A RELIABLE SOLVER OF TSP-BASED ON THRESHOLD ACCEPTING ALGORITHM

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ABSTRACT

THRESHOLD ACCEPTING（TA）METHOD IS A META-HEURISTIC ALGORITHM TO SOLVE THE OPTIMIZATION PROBLEM. LIKE THE SIMULATED ANNEALING（SA）METHOD, THE RESULT OF TA VARIES FROM ONE RUN TO ANOTHER. HERE WE PROPOSE TO FIND A RELIABLE TSP SOLVER SUCH THAT THE OPTIMAL SOLUTION IS GUARANTEED WITHIN A SPECIFIED NUMBER OF FUNCTION EVALUATIONS. THE METHOD IS CALLED "DOUBLE THRESHOLD ACCEPTING ALGORITHM", OR CALLED DOUBLE TA FOR SHORT. IN THIS ALGORITHM, THE THRE -SHOLD VALUE IS DECOMPOSED INTO TWO PARTS : NORMALIZED THRESHOLD VALUE AND CAP. THE THRESH -OLD VALUE IS EQUAL TO NORMALIZED THRESHOLD VALUE MULTIPLIED BY CAP. FIRST, WE PLAN TO FIND THAT WITH A PROPER SELECTION OF THRESHOLD VALUES IN TA, THE EMPIR -ICAL RESULT SHOWS IT ALWAYS CONVERGES TO THE OPTIMAL SOLUTION IN THE REGULAR-GRID TSPS.TH -E EXPERIMENT WILL BE PERFORMED ON 18 CASES RANGING FROM 16 THROUGH 441 POINTS（CITIES）AN -D EACH CASE IS EXECUTED 100 TIMES. WE DESIRE THAT THEY ALL CONVERGE TO THE OPTIMAL SOLUTI -ON WITHIN THE SPECIFIED LIMIT OF NUMBER OF FUNCTION EVALUATIONS. THE PATTERN OF THRESHOLD IS IN THE SHAPE OF NATURAL CUBIC SPLINE AND CAN BE CONSTRUCTED BY SEVERAL CONTROL POINTS. THE SCALE IS TERMED CAP AND CAN BE OBTAINED FROM THE CAP FUNCTI -ON OF POSITIVE CHANGES OF THE COST FUNCTION IN THE STEP OF MOVE FROM A SUB-OPTIMAL TOUR T -O A GLOBAL OPTIMAL TOUR. THE TA IS PERFORMED TWICE IN OUR IMPLEMENTATION WHERE THE NAME " DOUBLE THRESHOLD ACCEPTING" IS DERIVED.THE SECOND RUN OF THE TA MAKES SURE THE OPTIMAL VAL -UE IS OBTAINED IN CASE IT SLIPS AWAY FROM THE OPTIMAL IN THE FIRST RUN. FURTHERMORE, WE PLAN TO APPLY IT TO OTHER PRACTICAL PROBLEMS LISTED IN THE LITERATURE ES -PECIALLY THE GROTSCHEL'S PCB442 PROBLEM. THIS PROBLEM IS NOTORIOUS BECAUSE IT HAS MANY DE -GENERATE POINTS NEARBY THE GLOBAL OPTIMAL.

Keywords : THRESHOLD ACCEPTING、SIMULATED ANNEALING、REGULAR-GRID TSPS、NATURAL CUBIC SPLINE、NORMAL -IZED THRESHOLD、CAP。

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