

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 QBASIC, a DOS program which can still be handled in Windows XP. For Windows versions later than XP, FreeBASIC can be downloaded from its Web site and used (with some modifications to the QBASIC code).

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, use of FreeBASIC, etc., to

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'THIS IS THE CONTEST ALGORITHM IN ITS REVISED FORM (AUGUST '09)
CLS
DATA 0,0,1,2,3,0,0,2,4,6,0,0,4,5,1
DATA 4,8,1,0,0,4,8,2,0,0,4,8,3,0,0
DATA 1,2,1,1,1,1
M = 6          'NUMBER OF GROUPS
'ALL INPUT DATA ARE ABOVE THIS POINT (SCOREBOARD, GROUP SIZE, AND M)

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)"
PRINT A(1, 4), A(1, 5), A(1, 6)
PRINT A(2, 4), A(2, 5), A(2, 6)
PRINT A(3, 4), A(3, 5), A(3, 6)
PRINT A(4, 1), A(4, 2), A(4, 3)
PRINT A(5, 1), A(5, 2), A(5, 3)
PRINT A(6, 1), A(6, 2), A(6, 3)
STOP
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
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X(I) = 1 'STARTING VALUES FOR THE X'S
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
T = A(I, J) * FR(I, J) * X(J)
'COMPONENT OF VECTOR I IN DIRECTION J
COMP(I, J) = SQR(T)
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 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)
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
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)
'PRINT I, K, COMP(I, K) * Y(K), A(I, K) * X(K) 'COMPARE 2 WAYS OF COMPUTING
NEXT K
'RELATIVE CONTRIBUTION OF VECTOR I TO CONTEST

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STRENGTH(I) = SUM / CONTEST ^ 2
NEXT I
'STOP
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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