

Computer Code for the Contest Algorithm

Printed in fixed-width characters below is the code for the simplest version of the contest algorithm. It can be highlighted and then copied to the Windows Notepad, from which it can be saved as a file of the form *.bas (for example as contest.bas). Be sure to have wide enough margins in Notepad so that none of the code lines are "wrapped". Then it will run in the QBASIC program (a DOS program, but available on Windows installation disks). The data set can be expanded to whatever size is needed, up to the limit of what QBASIC can accept for an array size. No programming skill is needed to change the data and run the program. Users of this code are requested to send notes about applications, problems, questions, good/bad results, etc., to Alan Johnsrud (e-mail: aejohns@erols.com).

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'THIS IS JOHNSRUD'S CONTEST ALGORITHM
CLS
DATA 1,2,3,4,5,1,0,2,0,4,3,1,0,2,2
DATA 4,2,0,1,1,2,4,5,3,0,2,2,2,2,2
DATA 1,1,1,1,1,1
M = 6          'NUMBER OF GROUPS

'ALL INPUT DATA ARE ABOVE THIS POINT (SCOREBOARD, GROUP SIZE, AND
'NUMBER OF GROUPS) .
'THE SCOREBOARD DOES NOT INCLUDE THE DIAGONAL ELEMENTS, WHICH ARE
'ALWAYS ZERO.

DIM A(M,M) , GP(M) , X(M) , CSN(M,M) , FR(M,M) , COL(M)
DIM COMP(M,M) , Y(M) , STRENGTH(M)

FOR I = 1 TO M
FOR J = 1 TO M
IF I<>J THEN READ A(I,J) ELSE A(I,J) = 0
NEXT J,I
FOR I = 1 TO M
READ GP(I)          'NUMBER OF PARTICIPANTS IN EACH GROUP
NEXT I
FOR J = 1 TO M
COL(J) = 0
FOR I = 1 TO M
A(I,J) = A(I,J)/GP(J)      'SCORE PER DEFENDER IN EACH GROUP
COL(J) = COL(J) + A(I,J)
NEXT I,J
PRINT "COLUMN TOTALS (FOR DATA CHECKING)"
FOR J = 1 TO M
PRINT COL(J)
FOR I = 1 TO M
IF COL(J) > 0 THEN FR(I,J) = A(I,J)/COL(J) ELSE FR(I,J) = 0
NEXT I,J
STOP
FOR I = 1 TO M
X(I) = 1          'STARTING VALUES FOR THE X'S (ANY + NUMBER WILL DO)
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NEXT I
PRINT "CHECK ON CONVERGENCE"
LP = 0
DO UNTIL LP = 10      'ITERATIVE COMPUTATION OF THE X'S
FOR I = 1 TO M
SUM = 0
FOR J = 1 TO M
IF J<>I THEN T = A(I,J) * FR(I,J) * X(J) ELSE T = 0
COMP(I,J) = SQR(T)    'COMPONENT OF VECTOR I IN DIRECTION J
SUM = SUM + T
NEXT J
X(I) = SQR(SUM)
NEXT I
PRINT X(1),X(2)      'CHECK ON CONVERGENCE
LP = LP + 1
LOOP

'DOT PRODUCT OF VECTORS AND COSINE OF THE ANGLE BETWEEN THEM
FOR I = 1 TO M-1
FOR K = I+1 TO M
SUM = 0
FOR J = 1 TO M
SUM = SUM + COMP(I,J) * COMP(K,J)
NEXT J
IF X(I) * X(K) > 0 THEN CSN(I,K) = SUM / X(I) / X(K) ELSE CSN(I,K) =
0
CSN(K,I) = CSN(I,K)  'COSINE OF THE ANGLE BETWEEN VECTORS I AND K
NEXT K,I
STOP
PRINT
PRINT "VECTOR MAGNITUDES"
FOR I = 1 TO M
PRINT I,X(I)
NEXT I
STOP
PRINT
'PRINT "I, J, AND COMPONENT OF VECTOR I IN DIRECTION J"
FOR J = 1 TO M
SUM = 0
FOR I = 1 TO M
'IF COMP(I,J) > 0 THEN PRINT I,J,COMP(I,J)
SUM = SUM + COMP(I,J)
NEXT I
Y(J) = SUM          'COMPONENT OF CONTEST VECTOR IN DIRECTION J
NEXT J
'STOP
SUM = 0
FOR I = 1 TO M
SUM = SUM + (Y(I))^2
NEXT I

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CONTEST = SQR(SUM)          'MAGNITUDE OF THE CONTEST VECTOR
FOR I = 1 TO M
SUM = 0
'DOT PRODUCT OF VECTOR I AND CONTEST VECTOR
FOR K = 1 TO M
SUM = SUM + COMP(I,K) * Y(K)
NEXT K
'RELATIVE CONTRIBUTION OF VECTOR I TO CONTEST
STRENGTH(I) = SUM / CONTEST^2
NEXT I
PRINT
PRINT "RELATIVE APPLIED STRENGTHS: OF GROUP AND PER GROUP MEMBER"
SUM = 0
FOR I = 1 TO M
PRINT I, USING "      .###"; STRENGTH(I); STRENGTH(I) / GP(I)
SUM = SUM + STRENGTH(I)
NEXT I
PRINT
PRINT "APPLIED STRENGTH TOTAL (SHOULD BE 1)"
PRINT USING "      #.###"; SUM      'CHECK ON STRENGTH COMPUTATION
STOP
PRINT
PRINT "COSINE OF ANGLE BETWEEN VECTORS (IF > 0)"
FOR I = 1 TO M
FOR J = 1 TO M
IF CSN(I,J) > 0 AND I > J THEN PRINT I,J,USING "#.###"; CSN(I,J)
NEXT J,I
STOP

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