

A REMOTE INTERACTIVE GRAPHICAL INFORMATION
RETRIEVAL SYSTEM

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ABSTRACT

A programme has been developed to demonstrate an information retrieval system of graphical data on a remote Tektronix storage tube terminal. The techniques used are applicable to any type of graphical data but in the specific case was oriented to the type of information used by Public Utilities Commissions or similar bodies. In practice this type of system involves a large data bank, but due to problems of long distances and relatively low transmission rates, it is desirable to divide the data bank into sections to minimize the redraw time for different displays. Such redraws may be required due to interest in different utilities or varying amount of detail. The methods used to determine the required data display will be given in the paper together with a number of displays actually obtained using a hard copy unit.

UN SYSTEME À ACTION RÉCIPROQUE DE TÉLÉ-EXTRACTION
DES DONNÉES GRAPHIQUES

ABRÉGÉ

On a mis au point un programme démontrant un système d'extraction des données graphiques à l'aide d'un terminal Tektronix à distance muni d'un tube enregistreur. Les techniques employées s'appliquent à n'importe quel type de données graphiques, mais dans le cas qui nous occupe elles ont été axées sur les informations utilisées par les services d'utilité publique et organismes du genre. En pratique, ce type de système comporte une imposante banque de données, mais vu les problèmes engendrés par les longues distances et les vitesses de transmission relativement faibles, il est souhaitable de diviser la banque de données en sections pour minimiser le temps de régénération entre divers affichages. Une telle régénération peut être nécessaire en raison de l'intérêt et des détails qui peuvent varier suivant les services. Le mémoire traite des méthodes employées pour déterminer l'affichage de données requis et donne un nombre d'affichages obtenus à l'aide d'un appareil de transposition en clair.

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Introduction

The information retrieval system to be described was an experimental one to demonstrate the capability of using a computer terminal for retrieval of graphical information at any suitable remote telephone outlet such as at a public telephone kiosk.

Specifically the data to be displayed would be that concerned with the location of various public utility services in a city; in particular it was envisaged that the public utility body might conceptually have vans equipped with a graphics display terminal which could be acoustically coupled to any telephone (possibly installed in private manholes) in the city; this would mean that essentially if information was required "in the field" as a result perhaps of a burst water main, damaged cables, etc., the van would simply drive up to the nearest telephone, connect into the computer system and retrieve the information required in the particular vicinity. Due to using the normal telephone system, two assumptions were made: (1) a direct viewing storage tube would probably be used for the display to eliminate the refresh problem (though a refresh system could be used with a local memory) and (2) the data transmission rate would be relatively low (300-1200 baud rate). At the same time it must be appreciated that the amount of data involved is considerable considering that there may be typically 10 or more different services distributed throughout the area.

Method Used

The method used to overcome these problems is to divide the data into the smallest reasonable size 'packages' — I will call them packages rather than the more conventional term, 'pages', which are normally of fixed size, whereas the packages here are of different sizes — and allow the user to interact to display the package of information required. Considering a hypothetical town or city consisting of a number of intersecting streets, these can be displayed schematically, superimposed with a grid together with reference points as shown in Figure 1; the user may then pick out the area of interest by placing a cursor on the reference point. In essence this means that he is selecting a package of data which will produce a more detailed display of the area of interest. However at this time, only the street outlines need be presented, Figure 2, so that the user may decide which service or services he wishes to examine, these being superimposed

individually on the original display, bearing in mind that a storage display tube display system is being used. Typically one service might be superimposed as shown in Figure 3. Further services may then be added if the user wishes to know the physical relationship between the various services, as shown in Figure 4. At this stage more detail at a particular area may be required so that provision is made to zoom into a smaller area which is then expanded up to the full screen size as shown in Figure 5. Two advantages of using the zoomed version are (i) clarity of detail and (ii) reduced drawing time as less data is actually being transmitted for displaying on the cathode ray tube screen.

If desired at any time, the user may change to a different part of the current data bank by windowing in the same local area - the windowing may just expand up from the detailed area to a larger area or may move to a different part of the current package as shown in Figure 6; furthermore, as a convenience the user may also window out to the original full display as at Figure 4. Alternatively, the user may move to a different part of the town by returning to the initial street plan and select another area. It must, however, be remembered that at anytime when zooming, windowing or a change to a different part of the town is required, the complete display has to be regenerated which takes some considerable time. To minimize this time, a reasonable minimum of information is displayed; however certain other information which may be very useful to the user is also available in the data bank - such information might be service depths, pipe sizes, number of ducts, etc. This information is available at anytime to the user by selecting an alphanumeric information retrieval routine and then selecting the particular "line" whose information is required; this is shown in Figure 7.

Implementation

Although the above information retrieval system could be implemented with any suitable programming language, a complete working demonstration system was written using the interactive computer graphics language GRAPPLE developed by Bell Northern Research, Ottawa, and run on a remote Tektronix 4013 terminal at the University of Western Ontario, London attached to the Bell Northern Research computer through telephone lines using standard 300 baud modems.

In the demonstration all the facilities mentioned in the method were incorporated and available to the user by means of a menu, this being displayed on the right hand side of the screen as shown in Fig. 7 and provision was also made for producing off-line plotting of large scale drawings.

As an indication of the time problem mentioned earlier, the time taken to display the entire data of Figure 4 was approximately 5 minutes. Typically the user does not require all the information at any one time and thus this time is considerably reduced by the technique described.

Acknowledgement

I wish to acknowledge the facilities provided by the Systems Analysis and Computer Aided Design Activity (SACDA) at the University of Western Ontario, London, Ontario, and the help provided by the staff of Bell Northern Research during this development.

References

"GRAPPLE Language Reference Manual (Ed. 4.0)", Bell Northern Research (Sept. 1973).

SELECT REQUIRED AREA BY PLACING CURSOR ON AREA CENTRE SPOT

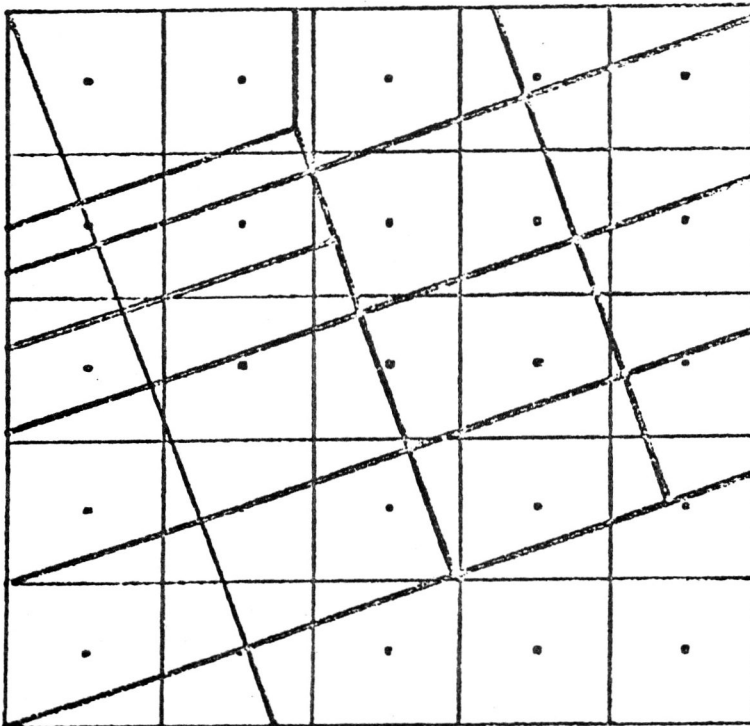


FIGURE 1

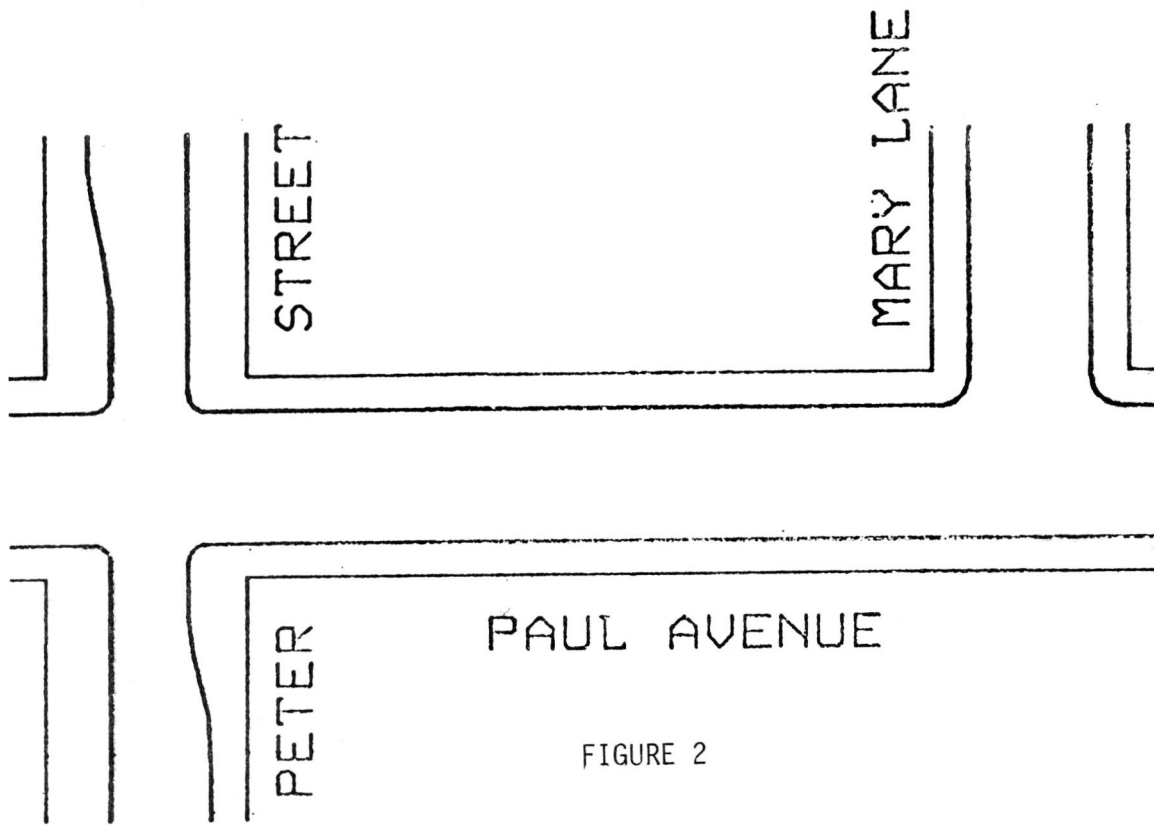


FIGURE 2

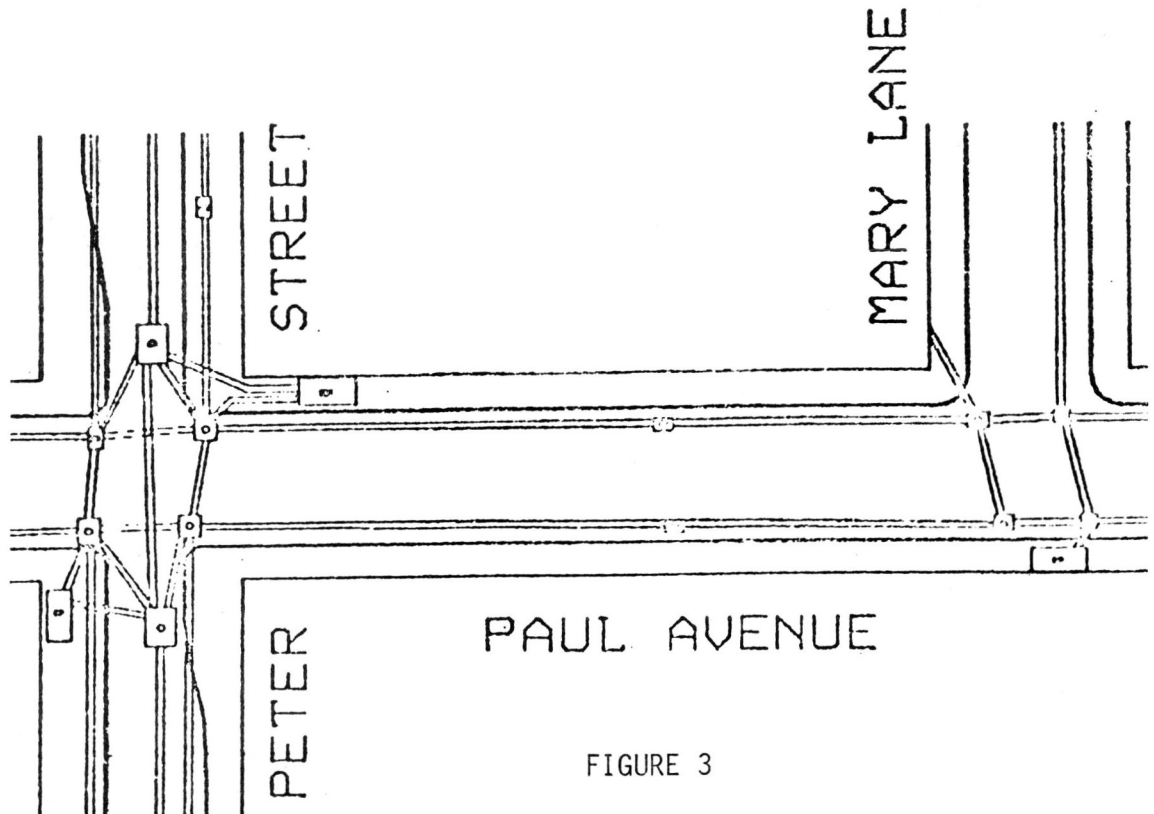
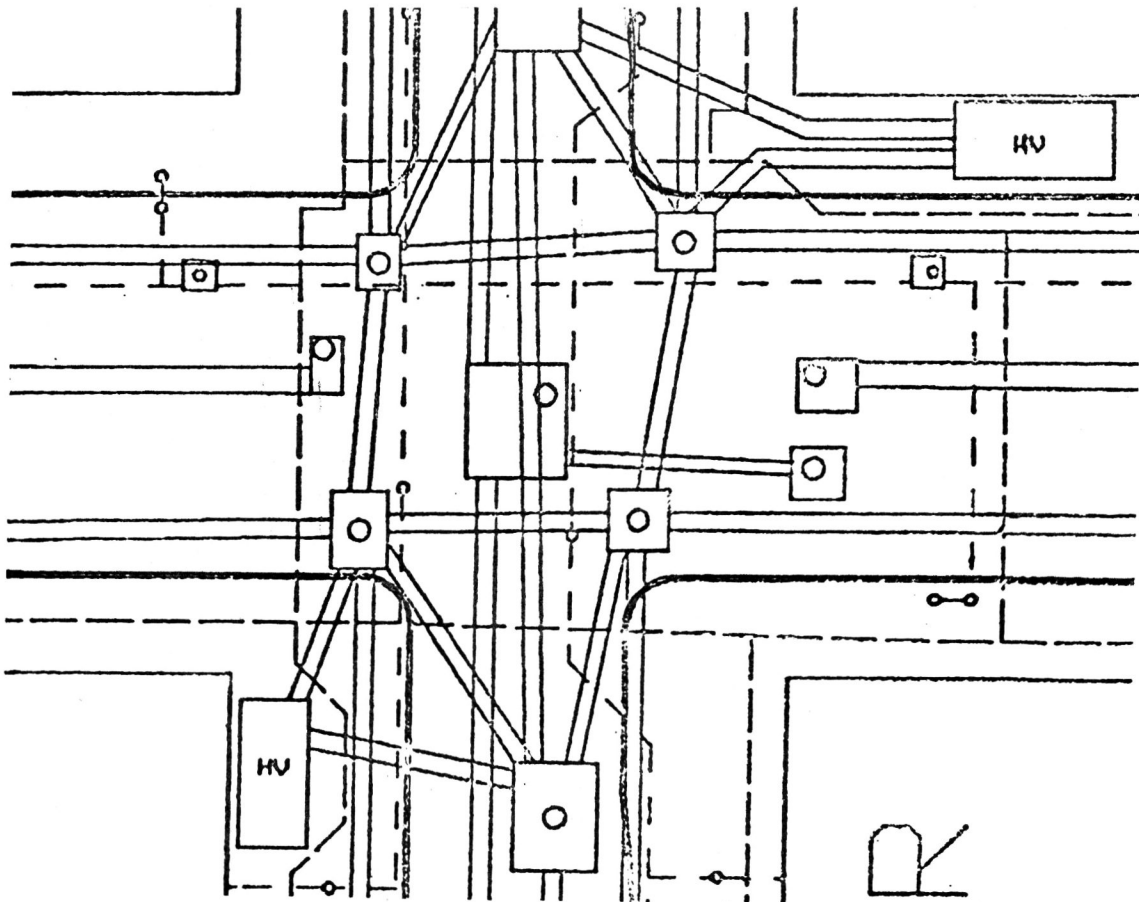
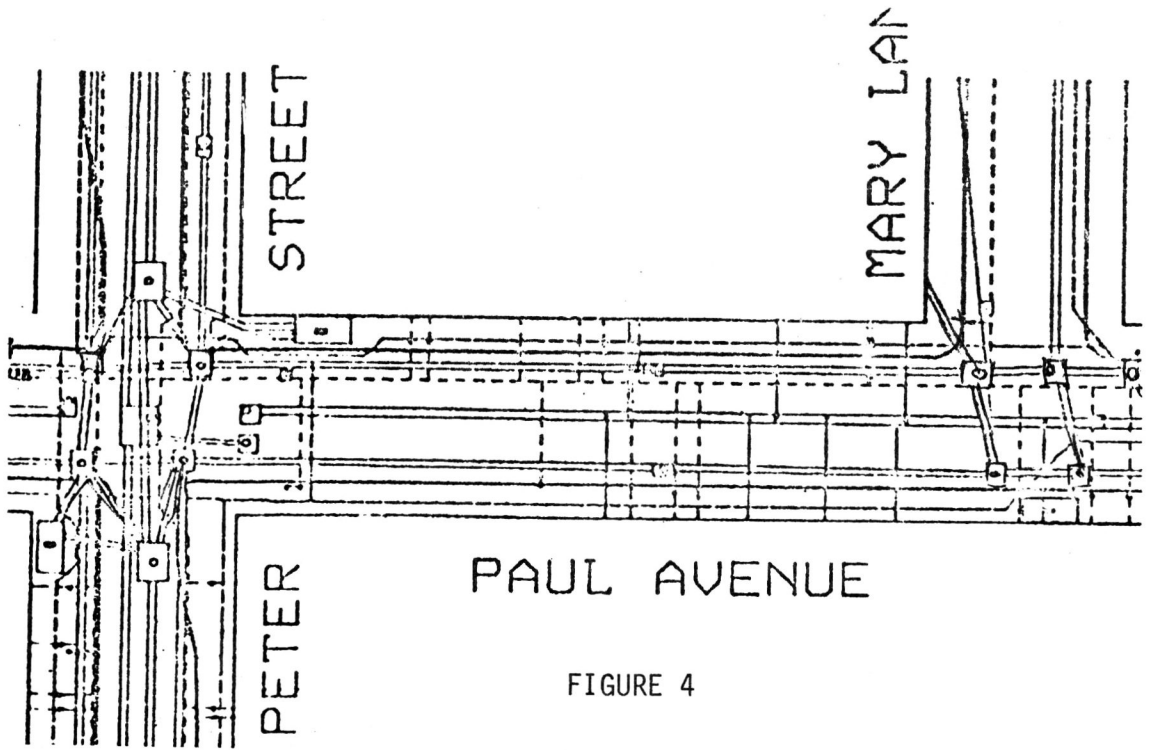


FIGURE 3



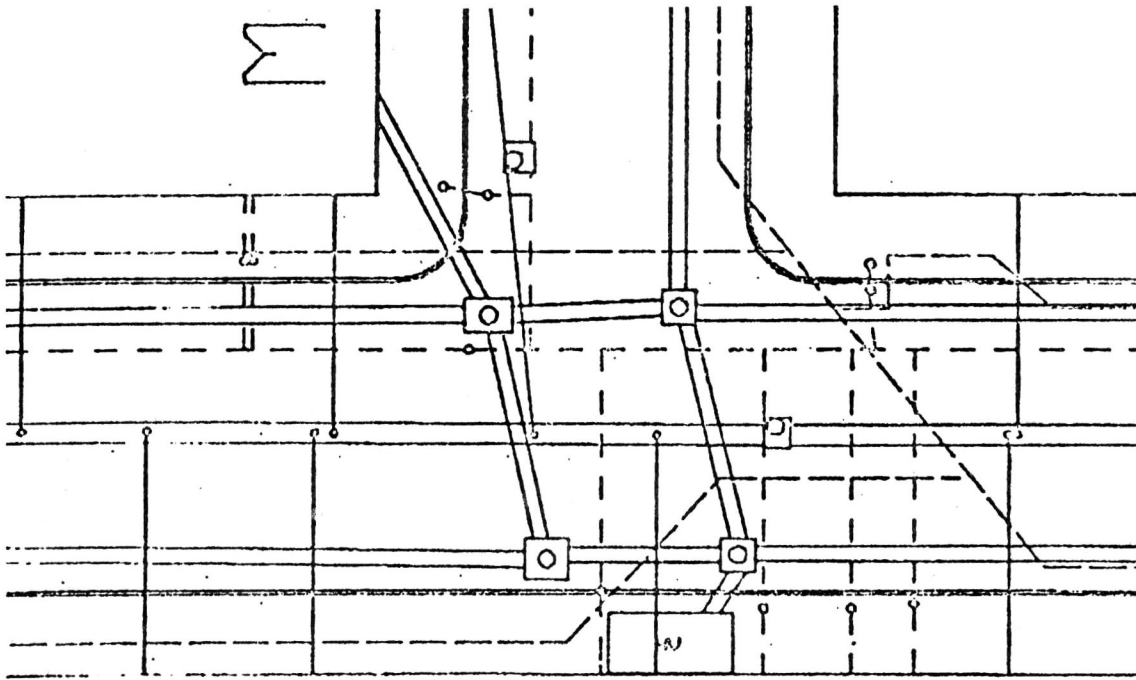


FIGURE 6

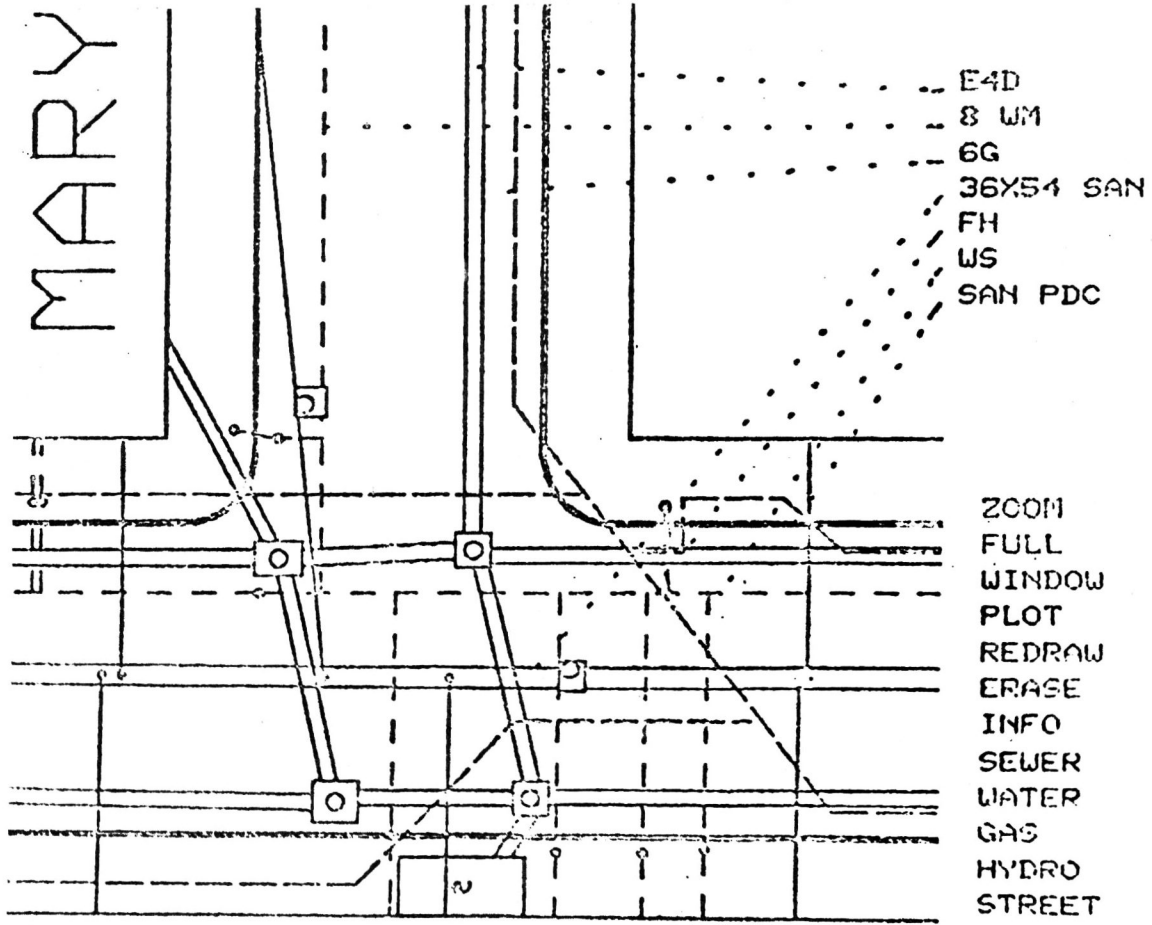


FIGURE 7