光子学报 2011, **40**(7) 1061-1065 **DOI**: 10.3788/gzxb20114007.1061 **ISSN**: 1004-4213 **CN**: 61-1235/O4

论文

水下光学监控系统照明方式的研究

张法全[1],王国富[1],叶金才[1],刘庆华[1],陈良益[2]

(1 桂林电子科技大学 信息与通信学院,广西 桂林 541004)
(2 中国科学院西安光学精密机械研究所,西安 710119)

摘要:

提出了一种确定水下光学监控系统中照明光源方向角和安装位置的方法.利用光在水中的传输特性,分析了传输距离、体积散射函数、散射角和小体积元的影响,以及照明光源不同方向角产生的不同照明效果.据此提出了光源方向角的确定原则,即在满足监控区域要求的前提下,照明光源的方向角应该选取散射角最大的方向.在视场角为45°时,光源方向角应为67.5°.根据监控范围边界的要求以及光源方向角,确定光源安装位置.实际应用结果表明,此方法可以很好地满足水下光学监控系统的要求.

关键词: 海洋光学 水下照明 体积散射函数 散射角 方向角

Lighting Pattern of Underwater Optical Monitoring System

ZHANG Fa-quan[1],WANG Guo-fu[1],YE Jin-cai[1],LIU Qing-hua[1],CHEN Liang-yi[2]

(1 School of Information and Communication,Guilin University of Electronic Technology,Guilin,Guangxi 541004,China)
(2 Xi′ an Institute of Optics and Precision Mechanics,Chinese Academy of Sciences,Xi′ an 710119,China)

Abstract:

A method to determine directional angle of light source and installation location was proposed.Using transmission characteristics of underwater rays of light and considering transmission distance,volume scattering function,scattering angle and the small volume unit,the illuminating effect of various directional angle of the light source were analyzed.The selection principle of directional angle of the light source was proposed.It was that when meeting the requirements of the monitoring area,dirctional angle of the light source should be chosen to make the scattering angle maximum.When the view field angle was 45°,directional angle of the light source should be 67.5°.According to the boundary of the monitoring area and directional angle of the light source,the installation location of the light source was determined.The real results show that the system can meet the requirements of monitoring and has good effect.

Keywords: Ocean optics Underwater Illumination Volume scattering function Scattering angle Directional angle

收稿日期 2010-12-31 **修回日期** 2011-03-07 **网络版发布日期** 2011-07-25

DOI: 10.3788/gzxb20114007.1061

基金项目:

国家自然科学基金（No.60337030）和桂林电子科技大学博士基金(No.UF10006Y)联合资助

通讯作者: 张法全

作者简介:

参考文献:

[1]WEIDEMANN A,FOURNIER G R,FORAND L,et al.In harbor underwater threat detection/identification using active imaging [C].SPIE,2005,5780:59-71.
[2]CELLA U ,CHIFFINGS T,GANDELLI A,et al.Advanced monitoring systems for biological applications in marine environments [C].SPIE,2006,6416:64160T-1.
[3]CHUNG W,CRESPI V,CYBENKO G.Distributed sensing and UAV scheduling for surveillance and tracking of unidentifiable targets [C].SPIE,2005,5778:226-235.
[4]JAFFE J S.Enhanced extended range underwater imaging via structured illumination[J].Optics Express,2010,18(12):12328-12340.
[5]ZHU Cai-xia,YAN Ya-dong,YU Wen-de,et al.Underwater low light level imaging system[J].Ship Science And Technology,2007,29(6):56-58.
朱彩霞,闫亚东,余文德.水下微光成像系统[J].舰船科学技术,2007,29(6):56-58.
[6]LIU Guang-rong,HUANG Rui,JIN Wei-qi,et al.Recent development in underwater imaging technique[J].Optical Technique,2004,30 (6):732-737.
刘广荣,黄睿,金伟其,等.水下探测光电成像技术及其进展[J].光学技术,2004,30(6):732-737.
[7]ZHANG Li,SUN Chuan-dong,HE Jun-hua.Impact of light source angle on imaging quality of underwater imaging systems [J].Journal of Applied Optics,2010,31(4):579-583.
张利,孙传东,何俊华,等.光源角度配置对水下成像图像质量影响的研究[J].应用光学,2010,31(4):579-583.
[8]ZHANG Jian-sheng.The development and measurement of ship wake optical specialty[D].Xi′ an:Xi′ an Institute of Optics and Precision Mechanics,Chinese Academy of Sciences,2001.
张建生.尾流的光学特性研究与测量[D].西安:中国科学院西安光学精密机械研究所,2001.
[9]SUN Chuan-dong,CHEN Liang-yi,GAO Li-ming,et al.Water optical properties and their effect on underwater imaging[J].Journal of Applied Optics,2000,21(4):39-46.
孙传东,陈良益,高立民,等.水的光学特性及其对水下成像的影响[J].应用光学,2000,21(4):39-46.
[10]ZHENG Cheng-dong,WENG Yan-sheng,LIU Xi-zhan.The optical monitor system of anti-phobic raid underwater[C].SPIE,2009:73824M1-7.
[11]TELEM G,FILIN S.Photogrammetric modeling of underwater environments[J].Journal of Photogrammetry and Remote Sensing,2010,65 (5):433-444.
[12]SUN Jing-hua,SHANG Shou-ting,SANG En-fang,et al.Theoretical analysis of the contrast of image under water[J].Journal Harbin Institute of Technology,2004,36(4):460-462.
孙晶华,尚寿亭,桑恩方,等.水下影像衬度的理论分析[J].哈尔滨工业大学学报,2004,36(4):460-462.
[13]XU Lu-an,YE Mao-dong,ZHANG Qi.New method to evaluate image quality[J].Computer Engineering and Design,2004,25(3):418-420.
徐鲁安,叶懋冬,章琦.一种新的图像质量评价方法[J].计算机工程与设计,2004,25(3):418-420.
[14]WANG Ti-sheng,GAO Xin-bo,LU Wen,et al.A new method for reduced-reference image quality assessment[J].Journal of Xidian University,2008,35(1):101-104.
王体胜,高新波,路文,等.一种新的部分参考型图像质量评价方法[J].西安电子科技大学学报(自然科学版),2008,35(1):101-104.

本刊中的类似文章

文章评论 (请注意:本站实行文责自负, 请不要发表与学术无关的内容!评论内容不代表本站观点.)

扩展功能

本文信息

- Supporting info
- PDF(893KB)
- HTML
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert
- 文章反馈
- 浏览反馈信息

本文关键词相关文章

- 海洋光学
- 水下照明
- 体积散射函数
- 散射角
- 方向角

本文作者相关文章

- 张法全
- 王国富
- 陈良益
- 刘庆华
- 叶金才

反馈人 邮箱地址

反馈标题 验证码 8266

反馈内容

提交