

Two Formulations for Minimizing Weight-Distance Objective in Single Vehicle Routing Problem with Quadratic, Cubic Objective Function and its Linearization

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Abstract

Here we consider a single vehicle routing problem (of unlimited capacity) that visits different dealers. As it visits the first dealer, it offloads the demand of first dealer and moves on to second dealer 'lighter'. In this context we seek to minimize weight-distance of the entire tour. We give two formulations of the above. It results in a 'cubic' and 'quadratic' terms in the objective function with negative cost coefficients in one formulation and positive cost coefficients (of 'cubic' and 'quadratic' terms) in other formulation. We give a novel linearization scheme for the resulting two formulations. It will be interesting to see computational performance of the two formulations given in this paper.

Keywords

Vehicle, Routing Problem, Cubic Terms, Objective Function, Quadratic Terms.

Biographies

Prof. RRK Sharma: He is B.E. (mechanical engineering) from VNIT Nagpur India, and PhD in management from I.I.M., Ahmedabad, INDIA. He has nearly three years of experience in automotive companies in India (Tata Motors and TVS-Suzuki). He has 32 years of teaching and research experience at the Department of Industrial and Management Engineering, I.I.T., Kanpur, 208016 INDIA. To date he has written 1195 papers (peer-reviewed (395) / under review (18) / working papers 782 (not referred)). He has developed over ten software products. To date, he has guided 64 M TECH and 21 Ph D theses at I.I.T. Kanpur. He has been Sanjay Mittal Chair Professor at IIT KANPUR (15.09.2015 to 14.09.2018) and is currently a H.A.G. scale professor at I.I.T. Kanpur. In 2015, he received "Membership Award" given by IABE USA (International Academy of Business and Economics). In 2016 he received the "Distinguished Educator Award" from IEOM (Industrial Engineering and Operations Management) Society, U.S.A. In 2021, he received IEOM Distinguished Service Award. In 2019 and 2020, he was invited by the Ministry of Human Resources Department, India, to participate in the NIRF rankings survey for management schools in India. In 2019, he was invited to participate in the Q.S. ranking exercise for ranking management schools in South Asia.

Dr. Vinay Singh: He has earned his Bachelor Degree in engineering (Computer Science and Engineering) from RBS College Agra, Masters in Human Resource Development and Management from IIT Kharagpur and PhD in Management from IIT Kanpur. Currently he is working as Assistant Professor in the department of Management at ABV-Indian Institute of Information Technology and Management Gwalior, India since Nov 2012. So far he has 26 publications in peer review journals to his credit. He has supervised 92 Masters Students and guided 02 PhD theses. He has also earned two national patents in embedded products design and has developed three software packages. He has received 03 research project grants from prestigious agencies of India.

Prof. KK Lai: He is currently President of CYUT Taiwan. He has numerous publications to his credit.