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March 24, 1939

Iowa State College Research Council
Iowa State College
Campus

Gentlemen:

For the mathematical treatment of many practical problems, one requires the solution of systems of linear simultaneous algebraic equations. As three examples of such problems of continual interest to investigators on our campus, one may mention, (1) Electrical circuit analysis, (2) Approximate solution of the differential equations of mathematical physics with special emphasis on their technological application, (3) Multiple correlation in statistics. The theory and method of solution of such systems is well known and, if the number of unknowns is small (the number of equations is generally equal to the number of unknowns) the solution presents no difficulty. However, the satisfactory treatment of many problem, the three problems mentioned above, for instance, frequently requires the use of many unknowns. Since the time of solution of such a system varies roughly as the cube of the number of unknowns the solution of the larger systems becomes extremely arduous.

About six years ago, I started to think about the possibility of mechanizing this solution. After I had succeeded in forming a rough outline of the process necessary, I attempted to realize this process by using the computational capacity of the punched card tabulating equipment. I finally abandoned this attempt because it would require considerable changes in the machines themselves which are leased to the user on a basis that would not permit such changes and because even the large computational capacity of these machines is not high enough. The construction, from the beginning, of a machine to perform the necessary functions seemed too involved for successful completion with the means at hand.

However, about two years ago I came to a realization that computing machines can be much simplified by changing from the use of numbers to the base 10 to the use of numbers to the base 2. Further study has reinforced this point of view and it now seems possible to build into a small machine of perhaps the size and intricacy of a Monroe a computational capacity over twice that of the 8 bank punched card tabulation.

This would be, as far as I am aware, the most powerful computing machine in existence and would furnish a direct and satisfactory method of solving simultaneous linear equations.

While the basic idea of this machine is original, I have made careful calculations and believe it will work. Therefore, I wish to request a grant of \$450 for a research fellow in physics to work on the plan and \$200 for materials and mechanical assistance.

Very truly yours

J. V. Atanasoff
Assoc. Prof. of Physics
and Mathematics

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Approved - Jay W. Woodrow

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