

SUDAN UNIVERSITY OF SCIENCE AND
TECHNOLOGY
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DESIGN AND CONSTRUCTION OF LASER AND VIDEO TRACKING SYSTEM

A thesis presented for the degree of doctor of
philosophy in laser physics

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AWADELGIED**

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بسم الله الرحمن الرحيم
(الله نور السماوات والأرض مثل
نوره كمشكاة فيها مصباح المصباح
في زجاجة الزجاج كأنها كوكب
دري يوقد من شجرة مباركة زيتونة
لا شرقية ولاغربية يكاد زيتها
يضئ ولو لم تمسسه نار نور على
نور يهدي الله لنوره من يشاء
ويضرب الله الأمثال للناس والله
بكل شيء عليم))
صدق الله العظيم
الآية (35) من سورة النور

الخلاصة

اختصت الأطروحة بتصميم وبناء منظومة تتبع بواسطة الليزر ودراسة أدائها وكان ذلك بواسطة أشعة الليزر وبواسطة كاميرا رقمية.

تتكون منظومة التتبع الليزري من الرأس الليزري، المنظومة البصرية، المنظومة الميكانيكية والالكترونية ودائرة الموائمة الالكترونية مع الحاسوب.

تم تهيئة كل جزء من أجزاء المنظومة أعلاه. أرسلت إشارة ليزرية من الرأس الليزري الى الهدف ومن ثم استقبلت الإشارة الليزرية بواسطة الجزء البصري وتم تحويلها الى إشارة رقمية بواسطة دائرة الموائمة.

أستخدمت الكاميرا لمتابعة الهدف، واستخدم برنامج البسيك السريع للتحكم في حركة الهدف وحساب الاخطاء.

من مميزات هذه المنظومة علي المنظومات الاخرى أنها تجمع بين التتبع بواسطة أشعة الليزر والكاميرا وهذا يجعل دقة عالية للتعاون بين الوحدتين. كذلك استخدمت اربع دوائر **ADC** وهذا يجعل التتبع سريع جداً بدلاً من استخدام دائرة واحدة. البرامج المستخدمة عندها القدرة على التعامل السريع مع الذاكرة.

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DEDICATION

I dedicate this thesis to my mother, my wife and children, my sisters, brothers to souls of my father, and my brother Ali. Also to my relatives and colleagues friends and to Mohamed Brakat.

إهداء

إلى أمي ،
زوجتي ، أبنائي ، بناتي ،
أخواني وأخواتي .
إلى روح أبي وروح أخي
علي. إلى زملائي وأصدقائي
وأقربائني وإلى أخي محمد بركات.

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ABSTRACT

The system that has been designed and constructed combined of laser tracking system and video tracking system. The laser tracking system consists of laser source, optomechanical housing, electro-optic unit and interfacing unit. The laser beam was transmitted to a moving target and received by the optical receiver. The heart of the optical receiver is the quadratic detector, which is received the returned beam and converted to electrical signal and then to digital signal through an ADC and that shown as image of the target on the monitor.

In video tracking the CCD camera has been used, and the moving target detected. The performance of the system is evaluated by conducting several tests on computer and camera generated scenes for different target and background conditions.

The software used to determine the error function in the target position is a visual basic program.

There are many advantages of this system:

First, the system combined of laser tracking and video tracking; this gives cooperative performance with high efficiency. Second, the system used four ADC rather than one ADC with multiplexer so the system is fast. Third, The software program has the ability to process directly with the PC. RAM without returning to the drivers of the video card. This point is very important because the principle of the real time may be approached. Four, The calculation of the attenuation is analytical, rather than empirical in the other systems. Finally, the Cassegranian optomechanical housing has been

used in this system is better than Newtonian, Gregorian and Herschelian optomechanical housing.

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