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### Abstracts

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#### SOLVING RATIO-DEPENDENT PREDATOR-PREY SYSTEM WITH CONSTANT EFFORT HARVESTING USING VARIATIONAL ITERATION METHOD

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*ACM Computing Classification System (1998):* G.1.7.

*Key words:* ratio-dependant predator-prey model, variational iteration method, Prey harvesting.

**Abstract.** Due to wide range of interest in use of bio-economic models to gain insight in to the scientific management of renewable resources like fisheries and forestry, variational iteration method (VIM) is employed to approximate the solution of the ratio-dependent predator-prey system with constant effort prey harvesting. The results are compared with the results obtained by Adomian decomposition method and reveal that VIM is very effective and convenient for solving nonlinear differential equations.

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#### ON SOME OPTIMAL $(N, T, 1, 2)$ AND $(N, T, 1, 3)$ SUPERIMPOSED CODES\*

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*ACM Computing Classification System (1998):* E.4.

*Key words:* superimposed codes, classification.

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**Abstract.** One of the main problems in the theory of superimposed codes is to find the minimum length  $N$  for which an  $(N, T, w, r)$  superimposed code exists for given values of  $T$ ,  $w$  and  $r$ . Let  $N(T, w, r)$  be the minimum length  $N$  for which an  $(N, T, w, r)$  superimposed code exists. The  $(N, T, w, r)$  superimposed code is called optimal when  $N = N(T, w, r)$ . The values of  $N(T, 1, 2)$  are known for  $T \leq 12$  and the values of  $N(T, 1, 3)$  are known for  $T \leq 20$ . In this work the values of  $N(T, 1, 2)$  for  $13 \leq T \leq 20$  and the value of  $N(21, 1, 3)$  are obtained. The optimal superimposed codes with parameters  $(9, 10, 1, 2)$ ,  $(10, 13, 1, 2)$ ,  $(11, 14, 1, 2)$ ,  $(11, 15, 1, 2)$ ,  $(11, 16, 1, 2)$  and  $(11, 17, 1, 2)$  are classified up to equivalence. The optimal  $(N, T, 1, 3)$  superimposed codes for  $T \leq 20$  are classified up to equivalence.

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## HAUSDORFF DISTANCES FOR SEARCHING IN BINARY TEXT IMAGES\*

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*ACM Computing Classification System (1998):* I.5.4.

*Key words:* Hausdorff distance, binary text image, word matching.

\*This work has been partially supported by Grant No. DO 02-275, 16.12.2008, Bulgarian NSF, Ministry of Education and Science.

**Abstract.** Hausdorff distance (HD) seems the most efficient instrument for measuring how far two compact non-empty subsets of a metric space are from each other. This paper considers the possibilities provided by HD and some of its modifications used recently by many authors for resemblance between binary text images. Summarizing part of the existing word image matching methods, relied on HD, we investigate a new similar parameterized method which contains almost all of them as particular cases. Numerical experiments for searching words in binary text images are carried out with 333 pages of old Bulgarian typewritten text, 200 printed pages of Bulgarian Chrestomathy from year 1884, and 200 handwritten pages of Slavonic manuscript from year 1574. They outline how the parameters must be set in order to use the advantages of the proposed method for the purposes of word matching in scanned document images.

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## A NOTE ON THE “CONSTRUCTING” OF NONSTATIONARY METHODS FOR SOLVING NONLINEAR EQUATIONS WITH RAISED SPEED OF CONVERGENCE\*

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*ACM Computing Classification System (1998):* G.1.5.

*Key words:* Nonlinear equations, finite difference method, multi-point method, nonstationary procedure, order of convergence.

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**Abstract.** In this paper we give methodological survey of “contemporary methods” for solving the nonlinear equation  $f(x) = 0$ . The reason for this review is that many authors in present days rediscovered such classical methods. Here we develop one methodological schema for constructing nonstationary methods with a preliminary chosen speed of convergence.

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## ISOMERISM AS MANIFESTATION OF INTRINSIC SYMMETRY OF MOLECULES: LUNN–SENIOR’S THEORY\*

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*ACM Computing Classification System (1998):* G.2.1, J.2.

*Key words:* Mathematical model of isomerism, enumeration of isomers, substitution reactions.

\*This article presents the principal results of the doctoral thesis “Isomerism as internal symmetry of molecules” by Valentin Vankov Iliev (Institute of Mathematics and Informatics), successfully defended before the Specialised Academic Council for Informatics and Mathematical Modelling on 15 December, 2008.

**Abstract.** This paper is an extended review of our doctoral thesis “Isomerism as Intrinsic Symmetry of Molecules” in which we present, continue, generalize, and trace out Lunn–Senior’s theory of isomerism in organic chemistry.