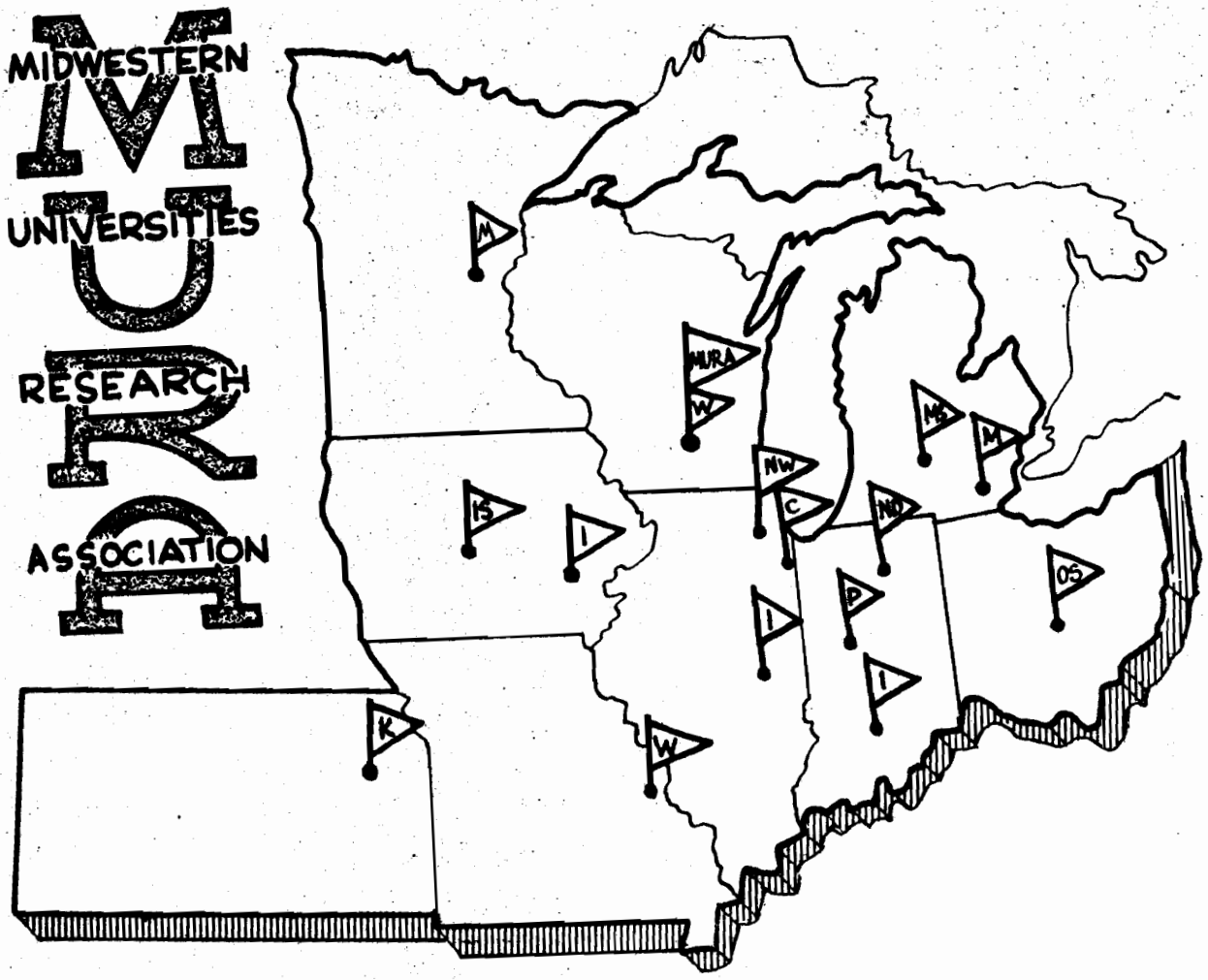
386

MIDWESTERN UNIVERSITIES RESEARCH ASSOCIATION



REPORT GOLLYCONDER

(Programme 171)
January, 1958

NUMBER 386

Internal
(IBM Program)

GOLLYCONDER
(Programme 171)

J. N. Snyder

This programme consists in a basic modification of FOROCYL (Programme 13). It is well known that the methods of Frankel and Young can accelerate the convergence of partial differential equations but were applied only to Laplace's equation on simple rectangular meshes with simple piecewise-constant Dirichlet data. Current work at the University of Illinois (Golub and Taub) points the way toward extending these methods to general elliptic equations with general Dirichlet data. Since the problems treated by FOROCYL fall within this class, FOROCYL was appropriately modified (becoming GOLLYCONDER) in order to experimentally test these methods. Preliminary tests indicate that convergence can be expected to be accelerated by approximately a (decimal) order of magnitude.

The GOLLYCONDER input data is sufficiently similar to FOROCYL that FOROCYL agendum sheets may be used. The user must remain cognizant of the differences enumerated below.

1. Mark Agenda Sheets vividly "Use GOLLYCONDER - Programme 171."
2. No Final Phase can be done, so FINAL must be marked "done."
3. Since convergence acceleration is applied only to the MAIN phase, it is wise to do only the minimum number of Laplace passes thereby entering the MAIN phase as soon as possible. This can be accomplished by setting ϵ_L to some large number, (say .75).
4. It is also advisable to always interpolate in the mesh initially.
5. The convergence criterium is no longer subject to choice but has been replaced by terminating when

$$\sqrt{\sum (\Omega_{\text{New}} - \Omega_{\text{Old}})^2} < 4\epsilon_M$$

where the sum is over all points of the mesh, and "old" and "new" pertain to the values on the last and the current iterations respectively. This ϵ_M is to be entered on the agendum sheet as usual.

6. The locations previously used for i_M, j_M, i_F, j_F, and ϵ_F are used by the programme for other purposes. Under no circumstance should the user tamper with these locations by entering values.

7. The use of the second and third sense switches (SS2 and SS3) has been changed.

   SS2 UP, SS3 UP - No convergence acceleration will be applied. The programme is equivalent to FOROCYL (except the convergence criterium 5 is used).

   SS2 DOWN, SS3 UP - The aforementioned convergence acceleration will be applied.

   SS2 DOWN, SS3 DOWN applies a variation of the acceleration procedure which is still in a very preliminary experimental stage. It should not be used before further experimentation and evaluation.