

~~CONFIDENTIAL~~6673
Memorandum M-2064

Page 1 of 5

Electronic Computer Division
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

CLASSIFICATION CHANGED TO:

Auth: DU254By: R.H. ErrettDate: 2/1/64SUBJECT: BI-WEEKLY REPORT, PROJECT 6673, JULY 14, 19501. ANALYSIS

(W. G. Welchman)

For the present the analysis group will consist of D. R. Israel, R. L. Walquist and E. J. Samario. J. A. Arnow will join the group during August. Miss Dorothy Lenihan though available for punched tape preparation and coding work in connection with Project 6673 will be responsible to C. W. Adams.

It seems probable that punched tape input to the computer will be available around August 21, and the first objective of the group will be to get several programs punched before that date. Three programs are in the course of preparation, and preliminary experimental runs are being made with test storage.

The nature of errors in radar measurements is being considered with the object of devising computer programs for their evaluation. Double occupancy of a tracking box is also being considered.

(D. R. Israel)

A coded program to handle the input of radar data, the conversion of (r, θ) coordinates to (x, y) coordinates, and the display of these (x, y) coordinates has been prepared. This program will probably form the nucleus of a more general display program.

Several coded programs for the movement of a spot on the main display scope have been written and tested on the computer using test storage only. In one of these programs the spot was moved by variation of the x and y components of velocity. Two of the adjustable constant switches were used for this variation, one each for the x and y velocity. This arrangement required that the deviation of the moving spot from the fixed spot be mentally converted to (x, y) velocity components. Provision was made for both a slow and a fast speed in both the x and y directions; nevertheless, it proved to be very difficult to properly position the spot.

~~CONFIDENTIAL~~

M-2064

1. ANALYSIS, (continued)

(D. R. Israel) - (continued)

Because of the relative difficulty with the (x,y) speed control and in order to more closely simulate the action of the "joy stick" or even the control of an aircraft several programs have been written which directly vary the heading or direction of motion of the spot. These programs will be experimentally run on the computer as soon as time is available.

The inclusion of the spot movement program as a part of a simple form of tracking has been studied. A flow diagram and a rough outline of the coded program have been written.

Some time was spent in consideration of programming for Adams' suggestion of a means for examining or changing the contents of selected electrostatic storage registers. This general feature, tentatively called "manual intervention", not only provides a very flexible means of checking or correcting programs, but it essentially makes almost every storage register as accessible as the FF registers. The value of this feature cannot be overestimated--especially as an aid in the initial selection of parameters for the radar data programs. Inasmuch as a complete control panel for the manual intervention programs will probably not be built for several months, an effort will be made to make the basic features of the method immediately available.

Some consideration has been given to questions of noise or other types of corrupt signals which might be introduced along with the radar data. It appears that this noise will not be too difficult to separate out inasmuch as all the azimuth signals as well as the range signals at any particular azimuth should form an increasing sequence.

(R. L. Walquist)

The major part of the past two weeks was spent on the project's indoctrination program.

Several coded programs were written for the simulation of an aircraft flight path. At present, these coded programs are being checked on the computer in order to determine their usefulness in flight simulation.

A coded program was written for determining the polar angle of a point given its (x,y) coordinates. The program, as written, uses between 55 and 60 storage registers. Only a superficial check of the program has been made due to the unavailability of electrostatic storage.

1. ANALYSIS, (continued)

(R. L. Walquist) - (continued)

Work is progressing on a coded program for determining the polar radius vector of a point from its (x,y) coordinates. A Lagrangian interpolation formula is being considered as a possible means of achieving the desired result.

2. ENGINEERING

(C. R. Wieser)

The third telephone line is being installed in Room 138.

The order for Dumont K105F7 oscilloscope tubes has been increased to four tubes to provide adequate spares.

Until the "joy stick" control is completed, the rotary octal switches on FFSO can be used for manual control of a scope spot. Experiments with these switches indicate that the desired ratio of slow to fast spot speed may be as high as 31:1

The first experiments with the rotary switches showed that control of the spot was lost while changing the switch position. This was traced to the switching circuits, which normally allow reset pulses to hit both sides of the flip-flops when the switch knob is midway between two positions. This can be rectified by setting the octal switch sign digit to "one" and setting all of the register toggle switches to "one". In the "joy stick" circuit design, transient loss of control must be avoided.

Drawings for video cabling ducts from WWI to Room 138 are complete. It is planned that the video cables will be placed in the same ducts as the future input-output cables. In the input-output room the cables to Room 138 will be dropped down through a 4" x 4" wireway. Installation will be started after the storage tube lab moves to the basement.

(W. Linvill)

I am studying further the problem of treating the computer as an element in a control system. When the program is made up of linear operations, the computer is a dynamic element which can be described quite easily in the frequency domain. At present I am trying to find out whether this description is useful or not.

2. ENGINEERING, (continued)

(D. A. Buck)

A manually-positioned spot on the display oscilloscope was decided upon as a convenient method of telling the computer which of several signals it is to work on. When the movable spot has been positioned so as to coincide with the desired spot on the oscilloscope face, a signal will be sent to the computer.

It was decided to experiment with a "joy stick" type of device for manually positioning the spot with a push-button in the top of the "joy stick" to inform the computer that the operator is on target. A salvaged component resolver has been acquired which will operate microswitches as the handle is displaced against spring-loaded centering. Motion towards the right, left, up, or down or any combination of these is done by pushing the "joy stick" in the desired direction. Three microswitches corresponding to three degrees of displacement in each of the four cardinal directions will allow the operator to speed the spot out to the approximate location of the target and then to position it accurately at one of the two slower speeds. The microswitches will actuate relays which will set up a binary number for the computer, and the computed positions of the spot will be sent to the display oscilloscope along with the other spot positions.

Present work on the "joy stick" is concentrated upon the mechanical details of mounting the microswitches.

(L. S. Bensky)

In making a cursory check of the Magnecorder's characteristics, the extreme sensitivity to stray power frequency fields was immediately noticed. All input leads must be well shielded and all magnetic circuits must be at appreciable distances from the record-playback amplifier and head.

The tape tensions on feed and take-up spools were measured with a spring balance. The torques producing these tensions were adjusted to values listed in instruction book.

The rubbing of tape against spool sides was partly eliminated by adjusting lateral spool position and by bending spool sides. This rubbing still persists because the machine rewinds irregularly.

CONFIDENTIAL

2. ENGINEERING, (continued)

(L. S. Bensky) -- continued

Checks on frequency stability were made by recording a 1000 cps output from Hewlett-Packard 205AG (-50 db re 5 volts gave acceptable signal to noise ratio) and applying the 1000 cps output and recorded signal to an oscilloscope. The number of times per second the resulting Lissajous ellipse degenerated to a given straight line was used as a measure of frequency stability. Changing tape speed (15 in./sec. or 7.5 in./sec.) and using auxiliary spooling mechanism instead of basic recorder showed basic recorder at 15 in./sec. to be poorest combination.

<u>7.5 in./sec.</u>	Approximate <u>% frequency drift</u>
Basic recorder	0.1
Auxiliary spooling	0.1
<u>15 in./sec.</u>	
Basic recorder	0.2
Auxiliary spooling	0.15

CONFIDENTIAL

UNCLASSIFIED