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# Improving the accuracy of land mobile object autonomous navigation

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*The article discusses the development of algorithms for improving land mobile object autonomous navigation. The navigation can be performed using inertial navigation system (INS) operating all alone or using odometer complementary to INS. In the former case, accuracy is improved as a result of INS error correction conducted during periodic stops of the object. In the latter the accuracy improvement is a result of calibration of INS and odometer errors on the known coordinates of at least one route point. The advantage of the proposed methods is their principal autonomy: there is no need to transmit/receive any signal from outside for their implementation. In each situation under consideration the proposed algorithms can significantly increase the accuracy of determining the location and velocity of the moving object. The results of algorithm testing on the INS of middle accuracy rating mounted on the cross-country vehicle are presented.*

**Keywords:** inertial navigation system (INS), odometer, gyroscope, accelerometer, autonomous navigation, global satellite navigation system NSS.

## REFERENCES

- [1] Salychev O.S. *Applied Inertial Navigation: Problems and Solutions*. Moscow, BMSTU Publ., 2004, 304 p.
  - [2] Salychev O.S. *MEMS-based Inertial Navigation: Expectations and Reality*. Moscow, BMSTU Publ., 2012, 208 p.
  - [3] Tereshkov V.M. *Metodika polunaturnykh ispytaniy korrekiruemykh besplatformennykh inertialnykh navigatsionnykh system* [Iron Bird Test Techniques of Updateable Strapdown Inertial Navigation Systems]. Candidate of Engineering Sciences Thesis. Moscow, 2011, 133 p.
  - [4] Besekerskiy V.A., Popov E.P. *Teoriya sistem avtomaticheskogo upravleniya. 4-e izdanie* [Theory of Automatic Control Systems. 4<sup>th</sup> ed.]. St. Petersburg, Professiya Publ., 2007, 747 p.
  - [5] Gorbachev A.Yu. *Vestnik MGTU im. N.E. Baumana. Seria Priborostroyeniye – Herald of the Bauman Moscow State Technical University. Series: Instrument Engineering*, 2009, no. 4, pp. 37–53.
  - [6] Chelnokov Yu.N. *Kvaternionnye modeli i metody dinamiki, navigatsii i upravleniya dvizheniem* [Quaternion Models and Methods of Dynamics, Navigation and Motion Control]. Moscow, Fizmatlit Publ., 2011, 556 p.
  - [7] Lipkin I.A. *Sputnikovye navigatsionnye sistemy. 2-e izdanie* [Satellite Navigation Systems. 2<sup>nd</sup> ed.]. Moscow, Vuzovskaya kniga Publ., 2012, 288 p.
  - [8] Matveev V.V., Raspopov V.Ya. *Osnovy postroyeniya besplatformennykh inertialnykh navigatsionnykh system* [Fundamentals of Strapdown Inertial Navigation Systems Design]. St. Petersburg, GNTs RF JSC “Contsern TsNII “Elektropribor” Publ., 2009, 280 p.
  - [9] Vasin V.A., Vlasov I.B., Egorov Yu.M., et al. *Informatsionnye tekhnologii v radiotekhnicheskikh skhemakh* [Information Technology in Radio Systems]. Fedorov I.B., ed. Moscow, BMSTU Publ., 2011, 848 c.
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- [10] Vlasov I.B. *Globalnye sputnikovyie sistemy* [Global satellite systems]. Moscow, BMSTU Publ., 2008, 182 p.
- [11] Matveev V.V. *Inertsialnye navigatsionnye sistemy* [Inertial Navigation Systems]. Tula, TulGU Publ., 2012, 199 p.
- [12] Pazychev D.B. *Nauka i obrazovanie: elektronnyy nauchno-tekhnicheskii zhurnal – Science and Education: Electronic Scientific and technical Journal*, 2011, no. 3. Available at: <http://technomag.bmstu.ru/doc/168994.html> (accessed November 11, 2015).
- [13] Tereshkov V.M. *Nauka i obrazovanie: elektronnyy nauchno-tekhnicheskii zhurnal – Science and Education: Electronic Scientific and technical Journal*, 2010, no. 8. Available at: <http://technomag.bmstu.ru/doc/152269.html> (accessed November 10, 2015).

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