

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国际局



(10) 国际公布号
WO 2023/221655 A1

(43) 国际公布日
2023 年 11 月 23 日 (23.11.2023)

- (51) 国际专利分类号:
G01S 5/02 (2010.01) *H04B 13/02* (2006.01)
H04W 64/00 (2009.01)
- (21) 国际申请号: PCT/CN2023/084119
- (22) 国际申请日: 2023 年 3 月 27 日 (27.03.2023)
- (25) 申请语言: 中文
- (26) 公布语言: 中文
- (30) 优先权:
202210536969.5 2022 年 5 月 17 日 (17.05.2022) CN
- (71) 申请人: 上海船舶运输科学研究所有限公司 (SHANGHAI SHIP & SHIPPING RESEARCH INSTITUTE CO., LTD.) [CN/CN]; 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。上海海事大学 (SHANGHAI MARITIME UNIVERSITY) [CN/CN]; 中国上海市浦东新区海港大道 1550

号, Shanghai 201306 (CN)。中远海运科技股份有限公司 (COSCO SHIPPING TECHNOLOGY CO., LTD.) [CN/CN]; 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。

(72) 发明人: 梅晓峻 (MEI, Xiaojun); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。韩德志 (HAN, Dezhi); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。吴中岱 (WU, Zhongdai); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。王骏翔 (WANG, Junxiang); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。郭磊 (GUO, Lei); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。胡蓉 (HU, Rong); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。韩冰 (HAN, Bing); 中国上海市浦东新区民生路 600 号, Shanghai 200135 (CN)。徐一言 (XU, Yiyang); 中国上海市浦东新区民生路 600 号,

(54) Title: JOINT ESTIMATION METHOD FOR TARGET POSITION AND ENVIRONMENTAL PROPAGATION PARAMETER OF UNDERWATER WIRELESS SENSOR NETWORK

(54) 发明名称: 一种水下无线传感网目标位置和环境传播参数的联合估计方法

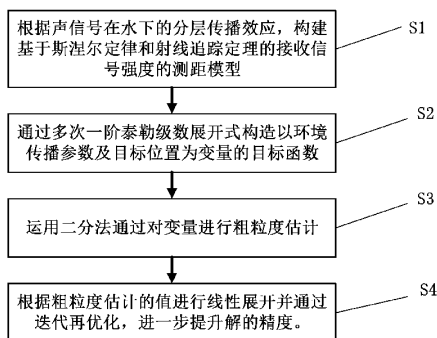


图 1

- S1 According to a layered propagation effect of a sound signal under the water, construct a ranging model of a received signal strength based on Snell's Law and a ray tracing theorem
- S2 By means of a plurality of first-order Taylor series expansions, construct an objective function using an environmental propagation parameter and a target position as variables
- S3 Perform coarse-grained estimation on the variables by using a dichotomy
- S4 Perform linear expansion according to the value of the coarse-grained estimation, and perform iterative re-optimization to further improve the precision of a solution

(57) Abstract: Provided in the present invention is a joint estimation method for a target position and an environmental propagation parameter of an underwater wireless sensor network. The method comprises: S1, according to a layered propagation effect of a sound signal under the water, constructing a ranging model of a received signal strength based on Snell's Law and a ray tracing theorem; S2, by means of a plurality of first-order Taylor series expansions, constructing an objective function using an environmental propagation parameter and a target position as variables; S3, performing coarse-grained estimation on the variables by using a dichotomy; and S4, performing linear expansion according to the value of the coarse-grained estimation, and performing iterative re-optimization to further improve the precision of a solution. The method has the advantages of solving the problem of an increased positioning error resulting from an unknown environmental propagation parameter and a layering effect in an underwater signal propagation process.

(57) 摘要: 本发明提出了一种水下无线传感网目标位置和环境传播参数的联合估计方法, 包含: S1、根据声信号在水下的分层传播效应, 构建基于斯涅尔定律和射线追踪定理的接收信号强度的测距模型; S2、通过多次一阶泰勒级数展开式构造以环境传播参数及目标位置为变量的目标函数; S3、运用二分法通过对变量进行粗粒度估计; S4、根据粗粒度估计的值进行线性展开并通过迭代再优化, 进一步提升解的精度。其优点是: 解决水下信号传播过程中因环境传播参数未知及分层效应而引起定位误差增大的问题。

[见续页]

Shanghai 200135 (CN)。杨珉(YANG, Min); 中国上海市浦东新区民生路600号, Shanghai 200135 (CN)。朱宇(ZHU, Yu); 中国上海市浦东新区民生路600号, Shanghai 200135 (CN)。

(74) 代理人: 北京海虹嘉诚知识产权代理有限公司 (HAIHONG JIACHENG INTELLECTUAL PROPERTY & PARTNERS); 中国北京市海淀区海淀南路21号中关村知识产权大厦B座9层, Beijing 100080 (CN)。

(81) 指定国(除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW。

(84) 指定国(除另有指明, 要求每一种可提供的地区保护): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG)。

根据细则4.17的声明:

— 发明人资格(细则4.17(iv))

本国际公布:

— 包括国际检索报告(条约第21条(3))。