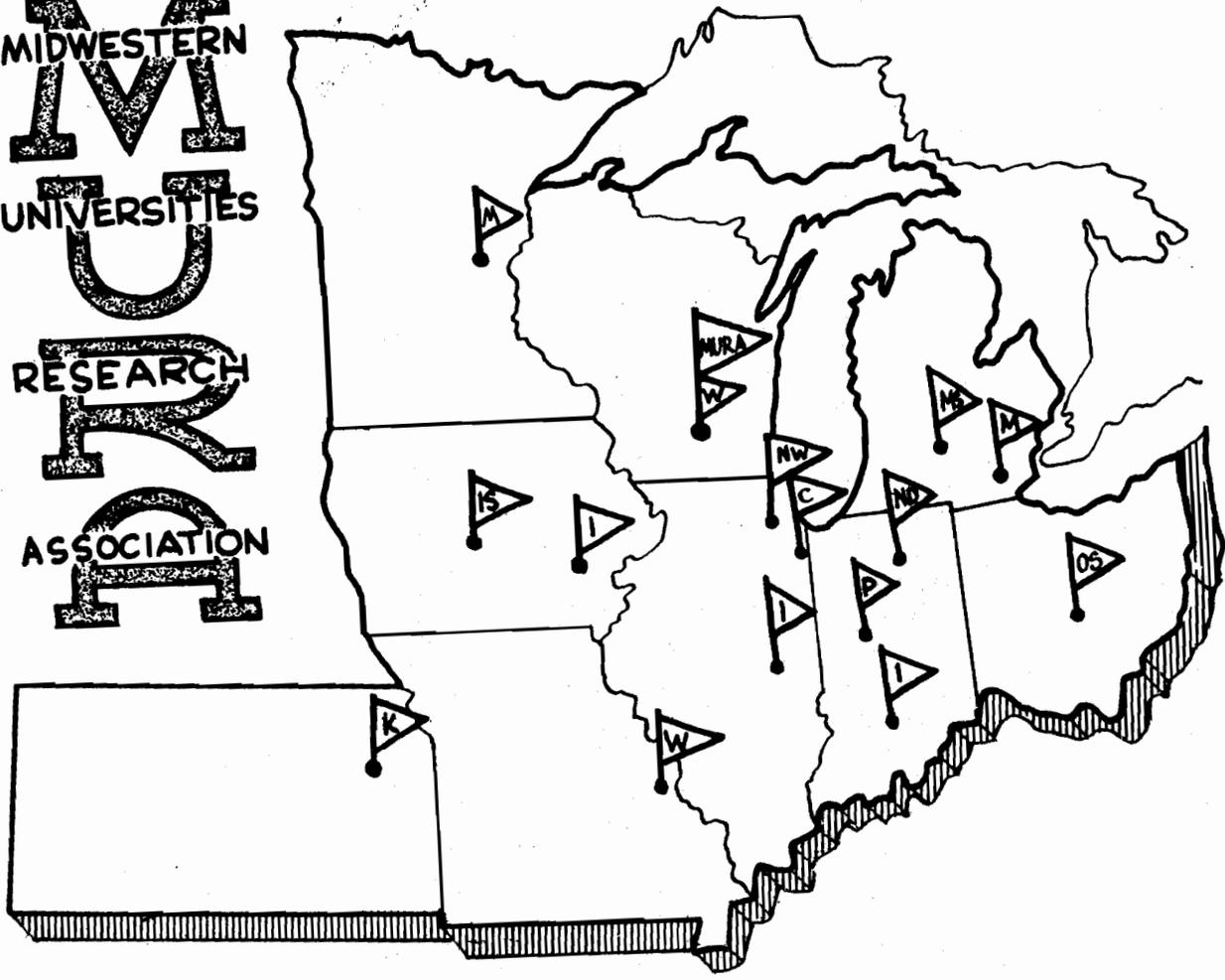




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MIDWESTERN
M
UNIVERSITIES
U
RESEARCH
R
ASSOCIATION
A



REPORT

MESSY MESSY
(Program 78)
February-March, 1957

NUMBER 239
Internal
(IBM Program)

MESSY MESSY

(PROGRAMME 78)

I. Purpose

The Messy Messy program arose from a memo to J. N. Snyder from F. T. Cole dated January 24, 1957. The program is designed to do "hard edge" matrix multiplication of the type discussed in many MURA reports (e. g. LWJ/KMT-2).

II. Matrix Types Available

Three types of matrices are available. They are

$$1. M_1 = \begin{pmatrix} \cos \delta t & \frac{\sin \delta t}{\delta} \\ -\delta \sin \delta t & \cos \delta t \end{pmatrix},$$

representing a focusing part,

$$2. M_2 = \begin{pmatrix} \cosh \delta t & \frac{\sinh \delta t}{\delta} \\ \delta \sinh \delta t & \cosh \delta t \end{pmatrix},$$

representing a defocusing part, and

$$3. M_3 = \begin{pmatrix} 1 & \delta \\ t & 1 \end{pmatrix},$$

representing an edge or a straight section.

Each type depends on two parameters δ and t . It is necessary in type 3 to have either δ or t zero to keep the determinant unity.

III. Input Format

One writes down on the **agendum sheet** (see **sample** attached) a Category I I. D. number and a quantity ϵ such that $1 - \epsilon < \det M < 1 + \epsilon$. If ϵ is not specified, the value 10^{-4} will be used. It might be observed that the routines used in calculating quantities which appear in type 1 and 2 matrices are accurate only to about 10^{-7} , so that it is not wise to choose ϵ smaller than 10^{-7} . Since the calculations will differ from reality in the fundamental (hard edge) approximation, the value 10^{-4} is felt to be adequate for most purposes.

One enters the type and parameters δ and t of each matrix in the order in which the particle encounters them. Thus, if one writes the sequence of matrices in the usual way, they are entered on the **agendum sheet** reading from right to left.

Only 90 matrices can be put on each page. If more are desired, additional pages must be used. Separate pages should be stapled together vividly and the page number inserted in the box provided. Up to 330 separate matrices can be multiplied.

The following restrictions must be observed in the input. In types 1 and 2,

$$0 < \delta < 64$$

$$0 < t < 4$$

and $\delta t < 4$

In type 3 we must have

$$0 < \delta < 4$$

$$-64 < t < 64$$

In all types every matrix element must be less than 10^4 in absolute value.

IV. Output Format

An output sheet will have the following form:

	00000	00000000078	ID Number	
Input data	{ 00001	Matrix type	δ	t
	{ 00002			
	{ 00003			
	etc.			
Space				
	100001	a	b	c
	100002	$\cos \sigma$	$\frac{\sigma}{\pi}$	$\sin \sigma$
	100003	β	α	DetM
				END

where the product matrix $M = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$,

$$\cos \sigma = \frac{a + d}{2}$$

$$\beta = \frac{b}{\sin \sigma}$$

$$\alpha = \frac{a - d}{2 \sin \sigma}$$

and $\det M = ad - bc$

$\frac{\sigma}{\pi}$, $\sin \sigma$, β and α are given only when $|\cos \sigma| < 1$, $\frac{\sigma}{\pi}$ is given mod 1.

If some restriction is not observed, one of the following failure signals will be given instead of output.

		Meaning
00004	# of matrix	Some element of the individual matrix is greater than 10^4 in absolute value
00005	# of matrix	Some element of the product matrix is greater in absolute value than 10^4
00006	# of matrix	Individual matrix does not satisfy $1 - \epsilon < \text{determinant} < 1 + \epsilon$.
00007	# of matrix	The product matrix does not satisfy $1 - \epsilon < \text{determinant} < 1 + \epsilon$.

MESSY MESSY (PROGRAMME 78)
AGENDUM SHEET

ADDRESS VALUE			PARAMETER							
1971			I.D. NUMBER							
1973			ϵ (if not specified, $\epsilon = 10^{-4}$)							
Type	δ		t			Type	δ		t	
	n	exp	n	exp			n	exp	n	exp
1					46					
2					47					
3					48					
4					49					
5					50					
6					51					
7					52					
8					53					
9					54					
10					55					
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37					82					
38					83					
39					84					
					85					
41					86					
42					87					
43					88					
44					89					
45					90					

FLOATING POINT NUMBERS