ACIS
A CLINICAL INFORMATION SYSTEM
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ABSTRACT

ACIS is a file generating system in which a compiler, using a simple data definition and schema language, accepts a description of the data and structures that are to be applied to this data and generates a series of PL/I programs. These programs are immediately available for use or can be user modified. This is far more powerful than providing the user with the conventional subroutine links.

Central to this system is a series of string manipulation programs including a file and core management program which offers and accepts variable length strings to and from routines and moves these strings between buffers and a variety of protected disc files.

A string of data is a member of a variable group and consists of one or more keys together with descriptors or modifiers to these keys. Two main structural forms apply to the data, internal and external. The former relates items, which are themselves members of strings, hierarchically or relationally. The latter associates independently maintained files of pointers to the data base, thus creating inverted files.

Incorporated into ACIS as an option is the Systematized Nomenclature of Medicine (SNOMED). This and other translation modalities translate coded variables into English. Also available are routines which interface hyper-rectangular retrievals to statistical packages which accept case-wise data.

I. INTRODUCTION

ACIS evolved from a data base system, designed by the author, which currently maintains information on approximately 30,000 patients at the City of Hope Medical Center. Subsequent development of the system has been motivated by its use in clinical trials and other areas of biomedical research.

The system is a compiler designed to generate custom programs for a data base using a file description language composed of very simple elements provided by the user. The first generated program actually builds the data base and the second is used for retrieval.

The data may be viewed and manipulated either hierarchically, relationally or both, depending on the options invoked during compilations.

All the programming for this system has been written in PL/I, with much use being made of the pre-processor features of the language to write the expanding compiler sections. Care has been exercised in the design of the system to allow
current development in enquiry languages to be acceptable adjuncts to the system. During the compilation phase ACIS operates on user supplied clauses and generates viable PL/1 programs which incorporate variable group names and variable names chosen by the user. The program produced is then link-edited to the nucleus system and is ready to use.

To the readable PL/1 code the user may add lines of code to those sections which operate on the data to incorporate features not supported by the Data and Schema Definition Language. For example, the values of the context-dependent variables can be evaluated.

The building of a data-base consists of adding new cases, adding to established cases, and modifying existing cases. During an ACIS run an audit is maintained of the data and rejected data is reproduced together with error messages. The retrieval program is created using the same Data Definition Language as that used to build the data base.

II. STRUCTURING THE DATA BASE

Although many of the procedures performed in a hospital eventually find expression in the patient's charts, these recorded sagas in many cases serve to entomb information rather than preserve it. It was with the conviction that a data base should be evolutionary rather than historical that a design was produced and implemented that not only would have a diverse appearance to different users but would permit growth and allow restructuring.

A physician is concerned with individual patients while a chemist is making measurements on a series of bloods and an admission clerk is concerned with bed occupancy. The data pertinent for all of these facets of hospital activity can each be described independently in a rectangular or tabular manner. Such tableaux or relations constitute relational files. Lines from different tableaux are, however, related when one considers the individual patient. The essential rectangular nature of the data is, though obscured, not lost. This follows from the axiom that all data can be written in a series of rectangular arrays with repeated groups as separate subrectangles. Existing rectangles may be manipulated to produce new rectangles or relations by the 'cut and paste' functions of 'projection' and 'join' of relational algebra. Fig. 1 depicts a series of such arrays covering some of the recordings that are ubiquitous to hospitals. Each row of these arrays or sets is a variable group or relation, and elements within a row are the variables or tuples. Describing some of these sets, there is the general index of patients or the set P, which contains the chart number, name and certain demographic information. The set L shows the location of the patients within the hospital. The set B produced by the technician drawing blood contains the patient chart numbers, acquisition