

IMPLEMENTATION PROBLEMS OF ROBUST AUTOMATIC TARGET DETECTION ALGORITHMS IN SHORT RANGE SONARS

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ABSTRACT

Detection and identification of underwater objects by sonar systems is performed through processing of signals influenced by nonstationary and discrete interference. For these purposes we use functional and mathematical models based on signal processing procedures resistant to external disturbances of different type. We mean developing algorithms estimating parameters of smooth reverberation, pinpoint and local-extended discrete interference without their statistically significant characteristics. In particular, the above is also true of false alarms detection and recognition. The task is to develop change models of interference characteristics and estimation robust procedure of their probability characteristics. The problem is solved through training data categorization (censoring with substitution method). The general algorithm of nonstationary sonar image processing comprises several particular algorithms such as categorization, estimation of image parameter fields, evaluation of interference immunity quantile corresponding to the required false alarm probability. The specialized particular algorithms are applied to decide a number of practical tasks.

Key words: sonar image, probability distribution, interference immunity, model of interference, decision statistics, training data, robust estimation.

REFERENCES

1. Bakut P.A., Bol'shakov I.A., Gerasimov B.M. [and etc.]. *Voprosy statisticheskoy teorii radiolokatsii* [Questions of statistical theory of radio-location]. Moscow, Sovetskoe radio Publ., Vol. 1, 1963. 425 p. Vol. 2, 1964. 1086 p.
2. Levin B.R. *Teoreticheskie osnovy statisticheskoy radiotekhniki* [Theoretical bases of the statistical radio engineering]. Moscow, Radio i svjaz' Publ., 1989. 656 p.
3. Liharev V.A. *Cifrovye metody i ustrojstva v radiolokacii* [Digital methods and devices in a radio-location]. Moscow, Sovetskoe radio Publ., 1973. 456 p.
4. Repin V.G., Tartakovskij G.P. *Statisticheskij sintez pri apriornoj neopredelennosti i adaptacija informacionnyh sistem* [Statistical synthesis at a priori vagueness and adaptation of information systems]. Moscow, Sovetskoe radio Publ., 1977. 432 p.
5. Leman Je. *Proverka statisticheskikh gipotez* [Verification of statistical hypotheses]. Moscow, Nauka Publ., 1964. 500 p.
6. Mosteller F., T'yuki Dzh. *Analiz dannykh i regressiya* [Analysis of data and regression] Vyp.1. Moscow, Finansy i statistika Publ., 1982. 317 p.
7. *Robastnost' v statistike. Podkhod na osnove funktsiy vliyaniya* [Robastnost in statistics. Approach on the basis of functions of influence]. Moscow, Mir Publ., 1989. 324 p.
8. Kh'yuber Dzh.P. *Robastnost' v statistike* [Robastnost in statistics]. Moscow, Mir Publ., 1984. 304 p.
9. Bass F.G., Fuks I.M. *Rasseyanie voln na statisticheski nerovnoy poverkhnosti* [Dispersion of waves on statistically uneven surface]. Moscow, Nauka Publ., 1972. 424 p.
10. Davidan I.N., Lopatukhin L.I., Rozhkov V.A. *Vetrovoe volnenie v Mirovom okeane* [Wind agitation in the World Ocean]. Leningrad, Gidrometeoizdat Publ., 1985. 256 p.
11. Kozlov N.N., Korneev Yu.A., Mazin Yu.V. *Kategorizatsiya dannykh pri adaptivnom obnaruzhenii signalov* [Categorizing of data at the adaptive detection of signals]. *Trudy LIAP* [Proc. LIAP]. Leningrad, 1979, no. 24. 156 p.
12. Seber Dzh. *Lineynyy regressionnyy analiz* [Linear regression analysis]. Moscow, Mir Publ., 1980. 456 p.
13. Smolyak S.A., Titarenko B.P. *Ustoychivye metody otsenivaniya* [Steady methods of estimation]. Moscow, Statistika Publ., 1980. 208 p.
14. Kazakov B.M., Voytov A.A., Korneev Yu.A., Myal'k R.A., Antokhin E.A. *Ustroystvo segmentatsii lokatsionnogo izobrazheniya* [Segmentation device of the location image]. Patent RF, no. 2219562, 2003.
15. Kazakov B.M., Voytov A.A., Korneev Yu.A., Myal'k R.A., Antokhin E.A. *Ustroystvo obrabotki lokatsionnogo izobrazheniya* [Treatment device of the location image]. Patent RF, no. 2212042, 2003