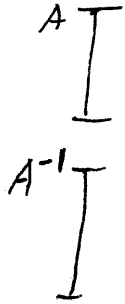


HGK
Aug 19/58

Identify

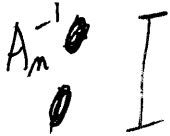
Invert Matrix by Cramer's rule

Remultiply ? as check ?



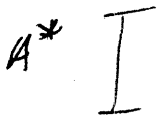
Difference Matrix between A^{-1} w/o noise A^{-1} noise

no noise



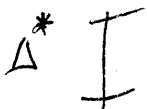
$$A_m^{-1} - A^{-1}$$

or percentage of A^{-1} ?
or no. of places correct ?



obtained by n.p.p. fact.

a measure of precision
what is that ?



$$A^* - A$$

one . no of digits correct.

average Δ

4x4 Matrix Inversion by Cramer's Rule

$$[a]^{-1} = \frac{[A_{ji}]}{|a|}$$

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{vmatrix}$$

Matrix in row order

Transpose:

$$\begin{vmatrix} a_{11} & a_{21} & a_{31} & a_{41} \\ a_{12} & a_{22} & a_{32} & a_{42} \\ a_{13} & a_{23} & a_{33} & a_{43} \\ a_{14} & a_{24} & a_{34} & a_{44} \end{vmatrix}$$

$$A_{ji} = A'_{ij}$$

example take a_{23}

$$A'_{23} = \begin{vmatrix} a_{11} & a_{31} & a_{41} \\ a_{12} & a_{32} & a_{42} \\ a_{14} & a_{34} & a_{44} \end{vmatrix}$$

$$= a_{11} \begin{vmatrix} a_{32} & a_{42} \\ a_{34} & a_{44} \end{vmatrix} - a_{12} \begin{vmatrix} a_{31} & a_{41} \\ a_{34} & a_{44} \end{vmatrix} + a_{14} \begin{vmatrix} a_{31} & a_{41} \\ a_{32} & a_{42} \end{vmatrix}$$

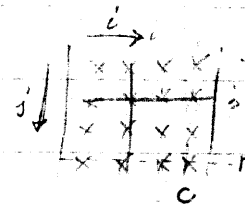
$$A'_{24} = \begin{vmatrix} a_{11} & a_{31} & a_{41} \\ a_{12} & a_{32} & a_{42} \\ a_{13} & a_{33} & a_{43} \end{vmatrix}$$

$$= a_{11} \begin{vmatrix} a_{32} & a_{42} \\ a_{33} & a_{43} \end{vmatrix} - a_{12} \begin{vmatrix} a_{31} & a_{41} \\ a_{33} & a_{43} \end{vmatrix} + a_{13} \begin{vmatrix} a_{31} & a_{41} \\ a_{32} & a_{42} \end{vmatrix}$$

A23

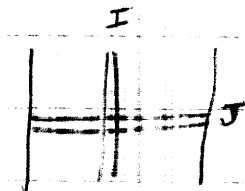
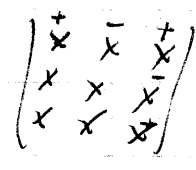
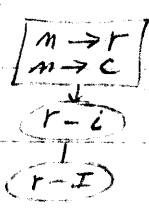
STZ	S2		
STZ	S1		
LDQ	a44	a44	a42
FMP	a32	a31	a31
FAD	S1		
STO	S1		
LDQ	a42	a41	a41
FMP	a34	a34	a32
FAD	S1		
STO	S1		
LDQ	S1		
FMP	a11	-a12	+a14
FAD	S2		
STO	S2		

~~LDQ~~
STO A23



set $I=m, J=m$
 set R, C
 set $i=m, j=m$
 calc r_i, c_j

$m \rightarrow r$
 Test $r=i$ if no at $r-1 \rightarrow r$
 $m \rightarrow c$
 Test $c=j$ if no at $c-1 \rightarrow c$
~~Test $r_i = c_j$ if no at $r_i-1 \rightarrow r_i$~~
 Test $r_i = c_j$ if no at $r_i-1 \rightarrow r$
 $c-1 \rightarrow c$
 Test $c_i = j$ if no at $c_i-1 \rightarrow c$
 calc 2 term + add to sum



adv. $j \geq 1 \rightarrow j$
 Test if $j=0 \rightarrow$ reset $j=m$ $i-1 \rightarrow i$
 Test if $i=0 \rightarrow$ end

START

$n \rightarrow I$

$n \rightarrow J$

note on
at $n=1 \rightarrow$
single
cell

$n \rightarrow I$
 $n \rightarrow J$
 $0 \rightarrow R$

$I - I = 0 \rightarrow I - 1 \rightarrow I$

$J - J = 0 \rightarrow J - 1 \rightarrow J$

$A_0 = I + N \cdot J$ $B_{00} = I + N \cdot J$

$n - 1 \rightarrow R$
 $n \rightarrow C$

$R - C = 0 \rightarrow R - 1 \rightarrow R$

$R - I = 0 \rightarrow R - 1 \rightarrow R$

$C - J = 0 \rightarrow C - 1 \rightarrow C$

$C - J = 0 \rightarrow C - 1 \rightarrow C$

$R - 1 \rightarrow R_1$
 $C - 1 \rightarrow C_1$

$R_1 - C = 0 \rightarrow R_1 - 1 \rightarrow R_1$

$R_1 - I = 0 \rightarrow R_1 - 1 \rightarrow R_1$

$C_1 - J = 0 \rightarrow C_1 - 1 \rightarrow C_1$

$C_1 - J = 0 \rightarrow C_1 - 1 \rightarrow C_1$

$A_1 = R + N \cdot C$
 $A_2 = R_1 + N \cdot C_1$
 $A_3 = R + N \cdot C_1$
 $A_4 = R_1 + N \cdot C$
Test cell to det(A)

change to
C + R N

$(2) C(A_0) \{ C(A_1) C(A_2) - C(A_3) C(A_4) \} + B_{10} \rightarrow B_{10}$

$J - 1 \rightarrow J$

$J - J = 0 \rightarrow J - 1 \rightarrow J$

$J = 0$ $J - 1 \rightarrow J$ $J = 0$

MATRIX

INV

BY

COLEMAN'S

PROC

FOR

NODE NODE

CALL

$T_{inv} = A^{-1} P$

$a_{ij} a_{ji} = P_{ij}$

B_{ij}
|a|

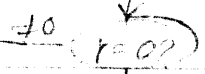
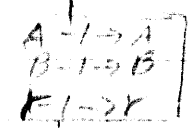
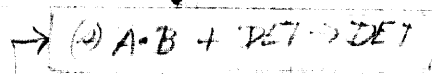
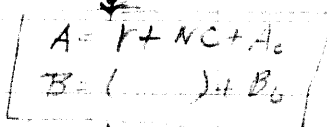
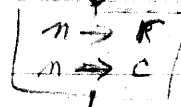
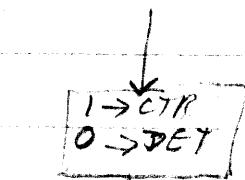
$\sum_{i=1}^n B_{ii} = |a|$

$I = 0?$ $= 0$

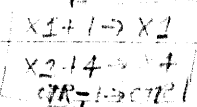
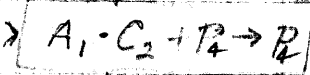
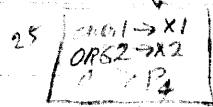
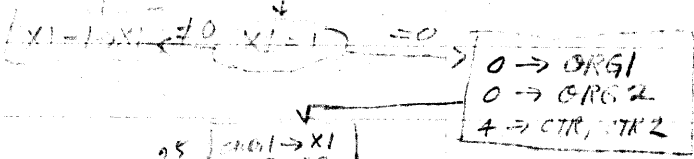
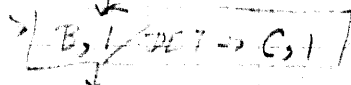
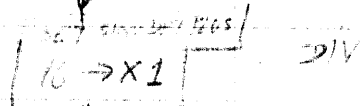
$I - 1 \rightarrow I$

- 11 - 0
- 12 - 1
- 13 - 2
- 14 - 3
- 21 - 4
- 22 - 5
- 23 - 6
- 24 - 7
- 31 - 8
- 32 - 9
- 33 - 10
- 34 - 11
- 41 - 12
- 42 - 13
- 43 - 14

- A2 - A3
- A4 - A1



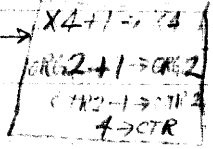
= 0



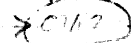
≠ 0



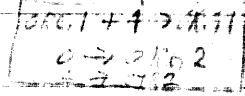
= 0



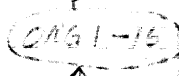
≠ 0



= 0



≠ 0



→ print

UPV (note)

1
2
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12
13
14
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25

4x4 address scheme

IJ	i j	r c	r _i c _j
44	33	22	11
	32	23	11
	31	23	12
43	34	22	11
	32	24	11
	31	24	12
42	34	23	11
	33	24	11
	31	24	13
41	34	23	12
	33	24	12
	32	24	13

IJ	i j	r c	r _i c _j
34	43	22	11
	42	23	11
	41	23	12
33	44	22	11
	42	24	11
	41	24	12
32	44	23	11
	43	24	11
	41	24	13
31	44	23	12
	43	24	12
	42	24	13

IJ	i j	r c	r _i c _j
24	43	32	11
	42	33	11
	41	33	12
23	44	32	11
	42	34	11
	41	34	12
22	44	33	11
	43	34	11
	41	34	13
21	44	33	12
	43	34	12
	42	34	13

IJ	i j	r c	r _i c _j
14	43	32	21
	42	33	21
	41	33	22
13	44	32	21
	42	34	21
	41	34	22
12	44	33	21
	43	34	21
	41	34	23
11	44	33	22
	43	34	22
	42	34	23