Variable Dimension Automatic Synthesis Programs (VASP)

The problem:
The Automatic Synthesis Program (ASP), that the
Variable Automatic Synthesis Program (VASP) was
derived from, is limited in two ways:
(1) ASP is programmed in FAP (Fortran Assembly
Program) and can only be used on the IBM-7090-
7094 computers;
(2) many complicated time-variant analysis, synthesis,
and optimization problems tax the capability of
the ASP program.

The solution:
A Variable dimension FORTRAN IV version of the
Automatic Synthesis Program was developed.

How it’s done:
The program is used to implement the Kalman filtering
and control theory. Basically, it consists of 31
subprograms for solving most modern control problems
in linear, time-variant (or time-invariant) control systems.
These subprograms include operations of matrix algebra,
computation of the exponential of a matrix and its
convolution integral, and the solution of the matrix
Riccati equation. The user calls these subprograms by
means of a FORTRAN main program, and so can easily
obtain solutions to most general problems of extremization
of a quadratic functional of the state of the
linear dynamical system. Particularly, these problems
include the synthesis of the Kalman filter gains and the
optimal feedback gains for minimization of a quadratic
performance index.

The VASP is an outgrowth of ASP and has the follow-
ing improvements:
(1) a more versatile programming language;
(2) a more convenient input/output format;
(3) some new subprograms which consolidate certain
groups of statements that are often repeated; and
(4) variable dimensioning.

The pertinent difference between the two programs is
that VASP has variable dimensioning and a more
efficient storage.

The documentation for the VASP program contains
a VASP dictionary and some example problems. The
dictionary contains a description of each subroutine
and instructions on its use. The example problems include
dynamical response, optimal control gain, solution of the
sampled data matrix Ricatti equation, matrix decom-
position, and a pseudo inverse of a matrix.

Notes:
1. This program is written in FORTRAN IV to be uti-
лизized on the IBM-360 computer; however, the program
can be used by other machines that have FORTRAN
IV compilers.

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