosfera pada ruang bebas. Gelombang pada 1550nm adalah kurang baik berbanding dengan gelombang pada 902 nm atau 1064 nm. Di dalam sistem ini, denyut laser pada gelombang 1550 nm digunakan. Kuasa denyutan diperkuatkan dengan menggunakan EDFA yang dihasilkan pada gelombang 1480nm untuk mendapatkan isyarat laser pada 53.15mW 1550nm**.** Sebahagian kuasa selepas melalui gelombang 1550 nm pengganding pemicu akan mengaktifkan pembilang. Denyutan optik adalah pengkolimatan sebelum berlaku perambatan pada ruang bebas. Penerima akan mengesan kuasa laser yang dipantulkan dari sasaran. Pembesaran isyarat yang

dipantulkan digunakan untuk menghentikan pengiraan. Bilangan pembilang adalah berkadar terus dengan masa penerbangan. Oleh kerana jarak boleh dikira dengn menggunakan masa penerbangan dengan menggunakan pengesan jarak, maka nilai pecutan boleh dikira.

ACKNOWLEDGEMENTS

First and foremost, all praise and thanksgivings to Allah the Almighty, for gracing me with strength to complete my thesis. Alhamdulillah.

I would like to express my deepest gratitude to my supervisor Dr. Syed Javaid Iqbal and the committee members, Prof. Madya Ir. Dr. Norman bin Mariun and Assoc. Prof. Dr. Mohd Adzir Mahdi for their guidance, advice and encouragement throughout the completion of my thesis.

To Assoc. Prof. Dr. Mohamad Khazani Abdullah and Mohamad Mansori, I would like to extend special word of thanks for their support and guidance to provide valuable information for my thesis completion.

My gratitude also goes to the members of Photonic Laboratory and staff of Communications and Networking Department, for their assistance and contribution of my thesis and to all of my friends for their moral support throughout my study in UPM.

Last but not least, I would like to express my sincere thanks to my family for being patient and supporting me throughout my study. Without their support and help in being patient, I would not have made it to the end.

I would like also to thank Mr. Mohammed abdulmoula Joulgaf and Mr. Abdullah Ali Rashdi from the mechanical department in showing me how to utilizes the computer in order to writing my thesis. I would also like to thank Mr. Hafied Mohamed Alfegi and his brother Ibrahim for there support and advice through this work.

I certify that an Examination Committee has met on date of viva to conduct the final examination of Basm Altaher Moloud Abufela on his Master of Science thesis entitled "New Eye Safe Rangefinder Using 1550nm with EDFA " in accordance with University Purta Malaysia (Higher Degree) Act 1980 and University Purta Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for the quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

_____

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