**"Gyroskopiya i Navigatsiya" №3, 2003**

**CONTENTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ya.I. Binder, T.V. Paderina,**

|  |
| --- |
| **O.N. Anuchin** |

 | **Calibration of angular rate sensors with mechanical carrier of angular momentum vector, being parts of strapdown inertial measurement units** | **3** |
| Considered is the problem of determining drift model coefficients for angular velocity transducers with mechanical carrier of angular momentum vector, included in strapdown inertial measurement units (IMU). The parameters under estimation include drift components both connected with acceleration influence on angular velocity transducers and those, which do not depend on acceleration, as well as parameters of geometrical errors of a gyro and its mounting as a part of the measurement unit. The calibration method is suggested, which does not require standardization by heading and the availability of measuring instruments for relative angular motion. It is noted that in such case the proposed methods do not require complicated rotary facilities and goniometric devices for their implementation. It is shown that the results of the analysis executed are valid not only with small uncertainty but also with any initial uncertainty caused both by gyro drift and errors of the initial alignment by azimuth from the external heading indication source. In so doing one-two simplified procedures should be performed, which act as iterations in the process of achieving small uncertainties of alignment. |  |

|  |  |  |
| --- | --- | --- |
| **A.A. Novozhilov** | **Conceptual approaches to selection and substantiation of the structure of the ship motion control system in inland waterways** | **17** |
| Development of river transport assumes improvement of ship motion control, especially in complicated areas. Up-to-date facilities and systems of communication, navigation, monitoring and dataware substantially expand possibilities for development of vessel traffic management systems (VTMS). At present VTMS are widely used for marine navigation, and there is a problem of equipping complicated river fairway sections with similar systems. On the basis of the analysis of marine system progress trends a concept is proposed of VTMS design for inland waterways. Formulated are the basic criteria of economical efficiency and expediency in designing river VTMS. |  |

|  |  |  |
| --- | --- | --- |
| **V.A. Zuev, Yu.A. Lukomsky,A.G. Shpektorov** | **Automatic stabilization of a hovercraft at the prescribed route** | **26** |
| The stabilization system structure providing for the specified dynamic quality is presented for cushion ships of amphibian type. The system is oriented to the use of integrated navigation system providing data on all motion parameters. Research results are presented for stabilization modes, degree correction and turn on the base of non-linear model. |  |

**Brief  notes**

|  |  |  |  |
| --- | --- | --- | --- |
|

|  |
| --- |
| **A.S. Anfinogenov,** |

**O.G. Dryapak, O.I. Parfenov, V.V. Sumarokov** | **Potential of an electrostatic gyro rotor with different structures of suspension** | **37** |
| The rotor potential stability of electrically suspended gyro (ESG) is one of the parameters influencing its accuracy characteristics. The rotor potential depends on electrical suspension structure. It is shown that different polar suspension essentially increases the rotor potential stability. |  |

|  |  |  |
| --- | --- | --- |
| **B.N. Agroskin, S.V. Shipilov** | **Calculation of temperature in the contact zone of rotor surfaces and electrostatic gyro supports** | **40** |
| The paper studies theoretical foundation of temperature disturbances evaluation of support elements of free gyro during power failure ESG rotor - limit stops interaction. Optimal structure and material properties for device performance reliability increasing are investigated. Physical model of external friction process is proposed. Rotor and limit stop surfaces contact spot temperature calculation method is developed. It's shown that contacting surfaces temperature doesn't exceed 180oC. Numerical calculation results are in agreement with physical principles of friction and impact processes taking place in contact zone. Temperature maximum corresponds to normal peak load. With TiN film thickness decreasing heat removal to beryllium rotor goes on at a high rate. In general coating thickness range up to a few micrometers doesn't influence on heating temperature. Instantaneous heating up to predicted temperature causes nonsubstantial evaporation of protection coating in vacuum. |  |

|  |  |  |
| --- | --- | --- |
| **P.K. Plotnikov, V.B. Nikishin,A.V. Melnikov** | **Determination of position of a strapdown gyro inclinometer with allowance for the Earth nonsphericity** | **45** |
| The algorithms of positioning of the point of longitudinal axis for the barrel of borehole in the increments of coordinates with account of their small and non-sphericity are derived. Mathematical modeling of process of functioning of Cardanless Gyroinclinometrs conforming the principial theoretical positions is done too. |  |

**Materials of the 10th Saint Petersburg International Conference
on Integrated Navigation Systems**

|  |  |  |
| --- | --- | --- |
| **Yu.A. Litmanovich, J.G. Mark** | **Progress in strapdown algorithm design at the West and East as appeared at Saint Petersburg conferences: decade overview** | **52** |
| This paper is an overview of the papers on strapdown algorithm design presented at the Saint-Petersburg conference on integrated navigation systems during its lifetime. |  |

|  |  |
| --- | --- |
| **Abstracts of papers** | **68** |

**Materials of the 23th Conference in memory of N.N.Ostryakov**

|  |  |  |
| --- | --- | --- |
| **S.S. Gurevich, V.I. Zavgorodniy, V.M. Kuzin, B.E. Landau, S.L. Levin, S.G. Romanenko** | **Experimental estimate of ESG characteristics for space systems in conditions of ground tests** | **102** |
| Presented are the results of testing the strapdown ESG with double-level suspension. These results justify validity of the developed drift model and provide new opportunities for development of the methods of ground-based identification of model coefficients as well as for estimation of their values in conditions of space operation. |  |

|  |  |  |
| --- | --- | --- |
| **N.A. Lukin** | **Architectural synthesis of functionally oriented processors of mathematical functions** | **109** |
| Functional-oriented processors (FOP) are efficient instrument for increasing of board computer performance. FOP may be used on various levels of data processing as hardware modules or VLSI-based circuits. They may be embedded into from inertial sensors digital hardware to accelerators for board computer central processors. Development of optimal functional-oriented processors (FOP) for fast mathematical function computations is considered. The basic expression for function computation by means of table-polynomial FOP realizing spline-approximation is given. Existence of minimum of FOP hardware complexity for arbitrary analytical function has been justified. Formula of minimal possible polynomial power for given computation error is presented. Common problems for FOP synthesis algorithms are considered. |  |

**International Public Association
The Academy of Navigation and Motion Control
*Official information***

|  |  |
| --- | --- |
| **To the 70th anniversary from the birth of D. M. Klimov - the Honorary Member of the Academy of Navigation and Motion Control**    | **121**     |

|  |  |
| --- | --- |
| **Information about the 15th General meeting of the Academy**    | **123**     |

**History pages**

|  |  |  |
| --- | --- | --- |
| **S.S.Rivkin** | **Meetings with academician A.Yu. Ishlinsky (To the 90th anniversary from his birth)** | **125** |
| Brief description of the science and technique areas in which A.Yu. Ishlinsky was involved is given. The roles of Academician A.N.Krylov and outstanding designer N.N.Ostryakov in making A.Yu. Ishlinsky familiar with marine themes including applied gyroscopy, stabilization and inertial navigation are marked. Memories about the author's meetings with A.Yu. Ishlinsky are presented. Work on the digest Mechanics development for gyroscopic and inertial systems devoted to 60 anniversary of A.Yu. Ishlinsky in 1973 is described in details |  |

**Information**

|  |  |
| --- | --- |
| Materials of the joint scientific session of the Navigation Systems and Their Sensors Section and the Saint Petersburg Section of Precise Gyroscopy of the RAS Scientific Council on the Problems of Motion Control and Navigation.  | **131**     |

|  |  |
| --- | --- |
| Russian and international conferences, symposiums and exhibitions  | **132**    |