THE ROYAL INSTITUTE OF NAVIGATION

Aims and Objects

The objects of the Institute are to unite in one body those who are concerned with or who are interested in navigation and to further its development. Navigation is conceived as applying to locomotion of all kinds and is perceived as encompassing aspects of: command and control, psychology and zoology, operational research, risk analysis, theoretical physics, operation in hostile environments, instrumentation, ergonomics, financial planning and law as well as electronics, astronomy, mathematics, cartography and other subjects traditionally associated with navigation.

The aims of the Institute are to encourage the creation and dissemination of knowledge through research and development, to co-ordinate information from all the disciplines involved, to provide a forum in which new ideas and new products can have the benefit of informed and professional scrutiny and to further education and communication. The Institute initiates conferences and symposia on specific subjects and has a programme of meetings at which lectures are given and discussed. There are standing Special Interest Groups (SIGs), which keep under constant review pertinent aspects of navigation. The success of these Special Interest Groups is crucially dependent on the active involvement of members.

The SIGs include: Land Navigation and Location Group (LN&L), General Aviation Navigation Group (GANG), History of Air Navigation Group (HANG), Civil and Military Air Group (CMAG), Marine Traffic & Navigation Group (MT&NG), Small Craft Group (SCG), Space Group (Space), Animal Navigation Group (ANG) and Research & Development Group (R&D).

The Institute publishes *The Journal of Navigation* six times a year. It contains papers which have been presented at meetings, other original papers and selected papers and reports from Special Interest Groups. The Institute also publishes *Navigation News* six times a year which contains a full account of the Institute's proceedings and activities. This includes Branch News, a record of current navigational work, a diary of events, topical articles, news about Membership and advertising. A great deal of the Institute's work is international in character and is coordinated with that of similar organisations in other countries.

Membership

There are nine classes of membership under which individuals or organisations may apply to join the Institute. Details of the various membership criteria and current subscriptions are available on the RIN website (Home / Join the RIN / Membership Types http://www.rin.org.uk/general.aspx?ID=59) and from the Membership Secretary (membership@rin.org.uk Tel: +44(0)20 7591 3130 Fax: 44(0)20 7591 3131).

- (1) Ordinary Membership
- (2) Associate Membership
- (3) Associate Fellow Membership
- (4) Student Membership
- (5) Junior Associate Membership
- (6) Corporate Membership
- (7) Small Business Membership
- (8) Affiliate College University Membership
- (9) Affiliate Club Membership

Additional membership classes of Fellowship, Honorary Fellowship, Retired Membership and Affiliate Membership also exist and details are available from the Membership Secretary.

The subscription price (excluding VAT) to The Journal (ISSN 0373–4633) for Volume 75, 2022, which includes print and electronic access, is £759 (USA, Canada and Mexico US \$1368) and includes delivery by air; single parts are available at £140 (USA, Canada and Mexico US \$252) plus postage. The electronic-only price available to institutional subscribers is £570 (USA, Canada and Mexico US \$1041). EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. The Journal is issued free to all Members of the Institute. Orders, which must be accompanied by payment, may be sent to any bookseller or subscription agent or direct to the publishers: Cambridge University Press, UPH, Shaftesbury Road, Cambridge CB2 8BS, or in the USA, Canada and Mexico to Cambridge University Press, Journals Fulfillment Department, 1 Liberty Plaza, Floor 20, New York, NY 10006, USA. Japanese prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan.

© 2022 The Royal Institute of Navigation Printed in Great Britain by Bell & Bain Ltd, Glasgow.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see www.fsc.org for information.

THE JOURNAL OF NAVIGATION

VOLUME 75 • NUMBER I • JANUARY 2022

CONTENTS

Visual imagination and cognitive mapping of a virtual building Kate Jeffery, Wanying Guo, Danny Ball and Julia Rodriguez-Sanchez	I
What determines a boundary for navigating a complex street network: evidence from London taxi drivers Eva-Maria Griesbauer, Ed Manley, Daniel McNamee, Jeremy Morley and Hugo Spiers	15
Social-material aspect of navigation technology: using structural topic models to identify the causes of ship accidents (1973–2018) Yang Chen, Zhenghao Liu, Han Zhou, Jian Zheng and Likun Wang	35
Maritime navigational assistance by visual augmentation Bruno G. Leite, Helio T. Sinohara, Newton Maruyama and Eduardo A. Tannuri	57
A novel regional collision risk assessment method considering aggregation density under multi-ship encounter situations Rong Zhen, Ziqiang Shi, Zheping Shao and Jialun Liu	76
Applying spatial mutual information to AIS data Bruce A. McArthur and Anthony W. Isenor	95
Method for prediction of ship traffic behaviour and encounter frequency Hiroko Itoh	106
Real-time single-frequency precise positioning with Galileo satellites Berkay Bahadur	124
An improved PDR system with accurate heading and step length estimation using handheld smartphone Dayu Yan, Chuang Shi and Tuan Li	141
Adaptive celestial positioning for the stationary Mars rover based on a self-calibration model for the star sensor Yinhu Zhan, Shaojie Chen and Xu Zhang	160
Statistical estimation of container condensation in marine transportation between Far East Asia and Europe Ping Chi Yuen, Kenji Sasa, Hideo Kawahara and Chen Chen	176
Adaptively robust filtering algorithm for maritime celestial navigation Chong-hui Li, Zhang-lei Chen, Xin-jiang Liu, Bin Chen, Yong Zheng, Shuai Tong and Ruo-pu Wang	200
A dynamic adaptive grating algorithm for AIS-based ship trajectory compression Yuanyuan Ji, Le Qi and Robert Balling	213
Lightweight deep network-enabled real-time low-visibility enhancement for promoting vessel detection in maritime video surveillance Yu Guo. Yuxu Lu and Rvan Wen Liu	230

Cambridge Core







