PROBLEMS ON THE ROAD TO UTOPIA
part 1

UTOPIA
or
A DESIGN PROCESS
RELATED TO ARCHITECTURAL APPLICATIONS
ON THE VAX BASED INTERGRAPH
COMPUTER GRAPHICS SYSTEM
part 2

TRACY COX
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THIS THESIS PROJECT EMBODIES THE RESULTS OF ORIGINAL RESEARCH
FOR ACADEMIC CREDIT FOR THE ARCH 404, ARCH 405 AND ARCH 406
DESIGN COURSES AT THE COLLEGE OF ARCHITECTURE AND PLANNING, BALL
STATE UNIVERSITY UNDER THE DIRECTION OF PROFESSOR JACK WYMAN.
THIS WORK IS DEDICATED TO
DICK COLTER
OF
THE McGUIRE AND SHOOK CORPORATION
WHO PASSED AWAY MID-FLIGHT
IN HIS JOURNEY ABOARD THE INTERGRAPH
PREFACE

THIS WORK IS DIVIDED INTO TWO PARTS. THE FIRST PART, PROBLEMS ON THE ROAD TO UTOPIA, DEALS WITH GENERAL PROBLEMS ASSOCIATED WITH THE AREAS OF COMPUTER GRAPHICS AND AEC APPLICATIONS. THE SECOND PART, A DESIGN PROCESS RELATED TO ARCHITECTURAL APPLICATIONS ON THE VAX BASED INTERGRAPH COMPUTER GRAPHICS SYSTEM, PRESENTS A SPECIFIC SYSTEM APPROACH FOR AEC APPLICATIONS ON THE INTERGRAPH SYSTEM.

THE FIRST PART OFFERS REASONS WHY THERE ARE SO MANY PROBLEMS RELATED TO CAD AND A METHOD TO DEAL WITH THEM. AN EXPLANATION OF PROBLEMS RELATED TO THE LARGE AMOUNT OF TIME REQUIRED FOR CAD RELATED PROJECTS IS ALSO DISCUSSED FOLLOWED BY PROBLEMS RELATED TO CAD IN ACADEMIC AND PROFESSIONAL ENVIRONMENTS. IT WAS EXECUTED USING TRADITIONAL VAX WORD PROCESSING TECHNIQUES (EDI/GOLD KEYPAD EDITING).

THE SECOND SECTION IS A RECORD OF THE SYSTEM AS DEVELOPED BY THE AUTHOR FOR HIS OWN USE. IT IS PRESENTED IN A NOTEBOOK FORMAT THAT FOLLOWS THE CHRONOLOGICAL DEVELOPMENT OF THE AUTHOR'S SYSTEM. ONE MAJOR COMPONENT IS THE DEVELOPMENT OF A ORGANIZATIONAL FRAMEWORK BY WHICH ALL FUTURE WORK CAN BE INTEGRATED. THE AUTHOR THEN CONCENTRATES ON ONE AREA WITHIN THIS FRAMEWORK, SCHEMATIC DESIGN. SEVERAL TECHNIQUES ARE THEN DEVELOPED AS A SUBSETS FOR SCHEMATIC DESIGN APPLICATIONS. THE AUTHORS THEN PRESENTS HIS PHILOSOPICAL VIEWS THAT ARE FOLLOWED BY A EXAMPLE PROJECT AND A SELF EVALUATION. THE APPENDIX COVERS A NUMBER OF RELATED AS WELL AS DIVERGING TOPICS AS DEVELOPED DURING THE COURSE OF THIS PROJECT. THE SECOND PART WAS GENERATED COMPLETELY ON THE INTERGRAPH SYSTEM IN TRUE 3D UNDER IGDS SOFTWARE VERSIONS 8.6.1 - 8.7.3.
# PROBLEMS ON THE ROAD TO UTOPIA

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PROBLEMS ON THE ROAD TO UTOPIA

AS AN STUDENT OF ARCHITECTURE IN THE LAST QUARTER OF THE TWENTIETH CENTURY I ASKED MYSELF, WHAT TOOL WOULD BE VALUABLE TO THE DESIGNER IN HIS WORK GIVEN THAT WE LIVE IN AN AGE OF RAPID CHANGE IN BOTH THE QUANTITY OF INFORMATION AND HOW INFORMATION IS COMMUNICATED.

IT IS THE AUTHORS OPINION THAT THE COMPUTER IS INTERGAL TO BOTH THE GENERATION AND COMMUNICATION OF INFORMATION. THEREFORE ANY ATTEMPT TO DEVELOP A VALUABLE TOOL FOR THE MODERN DESIGNER WOULD INCLUDE THE COMPUTER. IN THE AUTHOR’S THESIS THE VAX BASED INTERGRAPH COMPUTER GRAPHICS SYSTEM WAS USED AS THE MEDIUM OF EXPRESSION IN A MANOR CONSISTANT TO OTHER TOOLS, SUCH AS THE PENCIL, PAPER AND THE STRAIGHTEDGE.


THE REALITY OF THE SITUATION IS THAT A LARGE NUMBER OF PEOPLE WOULD SAY THAT THEY ARE INTERESTED IN A PROJECT OF THIS SCOPE THAT INCLUDES TOPICS THAT RANGE FROM THE MUNDANE TO THE PROVOCATIVE. SOME PART OF IT SHOULD APPEAL TO EVERY DESIGNER BECAUSE IT TRIES TO INCORPORATE EVERYTHING RELATED TO THE ART AND DESIGN OF OUR BUILT ENVIRONMENT. BUT WHEN WE GET RIGHT DOWN TO IT, MOST PEOPLE WOULD NOT ATTEMPT TO DEVELOP SUCH A SYSTEM WITHIN THE FRAMEWORK OF AN ACADEMIC YEAR OR WITHIN ONE’S PROFESSIONAL PRACTICE. THE QUESTION THE AUTHOR ASKS IS, WHY, GIVEN THE HIGH LEVEL OF INTEREST OF PEOPLE TOWARDS THE SUBJECTS OF BOTH DESIGN AND COMPUTERS, HAS THERE NOT BEEN MORE WORK DONE IN THIS AREA? THIS AUTHOR SUGGESTS THAT IT IS A RESULT OF THE LARGE BODY OF QUESTIONS OR PROBLEMS THAT DEVELOP WHEN ONE STARTS TO DEFINE A PROJECT OF THIS SCALE.
AFTER CONSIDERABLE DEBATE AND REHASHING OF MY WORK IN THE DEVELOPMENT OF A COMPLETE SYSTEM FOR THE PRACTICE OF ARCHITECTURE, I HAVE DECIDED THAT THE MOST VALUABLE AND INTERESTING ASPECTS OF THIS STUDY FOR OTHERS DOES NOT RELATE TO THE SPECIFICS OF MY SYSTEM, BUT INSTEAD RELATES TO THE GENERAL PROBLEMS ENCOUNTERED WHILE WORKING TOWARDS THE FINAL PRODUCT. I HAVE REACHED THIS CONCLUSION BASED ON THE FOLLOWING CONCEPT ABOUT PROBLEMS, PEOPLE AND COMPUTERS:

PROBLEMS ARE GENERAL IN NATURE WHILE SOLUTIONS ARE SPECIFIC TO BOTH PEOPLE AND COMPUTER SYSTEMS. THE POSITIVE EXPERIENCE AND FEELING OF ACCOMPLISHMENT OF SOLVING SPECIFIC PROBLEMS ON A SPECIFIC COMPUTER SYSTEM CAN BE CONSIDERED TO BE BOTH PERSONAL AND EGOCENTRIC.

IF THE AUTHOR WHERE TO DEVELOP A SCENARIO OF WHO MIGHT BENEFIT FROM A STUDY OF THE PROBLEMS TYPICAL TO THE DEVELOPMENT AND IMPLEMENTATION OF A SYSTEM FOR THE PURPOSE OF THE PRACTICE OF ARCHITECTURE ON COMPUTER GRAPHICS, THEY WOULD FALL INTO ONE OF THE FOLLOWING TWO CATEGORIES;

1) THOSE WORKING ON AN ACADEMIC PROJECT
2) THOSE WORKING ON NON-ACADEMIC APPLICATIONS
A METHOD OF PROBLEM CATAGORIZATION

BEFORE DISCUSSING THE PROBLEMS IN DETAIL THE AUTHOR WOULD LIKE TO DEFINE A METHOD FOR CLASSIFYING PROBLEMS. IT IS THE AUTHOR'S OPINION THAT IF PROBLEMS ARE DEALT WITH IN SEVERAL DIFFERENT CATEGORIES THEN THE AMPLITUDE OF ANY ENSUING PROJECT CAN ONLY BE SIGNIFICANTLY DECREASED AND A GREAT AMOUNT OF TIME SAVED. THE PROBLEM TYPES ARE AS FOLLOWS:

1) TECHNICAL
2) ORGANIZATIONAL
3) PHILOSOPHICAL
4) EXPLANATORY

TECHNICAL, ORGANIZATIONAL AND PHILOSOPHICAL PROBLEMS ARE GENERALLY INVOLVED IN ANY KIND OF PROJECT AND ARE FAIRLY EASY TO DEFINE OR DESCRIBE. THE AUTHOR HAS ADDED A FOURTH PROBLEM TYPE, EXPLANATORY PROBLEMS. THE AUTHOR FEELS THAT A STUDY OF THIS PARTICULAR KIND OF PROBLEM, THE EXPLANATORY, IS BOTH WORTHWHILE AND NECESSARY TO ANY PROJECT IN THE FIELD OF COMPUTER GRAPHICS. THE AUTHOR HAS CONCLUDED THIS DUE TO BOTH THE GREAT AMOUNT OF EXPLAINING INVOLVED WITHIN HIS PARTICULAR PROJECT AND WITHIN THE FIELD OF COMPUTER GRAPHICS IN GENERAL.

TO ILLUSTRATE THE PROBLEM TYPES OR CATEGORIES, THE AUTHOR WILL GIVE SOME EXAMPLES. A TECHNICAL PROBLEM COULD BE RELATED TO TRANSFERING A DRAWING FROM SYSTEM ABC TO SYSTEM XYZ, OR HOW TO FIX A SYSTEM HARDWARE OR SOFTWARE PROBLEM. AN ORGANIZATIONAL PROBLEM MIGHT DEAL WITH HOW DO I ORCHESTRATE MY VARIOUS PROGRAMS TO ACCOMPLISH MY GOALS WITHIN THE TECHNICAL FRAMEWORK OF MY CHOSEN SYSTEM OR SYSTEMS. PHILOSOPHICAL PROBLEMS ARE CONCERNED WITH PEOPLE, SUCH AS WHAT DO THE PEOPLE WANT TO ACCOMPLISH WITH THE COMPUTER. WHILE THE JOB OF EXPLAINING THE PARTICULARS OR EXPLANATORY PROBLEMS, ARE COMMON TO ANY PROJECT, IT DOES NOT BECOME A MAJOR CONCERN UNLESS IT REQUIRES MORE ATTENTION OR TIME THAN THE OTHER PROBLEM CATEGORIES. I.E. IT TAKES MORE TIME TO EXPLAIN THE TECHNICAL, ORGANIZATIONAL AND PHILOSOPHICAL ASPECTS OF A PROJECT THAN IT DID TO RESEARCH, DEVELOP AND IMPLEMENT THEM.

WE WILL LOOK AT THESE FOUR PROBLEM TYPES IN RELATION TO AN ACADEMIC PROJECT THAT WILL SHOW SOME OF THE TYPICAL PROBLEMS, HOW THEY DEVELOP AND HOW THEY ARE RELATED TO ONE ANOTHER. AFTER COVERING THE ACADEMIC MODEL WE WILL SHIFT TO A REAL LIFE SITUATION AND THEREBY FOCUS ON A WIDER SET OF PROBLEMS. IN THIS MANNER WE WILL DISCOVER THAT AN UNDERSTANDING OF BOTH THE ACADEMIC AND REAL LIFE PROBLEMS MUST BE PRESENT TO CARRY OUT A PROJECT OF THIS SCOPE IF IT IS TO HAVE ANY UTILITY.

BY STUDYING BOTH THE ACADEMIC AND REAL WORLD PROBLEMS WE WILL HAVE LOOKED AT A BASE OF PROBLEMS THAT SHOULD ALLOW US TO START PLANNING A COMPREHENSIVE APPROACH ON THE GRAPHICS SYSTEM TO ACCOMPLISH JUST ABOUT ANY OBJECTIVE. BUT AGAIN, WITHOUT A BROAD RANGE OF EXPERIENCE IN BOTH THE ACADEMIC AND REAL WORLD THE AUTHOR BELIEVES THAT IT WOULD BE IMPOSSIBLE TO DESIGN A TRULY MEANINGFUL SYSTEM FOR A COMPREHENSIVE APPROACH TO ARCHITECTURAL DESIGN. GETTING A WIDE BASE OF COMPUTER GRAPHIC EXPERIENCE IS PERHAPS THE FIRST PROBLEM TO OVERCOME FOR ANY WOULD BE DEVELOPER. WITHOUT SEEING A VARIETY OF USES, DIFFERENT APPROACHES TO SIMILAR PROBLEMS AND HOW PEOPLE INTERACT WITH THE COMPUTER GRAPHICS SYSTEM, IT IS DIFFICULT TO SEE THE OVERALL COMPLEXITY OF THE SITUATION. THE MORE SITUATIONS THAT CAN BE EXPERIENCED THE RICHER ONE’S KNOWLEDGE BASE WILL BE. EACH PARTICULAR APPLICATION USES DIFFERENT PROCESSES AND TECHNIQUES. THE CROSS FERTILIZATION OF EXPERIENCE WILL BE AN IMPORTANT INGREDIENT IN ANY RESULTING SYSTEM OR APPROACH. THE STUDENT HAS A GOOD ADVANTAGE OVER THE ESTABLISHED PRACTITIONER IN THAT THE STUDENT CAN STRUCTURE HIS DEVELOPMENT TO INCLUDE A WIDE APPLICATION BASE. THE PROFESSIONAL’S OPTIONS ARE SOMEWHAT LIMITED IN ACQUIRING A WIDE BASE PERSONALLY. HIS ALTERNATIVES SHOULD CENTER AROUND TRYING TO ASSEMBLE A TEAM OF PEOPLE WHO MIGHT THEMSELVES HAVE A WIDE APPLICATION BASE OR HE MIGHT TRY THE USE OF SPECIAL OUTSIDE COMPUTER GRAPHIC CONSULTANTS.
ORGANIZATION OF PAPER

THE REMAINDER OF THIS WORK WILL LOOK AT (1) WHY
SO MUCH TIME IS REQUIRED FOR CAD PROJECTS, (2) ACADEMIC PROBLEMS
AND (3) REAL WORLD PROBLEMS. THE FIRST PORTION, DEALING WITH
THE TIME PROBLEM, WILL BREAK THE CAD AREA INTO SEVERAL
GROUPS FOR CLARIFICATION OF THE SUBJECT. AFTER THIS SEVERAL
APPROACHES ARE PRESENTED TO HELP DEAL WITH THE TIME/COMPLEXITY
PROBLEM INHERENT TO CAD. THE LAST TWO SECTIONS, ACADEMIC AND
NON-ACADEMIC PROBLEMS ARE BOTH BROKEN DOWN INTO AREAS COMPOSED
OF FIRST, TECHNICAL PROBLEMS, SECOND, ORGANIZATIONAL PROBLEMS,
THIRD, PHILOSOPHICAL PROBLEMS, AND LASTLY EXPLANATORY
PROBLEMS. THE SECTION ON ACADEMIC PROBLEMS HAS A ADDITIONAL
SECTION BEFORE THE DISCUSSION OF THE FOUR SPECIFIC PROBLEM
AREAS CALLED 'GETTING STARTED FROM SQUARE ONE'. IT
CONCENTRATES ON THE PROBLEM OF RESEARCH AND GENERAL
WAYS TO GET A PROJECT OFF THE GROUND. THE GETTING STARTED
SECTION IS ALSO RELEVANT TO THE PROFESSIONAL PRACTITIONER
IN SOME RESPECTS. FOR THE PERSON WHO IS ESPECIALLY INTERESTED
IN DESIGN RELATED ISSUES, THE AUTHOR RECOMMENDS THE PART THAT
FOCUSES ON PHILOSOPHICAL PROBLEMS IN THE SECTION THAT CONSIDERS
NON-ACADEMIC PROBLEMS. A CONCLUSION WILL SUM UP THE AUTHOR'S
APPROACH OF HOW TO DEAL WITH CAD RELATED PROBLEMS
FOR THE AREA OF ARCHITECTURAL APPLICATIONS.
THE PROBLEM OF TIME: WHY SO MUCH IS REQUIRED

IF WE LOOK AT THE COMPONENTS OF A TYPICAL COMPUTER
GRAPHICS SYSTEM ONE CAN START TO UNDERSTAND WHY SO MUCH TIME
IS REQUIRED TO DEVELOP AN WORKING UNDERSTANDING. THERE ARE
THREE MAJOR AREAS THAT HAVE HAVE TO BE UNDERSTOOD AND/OR
MASTERED BEFORE ONE CAN START TO DEVELOP A SYSTEM FOR "doing
architecture". THE THREE AREAS CAN BE DEFINED AS (1) LEARNING
HOW TO OPERATE THE GRAPHIC DRAWING FEATURES; (2) UNDERSTANDING
THE ARCHITECTURE OF THE HOST/GRAPHIC OPERATING SYSTEM AND
(3) BEING ABLE TO PROGRAM. THE AREA OF PROGRAMMING CAN BE
SUBDIVIDED INTO THE THREE SUBCATEGORIES (a) PROGRAMMING THE
HOST, (b) PROGRAMMING WITHIN THE GRAPHIC SOFTWARE ENVIRONMENT
AND (c) PROGRAMMING THE ALPHA-NUMERIC DATABASE (INFORMATION
THAT CAN BE ASSOCIATED WITH THE GRAPHIC DATABASE FOR REPORT
GENERATION).

WE CAN DEFINE (1) LEARNING HOW TO OPERATE THE GRAPHIC
DRAWING SYSTEM AS BEING ABLE TO USE THE BASIC FEATURES TO
GRAPHICALLY COMMUNICATE IDEAS IN THE FORM OF DRAWINGS, THE
ABILITY TO DO ROUTINE MAINTENANCE OF THE DRAWING FILES, THE
DEVELOPMENT OF A METHOD OF STANDARD SCREEN DISPLAY
CHARACTERISTICS, AND THE ABILITY TO GET SOME TYPE OF HARDCOPY
OUTPUT.
AN UNDERSTANDING OF (2) THE ARCHITECTURE OF THE HOST/
GRAPHIC OPERATING SYSTEM WILL DIRECTLY IMPACT ANY SYSTEM
ORGANIZATIONAL SCHEME ONE WOULD DEVELOP. THE AREA OF SYSTEM
ORGANIZATION IS MORE CONCERNED WITH HOW ONE WOULD MOVE FROM
SAY THE DRAWING MODE, TO THE EXECUTION OF AN APPLICATION
PROGRAM, AND THEN TAKING THE RESULTS OF THESE TWO OPERATIONS
AND PUTTING THEM INTO SOME FORM THAT WILL BE OF SOME USE
IN OUR DESIGN PROCESS. IF ONE'S DESIRE IS TO USE THE SYSTEM AS
A DESIGN TOOL, THEN IN THE AUTHOR'S OPINION, THERE WILL
HAVE TO BE AN EASY AND RAPID TRANSITION FROM ONE TASK TO
ANOTHER WITH EQUALLY QUICK RESULTS TO MAKE DESIGN DECISIONS.
FOR EXAMPLE, LET'S SAY THAT IT TAKES 5 MINUTES TO GENERATE
THE GRAPHIC REPRESENTATION OF A CONCEPTUAL FLOOR PLAN,
5 MINUTES PREPARATION TO LOAD SOFTWARE FOR AN ENERGY PROGRAM,
5 MINUTES TO ENTER DATA AND RUN THE ENERGY PROGRAM AND 5 MINUTES
PREPARATION TO RELOAD THE SOFTWARE TO RESUME DRAWING.

5 MINUTES DRAWING  5 MINUTES ENERGY SOFTWARE PREP
5 MINUTES LOAD & RUN  5 MINUTES RELOADING GRAPHIC
ENERGY PROGRAM DATA SOFTWARE TO CONTINUE DRAWING

10 MIN. DESIGN RELATED  10 MIN. PREPARATION RELATED

GIVEN THIS SCENARIO, THE AUTHOR WOULD SAY THAT THERE MAY BE
PROBLEMS RELATED TO HOW THE SYSTEM WAS ORGANIZED, THAT HAS
CAUSED ONE TO SPEND TOO MUCH TIME ON NON DESIGN, PREPARATORY
TASKS. IN THIS CASE HALF THE TIME WAS USED FOR 'NONPRODUCTIVE
WORK'. IN SOME CASES THIS PROBLEM MIGHT BE RELATED TO TECHNICAL
OR HARDWARE LIMITATIONS, WHICH IS BEYOND THE SCOPE OF MOST
PEOPLES CONTROL FOR A NUMBER OF REASONS, ALTHOUGH TO A LARGE
DEGREE DUE TO ECONOMICAL CONSTRAINTS. THE ORGANIZATIONAL PROBLEMS
THAT CONCERN THE AUTHOR ARE THOSE THAT CAUSE UNDUE DELAYS THAT
ARE CAUSED BY A LACK OF KNOWLEDGE OF THEIR SYSTEM(S) CAPABILITIES
RESIDENT INTO ITSELF. UNDERSTANDING THE ORGANIZATION OF THE
SYSTEM SHOULD HELP LIMIT THE AMOUNT OF TIME WASTED MANIPULATING
THE COMPUTER NEEDLESSLY.

THE PROGRAMMING ASPECT OF THE COMPUTER GRAPHICS
SYSTEM IS RELATED TO THE THREE PRIMARY COMPONENTS OF THE
SYSTEM. THE HOST ENVIRONMENT (3a), THE GRAPHIC ENVIRONMENT (3b),
AND ANY ALPHA-NUMERIC DATABASE ENVIRONMENT (3c). PROGRAMMING
WILL GIVE ONE THE ABILITY TO CUSTOMIZE THE COMPUTER SYSTEM TO
EMULATE ONE'S PRESENT DESIGN TECHNIQUES THAT ARE DEEMED
IMPORTANT AND/OR DEVELOP NEW TECHNIQUES TO HELP US ACCOMPLISH OUR
OBJECTIVES. IF WE CAN NOT PROGRAM THE SYSTEM TO OPERATE IN A
MANNER THAT WE FEEL IS IN TUNE WITH OUR DESIGN PHILOSOPHY, THEN
IT IS THIS AUTHOR'S SUGGESTION THAT THE COMPUTER SYSTEM BEING
USED, IS NOT APPLICABLE FOR OUR PARTICULAR ARCHITECTURAL DESIGN
APPLICATION. BUT WITHOUT AN THROUGH UNDERSTANDING OF A SYSTEM,
AS NOTED IN THE PRECEEDING PARAGRAPH, OR WITHOUT HELP FROM AN
EXPERT, ONE COULD GIVE UP PREMATURELY BECAUSE OF AN APPARENT
IMPASSOR COMPROMISE. CONVERSELY, TREMENDOUS AMOUNTS OF TIME
MAY BE SPENT WITH A SYSTEM OR SEVERAL SYSTEMS ONLY TO FIND OUT
THAT THEY DO NOT HAVE THE CAPABILITIES THAT HAVE BEEN DEEMED
IMPORTANT TO ONE'S PROJECT.
LEARNING TO PROGRAMMING THE HOST COMPUTER (3a) HAS SEVERAL USES SUCH AS PROVIDING A STANDARD METHOD USER INTERFACE, ABILITY TO RUN EXISTING PROGRAMS AND THE CREATION OF A WORKING/LEARNING RELATIONSHIP FOR THE USER TOWARDS THE OVERALL SYSTEM.

HAVING A STANDARD USER INTERFACE AT THE LEVEL OF THE HOST COMPUTER IS IMPORTANT SINCE IT WILL ALLOW THE TRANSFER OF PROGRAMMING SKILLS DEVELOPED PREVIOUSLY IN THE FORM OF PROGRAMMING LANGUAGES SUCH AS BASIC, FORTRAN, PASCAL, ETC., TO THE BEGINNING OF THE PROJECT, SO THAT THE USER HAS SOME PROGRAMMING FOUNDATIONS WITH WHICH TO START THEIR PROJECT. IF THE USER IS VERY CONSERVATIVE, THEY MAY WISH TO ORGANIZE THEIR PROJECT SO THAT THEY CAN CONCENTRATE DEVELOPMENT TO AN AREA THAT MAY ENSURE A LONG LIFE TO THEIR HARD WORK AND EFFORTS. FOR INSTANCE, IF ONE DOES HIS PROGRAMMING ON AN IBM MAINFRAME USING THE FORTRAN LANGUAGE HE PROBABLY WILL HAVE A LONGER WORKING LIFESPAN FOR HIS PROGRAMS THAN IF HE HAD USED XYZ COMPANY’S ‘MR. DRAFTER’ CAD PACKAGE AND THE ASSOCIATED ‘MR. EASY DRAFTER PROGRAMMING LANGUAGE’, WHICH ALSO WAS RUNNING ON THE SAME IBM MAINFRAME. BUT, THE CHANCES OF XYZ COMPANY GOING OUT OF BUSINESS SEEM TO BE GREATER THAN IBM’S, SO WHILE ONE CAN DO A PROGRAM USING ‘MR. EASY DRAFTER PROGRAMMING LANGUAGE’ IN 15 MINUTES COMPARED TO 4 HOURS TIME WITH FORTRAN, THERE MAY BE LONG TERM TRADE OFFS THAT ONE MUST CONSIDER WHEN SETTING UP A SYSTEM.

THE VALUE OF USING STANDARD PACKAGE PROGRAMS HAS THE ADVANTAGE OF SAVING TREMENDOUS AMOUNTS OF DEVELOPMENT TIME FOR THE USER. FOR STUDENTS WITH BIG TIME CONSTRAINTS THESE APPLICATION PROGRAMS MAY BE A GOOD SOLUTION TO THE TIME PROBLEM. THE DISADVANTAGES ARE THAT GENERALLY THESE PROGRAMS ARE COSTLY AND/OR MAY NOT FIT ONES SPECIFIC REQUIREMENTS.

ANOTHER DISADVANTAGE TO USING CANNED PROGRAMS IS THAT IT REMOVES ONE FROM INTERACTING WITH THE HOST COMPUTER, WHETHER IT BE AN IBM MAINFRAME OR PERSONAL COMPUTER. IT COULD CREATE A SITUATION WHERE ONE MAY NOT BE LEARNING ABOUT AREAS THAT MAY BE IMPORTANT TO THE OVERALL SUCCESS OF ONES PROJECT. WHILE ONE THE GREAT ADVANCES IN COMPUTER GRAPHIC SYSTEMS AS BEEN THE INTRODUCTION OF EXTREMELY ‘USER FRIENDLY’ INTERFACES, THE AUTHOR BELIEVES THAT TO MOVE BEYOND THE ‘ELECTRONIC ETCH-A-SKETCH’, ONE WILL HAVE TO DIG DEEPER INTO THE WORKINGS OF THE COMPUTER, BOTH AT THE LEVEL OF THE HOST AND THE SPECIFIC GRAPHIC OPERATING SYSTEM, AS WE WILL SEE IN FOLLOWING PARAGRAPHS.
THE TOPIC OF PROGRAMMING WITHIN THE GRAPHIC SOFTWARE ENVIRONMENT (3b) IS CONCERNED WITH TWO PRIMARY AREAS, PROGRAMMING TO CONSTRUCT GRAPHIC IMAGES AND PROGRAMMING TO DO ANALYSIS.

THE GRAPHIC ASPECTS OF PROGRAMMING CAN RANGE FROM THE DEVELOPMENT OF SYMBOL LIBRARIES FOR COMMONLY USED GRAPHICS SUCH AS DOORS AND WINDOWS, TO COMPLEX PROGRAMS THAT COULD DELINEATE A COMPLETELY FUNCTIONAL 3D BUILDING. THE TIME REQUIRED TO GENERATE THE THOUSANDS OF PARTS REQUIRED FOR A STRUCTURE OR SYMBOLS ASSOCIATED WITH DESIGN STUDIES WILL BE A LARGE INVESTMENT. THE USER INTERFACE FOR THIS KIND OF PROGRAMMING USUALLY FALLS INTO ONE OF TWO CATEGORIES. SOME SYSTEMS ONLY ALLOW THE USER ONE TECHNIQUE, THE MORE SOPHISTICATED SYSTEMS OFFER BOTH METHODS. THE FIRST DEALS WITH TRADITIONAL LINE PROGRAMMING. THIS TRADITIONAL METHOD MAY OPERATE IN A STANDARD USERS ENVIRONMENT RELATED TO THE HOST OPERATING SYSTEM (PASCAL, FORTRAN, BASIC) OR IN A SPECIAL GRAPHICS PROGRAMMING LANGUAGE ENVIRONMENT THAT WAS DEVELOPED WHOSE SYNTAX CLOSELY RESEMBLES THE GRAPHIC DRAWING VOCABULARY. THIS PROGRAMMING/GRAPHIC LANGUAGE IS FREQUENTLY TERRED THE 'USERS COMMAND LANGUAGE'. USER COMMANDS ALLOW ONE WHO HAS NOT DEVELOPED A SPECIAL PROGRAMMING EXPERTISE TO ACCESS PROGRAMMING CAPABILITIES FOR DOING ROUTINE JOBS OR TASKS. THE SECOND METHOD IS ASSOCIATED MORE CLOSELY TO THE ACTUAL PROCESS OF DRAWING. IN ESSENCE, ONE CREATES A IMAGE BY THE NORMAL USER INTERFACE AND USES AN TRANSPARENT PROGRAM TO STORE THIS INFORMATION IN SPECIAL FILES CALLED LIBRARIES. THE OBJECTS WITHIN THESE LIBRARIES ARE FREQUENTLY CALLED 'WORKING PARTS', 'SYMBOLS' OR 'CELLS' DEPENDING ON THE DEVELOPERS NOMENCLATURE.

ANALYTICAL PROGRAMS, SUCH AS ENERGY OR LIGHTING STUDIES, WILL ALSO REQUIRE A CONSIDERABLE AMOUNT OF TIME TO FULLY DEVELOP. IF YOU ARE STARTING OUT WITH LITTLE OR NO PROGRAMMING AND/OR NO COMPUTER GRAPHICS EXPERIENCE, THE TIME REQUIRED TO UNDERSTAND AND USE THE PROGRAMMING LANGUAGE IN CONTEXT TO GRAPHICS COULD EASILY BE A COMPLETE PROJECT IN ITSELF. THE DEVELOPMENT OF SPECIFIC APPLICATION PROGRAMS, AFTER ONE DEVELOPS PROGRAMMING SKILLS, COULD LITERALLY CONSUME THE REST OF ONES ACADEMIC LIFE OR PROFESSIONAL CAREER. THE END PRODUCT THAT ONE MIGHT EXPECT TO SEE AFTER CONCENTRATING ON APPLICATION PROGRAMMING WOULD BE A SET PROGRAMS THAT WERE USED IN THE DESIGN PROCESS TO HELP VALID DESIGNS THROUGH ANALYTICAL METHODS. THE PROGRAMMING INTERFACE HERE IS GENERALLY LIMITED TO LINE PROGRAMMING THROUGH EITHER THE HOST LANGUAGE OR THE USERS COMMAND LANGUAGE. THE BEST SYSTEMS AGAIN WILL ALLOW ONE TO USE BOTH INTERFACES SO THAT ONE MAY MANIPULATE THE SYSTEM AS PER THE USERS REQUIREMENTS. FOR INSTANCE, ONE MIGHT WRITE A PROGRAM WITH THE USERS COMMAND LANGUAGE TO ACCESS A PROGRAM OR DATA FROM A SOURCE OUTSIDE OF THE GRAPHICS ENVIRONMENT. IT COULD BE RETRIEVED FROM A HOST COMPUTER, ANOTHER STAND-ALONE PC ON A NETWORK, OR FROM A SPECIALIZED CONSULTANT HALF-WAY ACROSS THE COUNTRY. UNDERSTANDING THESE TYPES OF TECHNICAL POSSIBILITIES OR IMPOSSIBILITIES WILL DIRECTLY IMPACT ONES OVERALL ORGANIZATION, CHOICE OF SYSTEMS AND TIME REQUIRED TO DEVELOP A SYSTEM TO ACCOMPLISH YOUR GOALS.
FOR SOME PROJECTS, THE NEED TO LEARN ABOUT
PROGRAMMING AN ALPHA-NUMERIC DATABASE (3C) WILL BE NONEXISTANT
FOR TWO REASONS. THE FIRST REASON IS THAT SOME GRAPHIC SYSTEMS DO
NOT HAVE THE CAPABILITIES DESIGNED INTO THE SYSTEM. THE SECOND
REASON WOULD BE FOR PROJECTS THAT HAVE NO NEED FOR SUCH
SOPHISTICATED FEATURES, SUCH AS THE PRODUCTION OF WORKING DRAWINGS.
BUT FOR OTHER PROJECTS, THE DEVELOPMENT OF ALPHA-NUMERIC DATABASES
THAT ARE ASSOCIATED WITH GRAPHIC ELEMENTS COULD BE CENTRAL TO THE
WHOLE PROJECT. FOR INSTANCE, ONE MAY WISH TO GENERATE BILL-
OF-MATERIAL REPORTS OR SPECIFICATIONS DIRECTLY FROM WORK GENERATED
WHILE GRAPHICALLY BUILDING A DESIGN. ONCE AGAIN THE COMPLEXITY
OF YOUR DATABASE PROGRAMMING WILL BE A FUNCTION OF YOUR GOALS.
DATABASE APPLICATIONS CAN ALSO BE CONSIDERED TO BE WORTHY
OF BEING A COMPLETE PROJECT JUST WITHIN ITSELF. PROBLEM
AREAS INCLUDE LEARNING THE SPECIAL LANGUAGES, DETERMINING
WHAT IS TO BE INCLUDED WITHIN THE DATABASE, DETERMINING
RELATIONSHIPS, LOADING LARGE QUANTITIES OF DATA INTO THE DATABASE,
MAINTENANCE TO KEEP DATA CURRENT AND FORMATTING OUTPUT TO MEET
THEIR SPECIAL USER REQUIREMENTS.

OVERALL PROBLEM AREAS FOR PROGRAMMING IN GENERAL
INCLUDE THE LEARNING OF SPECIFIC SYNTAX OF EACH PROGRAMMING
LANGUAGE AND ASSOCIATED OPERATION OF COMMANDS, MANAGEMENT OF
MEMORY AND STORAGE SPACES FOR SYMBOL LIBRARIES, APPLICATION
PROGRAMS AND DATABASE INFORMATION COMBINED WITH YOUR GRAPHIC
STORAGE REQUIREMENTS. DECIDING HOW TO CUT OUT INFORMATION WHEN
YOU HAVE REACHED YOUR LIMITS AND HOW IT AFFECTS THE OVERALL
PROJECT WILL ALSO BE A COMMON PROBLEM.
IF WE TRY TO DEVELOP SOME TYPE OF TIME FRAME TO
DEVELOP A GOOD UNDERSTANDING OF AN COMPUTER GRAPHIC SYSTEM
WE MIGHT OFFER THIS VERY CONSERVATIVE ESTIMATION:

3 MONTHS TO LEARN THE BASIC GRAPHIC OPERATIONS
3 MONTHS TO LEARN GRAPHIC PROGRAMMING
3 MONTHS FOR APPLICATION PROGRAMMING
3 MONTHS FOR LEARNING DATABASE OPERATIONS

FROM THIS VERY CONSERVATIVE ESTIMATE THE AUTHOR PREDICTS
THAT IT WOULD TAKE AT LEAST ONE YEAR TO DEVELOP AN
UNDERSTANDING OF A GRAPHICS SYSTEM SO THAT ONE WOULD BE
IN A POSITION TO MAKE DECISIONS ABOUT SETTING UP A
SYSTEM FOR DOING ARCHITECTURE ON A SELECTED COMPUTER
GRAPHICS SYSTEM. THIS FIGURE ALSO ASSUMES THAT ONE
HAS A GOOD HANDLE ON THE HOST OPERATING SYSTEM AND DOES
NOT ALLOW FOR ANY DESIGN TIME. IT SHOULD BE OBVIOUS FOR
THE UNDERGRADUATE STUDENT WHO MIGHT BE TYPICALLY ALLOTTED
9 MONTHS TO COMPLETE A PROJECT THAT WE HAVE AN NEAR
IMPOSSIBLE SITUATION.
APPROACHES TO THE TIME PROBLEM


IF WE LOOK AT THE DIRECT METHOD, IT CAN BE CHARACTERIZED AS THE ACCEPTANCE OF THE IDEA THAT THE PROJECT THAT WE ARE INTERESTED IN IS NOT A NORMAL PROJECT AND THAT IT WILL TAKE AT THE VERY MINIMUM, A YEAR JUST TO GAIN AN OVERVIEW OF A PARTICULAR COMPUTER GRAPHICS SYSTEM. THIS FIGURE DOES NOT TAKE INTO ACCOUNT ANY FACTORS SUCH AS TIME THAT MAY BE REQUIRED TO SELECT A SPECIFIC SYSTEM OR SYSTEMS, AVAILABILITY OF THE SYSTEM TO THE STUDENT, ACTUAL SYSTEM DEVELOPMENT IN ANY OF THE PRIMARY AREAS OF CONCERN OR PROBLEMS AS DEFINED AS THE TECHNICAL, ORGANIZATIONAL, PHILOSOPHICAL OR EXPLANATORY. AT THIS POINT THE STUDENT WILL HAVE TO WEIGHT THE VALUE OF AND EXPERIENCE DERIVED FROM ANY SYSTEM THAT THEY MIGHT DEVELOP VS. THE GREAT AMOUNT OF TIME REQUIRED FOR A PROJECT OF THIS NATURE AND THE ASSOCIATED DELAYED ENTRANCE INTO THE PROFESSIONAL WORK WORLD.

THE INDIRECT METHOD OR THE ADOPTION OF SOMEONE ELSE'S SYSTEM HAS THE ADVANTAGE OF NOT HAVING TO DEVELOP AN OVERALL SYSTEM AND HENCE LESS TIME IS DEMANDED FROM THE STUDENT. THE IDEA HERE WOULD BE THAT THE STUDENT COULD DEVELOP SELECTED PARTS OF THE SYSTEM AND PLUG THEM INTO A LARGER, ALREADY ESTABLISHED SYSTEM FRAMEWORK. OR CONVERSELY, ONE COULD SELECT A SERIES OF EXISTING SMALLER PARTS ALREADY DEVELOPED SUCH AS SYMBOL LIBRARIES, APPLICATION PROGRAMS, DATABASES, ETC., AND DEVELOP A METHOD OF TYING THEM TOGETHER TO FIT SPECIFIC NEEDS. THERE ARE SEVERAL PROBLEMS ASSOCIATED WITH THE INDIRECT APPROACH. THE FIRST IS WHERE DOES ONE FIND A SYSTEM FOR DOING ARCHITECTURE? SECONDLY, SUPPOSE YOU DO FIND A SYSTEM FOR DOING ARCHITECTURE, THE QUESTION THEN BECOMES HOW DOES ONE GAIN ACCESS TO THE HARDWARE/SOFTWARE, OF HAVING THE MONEY TO BUY THE SOFTWARE, OF HAVING THE CORRECT HARDWARE ON CAMPUS TO RUN THE SOFTWARE AND finally AND MOST IMPORTANTLY, DOES THIS BORROWED SYSTEM JIVE WITH YOUR PARTICULAR PHILOSOPHY?
THE THIRD APPROACH, OR THE BEST ALTERNATIVE METHOD, WOULD BE TO DEVELOP A SYSTEM OVER A LONG PERIOD OF TIME, I.E. AS ONE FIRST ENTERS AN ACADEMIC PROGRAM. THE IDEA HERE IS THAT AS STUDENT PROGRESSES THROUGH THEIR PROGRAM THEY COULD DEVELOP A SYSTEM THROUGH AN INCREMENTAL APPROACH ASSOCIATED WITH SPECIFIC ACADEMIC CLASSWORK. THIS APPROACH WOULD ALLOW MORE TIME THAN A SINGLE FINAL PROJECT, AS WELL AS THE DEVELOPMENT OF THE WIDE RANGE APPLICATIONS NORMALLY ASSOCIATED WITH THE PRACTICE OF ARCHITECTURE. A TERMINAL PROJECT MIGHT BE THE TESTING AND REFINEMENT OF ALL THE DIFFERENT PARTS WITHIN AN ORGANIZATIONAL FRAMEWORK FOR PREPARATION OF USE IN REAL WORLD.

THE FOURTH AND LAST METHOD IS CALLED BY THE AUTHOR THE SECOND BEST ALTERNATIVE. THIS METHOD TACKLES THE TIME CONSTRAINT PROBLEM BY DISTRIBUTING THE WORK AMONG A GROUP OF PEOPLE. SPECIFIC APPLICATIONS COULD BE DEVELOPED BY DIFFERENT PEOPLE UNDER THEIR OWN OR A BORROWED ORGANIZATIONAL FRAMEWORK. THE ADVANTAGE HERE IS THAT A LARGER MORE COMPREHENSIVE PACKAGE COULD BE DEVELOPED BY THE GROUP THAN BY A SINGLE PERSON. IT ALSO HAS THE ADVANTAGE THAT THE PEOPLE WILL BE ABLE TO SHARE A LARGE BODY OF COMMON LEARNING PROBLEMS AND THEREBY LEVERAGE THEIR SKILLS. THE DISADVANTAGE FOR THOSE WHO ARE TRYING TO DEVELOP A SPECIFIC DESIGN APPROACH IS THE POSSIBLE DILUTING EFFECT IMPOSED BY WORKING IN GROUP.
TO BRIEFLY RECAP THE ADVANTAGES AND DISADVANTAGES OF THE FOUR METHODS AS STATED ABOVE, WE CAN SAY THAT AN ADVANTAGE TO THE DIRECT METHOD IS THAT AS A STUDENT ONE CAN SPENT MORE TIME ON A PROJECT OF THIS SCOPE THAN SAY ONE WHO IS TRYING TO RUN AN ARCHITECTURAL PRACTICE CONCURRENTLY WITH SYSTEM DEVELOPMENT. ANOTHER ADVANTAGE IS THAT AS A STUDENT YOU DO NOT HAVE AN FINANCIAL INVESTMENT IN THE SYSTEM YOU DEVELOP, OTHER THAN YOUR TIME AND TUTION. WITH THE INDIRECT METHOD THE ADVANTAGE IS SHORTER DEVELOPMENT TIME. THE DISADVANTAGES OF THIS METHOD ARE THAT THERE ARE FEW IF ANY SYSTEMS AVAILABLE TO THE STUDENT COVERING THE PRACTICE OF ARCHITECTURE, ESPECIALLY IN THE AREA CONCERNED WITH THE DESIGN PROCESS. BUT PERHAPS EVEN MORE IMPORTANTLY, EVEN IF THERE WAS A SYSTEM, THE AUTHOR FEELS THAT THE BENIFIT OF DEVELOPING A SYSTEM ON YOUR OWN WILL BE LOST. THE NEGATIVE (OR IT COULD BE POSITIVE DEPENDING ON YOUR PHILOSOPHY) ASPECTS OF THE BEST ALTERNATIVE METHOD, IS THAT WE ARE PROPOSING BASICALLY A NEW, EXPERIMENTAL APPROACH TO ARCHITECTURAL EDUCATION. THE POSITIVES ARE A LONGTERM, INCREMENTAL APPROACH THAT WILL GIVE ONE TIME FOR REFLECTION AND REFINEMENT. THE ADVANTAGES OF THE SECOND BEST ALTERNATIVE ARE LESS CONSUMPTION OF TIME AND SHARED PROBLEM SOLVING. THE DISADVANTAGES ARE THE SAME AS FOR THE INDIRECT MODEL, THE LOSS OF EXPERIENCE OF DEVELOPING YOUR OWN SYSTEM. THE VALUE OF ANY OF THESE PROJECTS WHILE WORKING ON THE COMPUTER THAT DEALS WITH THE ISSUE OF DESIGN IS THAT ONE IS FORCED TO DEFINE YOUR DESIGN APPROACH, METHODOLOGY, AND/OR PHILOSOPHY. IN THE AUTHOR'S EYES, THIS IS SOMETHING THAT IS NEVER REALLY DONE WITHIN DESIGN CLASSES OUTSIDE OF THE HANDWAVING STAGE, AS PER STUDENTS AND PROFESSORS ALIKE. BY USING THE COMPUTER TO EXPRESS A DESIGN PROCESS WE HAVE IN EFFECT REQUIRED THAT PERSON TO DEVELOP A VERY INTIMATE KNOWLEDGE OF THEIR DESIGN PROCESS OR PHILOSOPHY. THIS EXPERIENCE WILL BE OF GREAT VALUE EVEN IF THE PERSON NEVER TOUCHES A COMPUTER AGAIN IN THEIR LIFETIME.
III. PROBLEMS RELATED TO ACADEMIC PROJECTS: GETTING STARTED FROM SQUARE ONE

At this point lets backup to the that time in our academic past when we were faced with trying to define the nature of our project for ones terminal or thesis project. The atmosphere is full excitement by your classmates who are anxiously pursuing their dreams of architectural delight that have been pentup over the course of their academic careers. Your cohearts are moving systematically on their paths as per their years of training. At this point one needs to sit back and make some plans of your own. I will venture to say that they will not include facility programming site analysis or presentation boards. Your plans will center around first deciding on how much time you want to invest. After deciding on your time frame you will be able to determine the scope of your project that will in turn impact the scope of your research.

One important factor as to the success of your project can linked to the definition your goals and matching them with appropriate advisors. If your project is general in nature then anybody could be a basis of help. As one becomes more involved with design applications special help will be advisable. This help may be from people who have special training or expertise on specific equipment. One problem to be aware here is to be clearly aware of your goals. One may use equipment that requires a high degree of expertise and a person who has years of experience could be very valuable to your project in how to overcome technical problems. But if the the real trust of your work centers around the development of doing design on cad equipment then the value of your selected expert may be greatly diminished.

If one does not commit to a long term all encompassing project then the author suggests that one concentrate on topics chosen from one of the authors four problem categories, i.e. the technical, the organizational the philosophical and the explanatory problem types. Another approach could deal with a series of topics from each of the four major problem categories.
RESEARCH

IN DOING YOUR PRELIMINARY RESEARCH YOU WILL FIND A WIDE RANGE OF BOOKS THAT START TO APPEAR IN THE EARLY 1960’S AND CONTINUE TO WITHIN SIX MONTHS OR A YEAR OF YOUR PRESENT TIME. THE PROBLEM WITH HARDBACK BOOKS ARE THAT THEY ARE NOT PRESENTING CURRENT INFORMATION IN REGARDS TO STATE OF THE ART EQUIPMENT. WHAT THEY DO OFFER IS A WIDE RANGE OF TASKS THAT HAVE BEEN TRIED IN THE PAST AND ASSOCIATED SYSTEMS.


COMPUTER APPLICATIONS FOR DRAWING OR COMPUTER GRAPHICS HAS BEEN AN INTERVAL PART OF BOTH THE DESIGN AND ENGINEERING RELATED GROUPS FROM THE EARLIEST DAYS BUT IT SEEMS TO HAVE BEEN HEAVILY RELATED TO HARDWARE DEVELOPED BY THE COMPUTER INDUSTRY PEOPLE. WHILE DOING ONE’S RESEARCH YOU WILL FIND THAT THE HISTORY OF THE HARDWARE (AND HENCE COMPUTER GRAPHICS), HAS BEEN WELL DOCUMENTED IN BOOKS RELATED TO COMPUTER HARDWARE SYSTEMS FOR THE LAST 25 YEARS. PERHAPS THE MOST INTERESTING ASPECT THAT CAN BE RELATED TO TRADITION BOOKS AND MANUSCRIPTS DEALS WITH THE AREA OF DESIGN METHODOLOGY. THIS AREA COULD BE VERY IMPORTANT TO PROJECTS THAT LOOK AT THE WHOLE DESIGN PROCESS. FEW PUBLICATIONS EXIST FOR THAT AREA OF ACADEMIC WORK. IS IT ANY COINCIDENCE THAT COMPUTER GRAPHICS AND THE SCIENCE OF DESIGN METHODOLOGY ARE OF THE SAME AGE? IF ONES STARTS TO INSPECT THE LITERATURE OF THE DESIGN METHODOLOGISTS ONE WILL FIND AN DIRECT LINK BETWEEN SYSTEMATIC DESIGN APPROACHES AND COMPUTERS.
PERIODICALS ASSOCIATED WITH ARCHITECTURE, ENGINEERING AND CONSTRUCTION (AEC) ALONG WITH THOSE SPECIALIZED TRADE MAGAZINES OF THE COMPUTER GRAPHICS HARDWARE/SOFTWARE COMMUNITIES MAY BE OF BETTER VALUE IN REGARDS TO DISCOVERING THE TRUE PULSE OF CURRENT RESEARCH AND ASSOCIATED PRODUCTS FOR THE GRAPHICS CONNOISSEUR. A GOOD PLACE TO FIND INDUSTRY RELATED Magazines IS AT COMPUTER GRAPHIC TRADE SHOWS.

THE COMPUTER GRAPHIC TRADE SHOWS ARE BY FAR THE BEST PLACE TO GAIN A WIDE VARIETY OF INFORMATION ABOUT THE SUBJECT OF COMPUTER GRAPHICS. PRODUCT DISPLAYS ALLOW ONE TO DEVELOP A FEEL FOR THE RANGE OF PRODUCTS AVAILABLE THAT SERVE A WIDE VARIETY OF APPLICATIONS. LECTURERS WILL PRESENT TOPICS OF GENERAL CONCERN, AS WELL AS SPECIFIC TOPICS COVERING CURRENT ISSUES. FREE LITERATURE WILL BE PLENTIFUL TO HELP ONE DEVELOP A VOCABULARY RELATED TO COMPUTER GRAPHICS AND WILL BE VALUABLE FOR FUTURE REFERENCE. ONE OF THE MOST IMPORTANT ASSETS ONE WILL FIND AT THE SHOWS WILL BE THE PEOPLE. BY TALKING TO MANUFACTERS YOU CAN EXPLAIN THE TYPE OF APPLICATIONS YOU ARE INTERESTED. THEY WILL BE ABLE TO STEER YOU IN THE DIRECTION OF SPECIFIC HARDWARE, SOFTWARE, WERE THE EQUIPMENT IS LOCATED AND WHO TO CONTACT. ONE OF THE THINGS YOU MUST DO IS TO BE ABLE TO DEFINE FOR THESE PEOPLE WHAT YOU WANT TO ACCOMPLISH. IF YOU DO, OR IF YOU DON'T WANT TO DO EVERYTHING UNDER THE SUN, THEN MAKE THIS CLEAR TO THE PERSON TO WHOM YOU ARE TALKING. THE PROCESS OF DEFINING YOUR PROBLEMS OR AREA(S) OF APPLICATION IS ONE OF BIGGEST PROBLEMS IN REGARD TO MATCHING EQUIP TO END USERS AND IS ESPECIALLY TROUBLEsome WHEN IN THE FIELD OF ARCHITECTURE. QUITE FREQUENTLY HARDWARE SYSTEMS ARE BROUGHT FIRST WITH SOFTWARE BEING A SECONDARY CONCERN. NEEDLESS TO SAY PEOPLE ARE UPSET WHEN THEY CAN NOT NO THE THINGS THEY WANT AFTER MAKING A LARGE COMMITMENT FOR A SYSTEM.
AFTER YOU HAVE DECIDED ON A RANGE OF
EQUIPMENT THEN FIND OUT WHERE THE SITES ARE THAT
ARE ACTIVELY USING THE EQUIPMENT. IF YOUR CAMPUS
OR LOCALITY DOES NOT HAVE ANY SUCH EQUIPMENT THEN
YOU WILL HAVE TO REvaluate YOUR SITUATION. YOU MAY
WANT TO ASK YOUR SELF SEVERAL QUESTIONS SUCH AS, 'HOW
IMPORTANT IS IT TO WORK ON SPECIFIC EQUIPMENT?'
IS IT POSSIBLE TO WORK ON PART OF A PROJECT AND
LATER TRANSFER IT TO THE DESIRED EQUIPMENT? WOULD
IT BE WORTHWHILE TO CHANGE LOCATIONS TO AN AREA
THAT HAS SUCH EQUIPMENT? IS IT POSSIBLE TO PURCHASE
THE EQUIPMENT YOURSELF? CAN I MODIFY MY PLANS TO
ALLOW FOR THE EXTRA COMPLEXITY OF THE SITUATION?

WHILE SOME OF THESE QUESTIONS SEEM A BIT EXTREME
LET ME ASSURE YOU THAT THEY ARE NOT. QUITE THE CONTRARY,
THEY MAY BE CONSERVATIVE, I.E. FOR ARCHITECTURAL APPLICATIONS
MOST OF THE EQUIPMENT IS VERY EXPENSIVE AND LOCATED MOSTLY
WITHIN THE ARCHITECTURAL INDUSTRY. ONE MAY NEED TO ALIGN
THEMSELVES WITH A COMPANY TO ACQUIRE ACCESS TO SUCH A SYSTEM.
AGAIN THIS MAY SEEM EXTREME BUT WILL BE VALUABLE IN THE LONGRUN.
INDEED THIS EXPERIENCE MAY BE IMPORTANT TO HELP ONE WITH
PROBLEMS ASSOCIATED WITH THREE OF THE AUTHOR'S MAJOR
PROBLEMS AREAS, THE TECHNICAL, THE ORGANIZATIONAL AND
THE PHILOSOPHICAL. IT WILL ALSO DEMONSTRATE WHY EXPLANATORY
PROBLEMS HAVE ALSO BECOME A MAJOR CONCERN.
AS AN ARCHITECTURAL STUDENT ONE OF THE MAJOR
ATTRACTIONS TO COMPUTERS CENTER AROUND THE ABILITY
TO PRODUCE GRAPHICS AND THE SELECTION OF A SYSTEM OR
A GROUP OF SYSTEMS WILL NO DOUBT BE INFLUENCED BY
THIS ASPECT. WHILE ALL COMPUTER GRAPHIC SYSTEMS
ARE SIMILAR IN THIS RESPECT, THE COMMONLITY ENDS
HERE. THE DIFFERENCES DEAL WITH HOW THE GRAPHIC INFORMATION
IS HANDLED WITHIN THE COMPUTERS 'BRAIN'. THIS INFORMATION
CAN THOUGHT OF AS CONSISTING AS A TWO DIMENSIONAL, TWO
AND HALF DIMENSIONAL OR TRUE THREE DIMENSIONAL
WIREFRAME, SURFACE AND/OR SOLID MODEL OF THE
OBJECT. THE QUICKNESS OF MANIPULATION (A PRIMARY
CONCERN FOR ANY USER) DEPENDS ON THE TECHNIQUE,
WHICH IN THIS IS REPRESENTED. IN THIS CASE THE
WIREFRAME IS THE SIMPLEST, THE SURFACE MODEL IS
MORE COMPLEX AND THE SOLID MODEL IS MOST COMPLEX.
THE USERS END GOAL OR APPLICATION SHOULD INFLUENCE THE
SELECTION PROCESS. EVEN WITH TWO SYSTEMS THAT BOTH USE
FOR INSTANCE A SURFACE REPRESENTATION TECHNIQUE, THE
METHOD OF PRESENTATION THAT THE USER GETS COULD BE VASTLY
DIFFERENT. I.E. ONE MAY SHOW ONLY ISOMETRIC TYPE PICTURES,
THE OTHER MAY SHOW ONE, TWO OR THREE POINT PERSPECTIVES.
THE LAST CONCERN AND PERHAPS THE MOST IMPORTANT QUESTION ONE CAN ASK THEMSELVES IN DOING RESEARCH FOR A PROJECT OF THIS NATURE IS, 'WHAT DO WE AS A STUDENTS WANT TO GAIN FROM THIS PROJECT? ARE WE INTERESTED IN A GENERAL KNOWLEDGE OF THE INDUSTRY SO THAT WE CAN COMMUNICATE WITHIN AN OFFICE ENVIRONMENT IN AN INTELLIGENT MANNER? OR DO WE WANT TO LEARN HOW TO OPERATE THE EQUIPMENT, LIKE DRAFTING TOOLS ARE USED IN A TRADITIONAL DRAFTING ENVIRONMENT, FOR THE PRODUCTION OF CONSTRUCTION DOCUMENTS? OR DO WE WANT TO BE ABLE TO DO A RANGE OF DESIGN TASKS? AND AFTER MAKING THIS INVESTMENT HOW DO WE TRANSFER THESE SKILLS TO THE REAL WORLD? DO WE TRANSFER THE END PRODUCT BY MAGNETIC TAPE? IS IT MARKETABLE TO OTHER INTERESTED DESIGNERS OR IS IT A SET OF SKILLS THAT THE COMPUTER ALLOWED US TO PERFECT THAT CAN BE TRANSFER CONCEPTUALLY TO ANOTHER SYSTEM. OR IS IT A SET OF SKILLS THAT CAN BE USED WITHOUT ANY TYPE COMPUTER? DOES THIS PROJECT REPRESENT ONLY PART OF A LARGER PROJECT THAT WILL BE DEVELOPED AS A GRADUATE STUDENT OR AS PROFESSIONAL OVER THE NEXT FIVE YEARS? IF SO, WILL THE WORK BE DEPENDENT ON A SPECIFIC TYPE OF EQUIPMENT. WHAT HAPPENS IF THAT COMPANY GOES OUT OF BUSINESS OR YOU MAKE A JOB CHANGE. IN SHORT WHAT TYPE OF INVESTMENT DO YOU WANT TO MAKE AND WHAT KIND OF RISK ARE YOU WILLING TO TAKE?
THE USE OF OUTSIDE EXPERTS FOR ADVISE SHOULD BE A MAJOR PART OF THE RESEARCH FOR YOUR PROJECT. THESE PEOPLE CAN BE LOCATED VIA THE TRADE SHOWS AND/OR BY THEIR WRITTEN WORKS. THE PROBLEM OF USING AND/OR LOCATING THESE EXPERTS MAY BE DIFFICULT SINCE THEY ARE GENERALLY NOT LOCAL PEOPLE, THEY MAY HAVE LITTLE TIME TO SPEND OUTSIDE OF WORK OR THEY MAY NOT BE IDENTIFIABLE OR BE UNWILLING/UNABLE TO SHARE THEIR WORK.

IF ONE CAN ACCESS THESE EXPERTS, A TREMENDOUS AMOUNT OF TIME COULD BE SAVED, ESPECIALLY IF YOU HAVE TIGHT TIME CONSTRAINTS. AS MENTIONED IN THE INTRODUCTION ONE COULD EXPLORE A TOPIC THAT THE EXPERT IS ACTIVELY WORKING ON OR INTERESTED. AT THE VERY MINIMUM THIS PERSON WILL BE VALUABLE IN WORKING WITH YOUR TECHNICAL PROBLEMS. THIS PERSON COULD SIMPLY BE A PERSON THAT WORKS AS AN GRAPHICS OPERATOR. MANAGERS AND DESIGNERS WHO WORK WITH SUCH SYSTEMS SHOULD BE ABLE TO HELP WITH THE MORE COMPLEX AREAS OF ORGANIZATIONAL AND PHILOSOPHICAL PROBLEMS.
TECHNICAL PROBLEMS

TECHNICAL PROBLEMS FOR PEOPLE IN ACADEMIC ENVIRONMENTS HAVE A DIRECT LINK TO THE TYPE OF HARDWARE AND SOFTWARE THAT HAS BEEN SELECTED. THE MAJOR PROBLEM AREAS ASSOCIATED WITH THE TECHNICAL FALL INTO THE SELECTION OF SYSTEMS, HOW TO GET TRAINING AND THE LENGTH OF TIME REQUIRED TO LEARN HOW TO OPERATE THE EQUIPMENT.

IN AN EFFORT TO LIMIT THE INCOMPATIBILITY PROBLEM THE AUTHOR RECOMMENDS THAT ONE STAY WITH EQUIPMENT THAT HAS BEEN PROVEN TO BE COMPATIBLE, UNLESS ONES WHOLE PROJECT IS AN EFFORT MERGE THE SYSTEMS TOGETHER. CURRENTLY MANY PACKAGE SYSTEMS ARE ON THE MARKET THAT OFFER A RANGE OF FUNCTIONS, SUCH AS DISPLAY TERMINALS, CPU, GRAPHIC DISPLAY SOFTWARE, PUBLISHING SOFTWARE, PLOTTERS AND USER INTERFACE HARDWARE IN THE FORM OF DIGITIZERS, LIGHT PENS AND KEYBOARDS.

TEN YEARS AGO THE PROBLEM OF TRYING TO DECIDE WHAT TYPE OF SYSTEM TO USE FOR A PROJECT OF THIS TYPE WOULD NOT HAVE BEEN EXISTANT, SINCE THERE WERE FEW IF ANY SYSTEMS FROM WHICH TO CHOOSE. TODAY WE HAVE EXACTLY THE OPPOSITE PROBLEM. AT A GIVEN UNIVERSITY, ONE MAY HAVE A DOZEN MICRO COMPUTERS SYSTEMS, 3 SUPERMICRO SYSTEMS AND TWO MAINFRAMES THAT CAN FACILITATE GRAPHICS. AS A USER, IT IS DIFFICULT NOT TO EXPLORE ALL THE SYSTEMS AS ONE IS GENERALLY WORKING IN CLOSE PROXIMITY TO THE EQUIP. AFTER ONE HAS CONDUCTED THEIR RESEARCH AND SELECTED A SYSTEM DO NOT START COMPUTER HOPPING FROM SYSTEM TO SYSTEM UNLESS THE GOAL OF THE PROJECT IS TO EVALUATE THE SYSTEMS AGAINST ONE ANOTHER. THIS PROBLEM IS VERY RELATIVE SINCE JUST LEARNING TO OPERATE MOST SYSTEMS ARE PROJECTS ONTO THEMSELVES, EVEN WITH THE MICROSYSTEMS. THIS PROBLEM CAN BE ESPECIALLY ACUTE SINCE NEW PRODUCTS ARE BEING BROUGHT ON LINE DAILY. IDEALLY YOU WILL BE ABLE TO ACCESS A SYSTEM THAT CAN BE UPGRADED CONTINUALLY WITH ENHANCEMENTS THAT ALLOW THE USER TO RETAIN OLD WORK AND TAKE ADVANTAGE OF THE NEW FEATURES. EVEN FOR SOME LARGE COMPANIES THE TECHNICAL PROBLEMS OF UPGRAILING FROM SOFTWARE TO SOFTWARE, AND/OR HARDWARE HAS BECOME A LARGE PROBLEM. SO MUCH OF A PROBLEM THAT SOME COMPUTER GRAPHIC SOFTWARE COMPANIES CAN NOT SUPPORT THEIR OWN UPGRADES. THIS IS SUCH A LARGE PROBLEM THAT SPECIALIZED COMPANIES CONCENTRATE ON THE TASK OF FACILITATING INFORMATION TRANSFER (FOR A DEAR PRICE) TO DEAL WITH THIS NOT TOO UNCOMMON PROBLEM SOLELY FOR THE COMPUTER GRAPHICS INDUSTRY.

ACQUIRING THE KNOWLEDGE AND SKILLS TO OPERATE A COMPUTER GRAPHICS SYSTEM IS A MAJOR PROBLEM, THAT THE AUTHOR CONSIDERS TO BE A TECHNICAL PROBLEM. ONE HAS SEVERAL METHODS TO ACQUIRE THESE SKILLS SUCH AS BY READING THE COMPUTER MANUALS, TERMINAL RESIDENT INSTRUCTIONS, FORMAL CLASSROOM TRAINING AND ON THE JOB TRAINING.
ORGANIZATIONAL PROBLEMS

WHEN ONE STARTS TO CONSIDER THE SECOND MAJOR PROBLEM CATEGORIZATION IN THE AUTHORS PROBLEM CLASSIFICATION SYSTEM, THE ORGANIZATIONAL PROBLEMS, WE FIND A VERY CLOSE RELATIONSHIP TO TECHNICAL PROBLEMS. ONE'S OVERALL GOAL AND OBJECTIVES WILL ALSO HEAVILY INFLUENCE YOUR ORGANIZATION.

COMPLETELY INDEPENDENT OF YOUR GOALS WILL BE THE CONSTRAINTS PLACED ON YOUR PROJECT BY THE TECHNICAL LIMITS OF THE EQUIPMENT YOU HAVE CHOSEN. ONE OF THE MOST PREVALENT OF THESE PROBLEMS DEALS WITH LIMITED STORAGE SPACE FOR INFORMATION STORED IN FILES THAT COMMONLY RESIDE ON DISK. ARCHITECTURAL APPLICATIONS COMMONLY REQUIRE LARGE AMOUNTS OF SPACE DUE TO THEIR COMPLEX NATURE. SINCE COMPUTER GRAPHICS ALSO USE LARGE AMOUNTS OF STORAGE COMPARED TO TYPICAL DATA PROCESSING APPLICATIONS, WE HAVE TWO HEAVY DATA STORAGE SITUATIONS FROM THE ONSET. WHAT THIS MEANS IN REAL TERMS, FOR ONE TRYING TO ORGANIZE SOME TYPE OF SYSTEM, IS THAT CONVENIENT METHOD OF ACCESSING, STORING AND RETRIEVING THIS INFORMATION WILL BE AN IMPORTANT PART OF THE ORGANIZATION.

AS A STUDENT, ONE'S ORGANIZATIONAL PROBLEMS WILL NOT BE AS CRITICAL AS FOR THE PRACTICING PROFESSIONAL. WHAT WILL BE IN COMMON WILL BE THE NEED TO SET CERTAIN STANDARDS FOR THE ORGANIZATION OF ALL YOUR DATA. BASIC DECISIONS SUCH AS WILL THE INFORMATION BE STORED AS GRAPHIC, OR ALPHANUMERIC DATA? IF IT IS TO BE GRAPHIC WILL IT BE REPRESENTED AS ISOMETRIC, 2D DIMENSIONAL OR TRUE 3 DIMENSIONAL DATA? SINCE ONE OF THE IMPORTANT CHARACTERISTICS OF MOST GRAPHIC SYSTEMS IS THE ABILITY TO DISPLAY VARIOUS LAYERS OF INFORMATION ONE MUST DEVELOP AN ORGANIZATION SCHEME FOR THEIR PARTICULAR APPLICATION. IF ONE IS ONLY DOING A PART OF LARGER GRANDER PROJECT, THEN THIS EARLY SCHEME MUST BE ABLE TO COEXIST HAPPILY WITH THE FINAL PROJECT. OTHER GRAPHIC PARAMETERS SUCH AS LINE COLORS, WEIGHTS, AND STYLE ARE IMPORTANT SUBTILIES. DECISIONS AS TO WHAT TYPE OR COMBINATION OF DISPLAYS IN REGARDS TO WIREFRAME, SURFACE OR SOLIDS REPRESENTATION, NEED TO BE MADE AND TESTED TO SEE IF THEY ACHIEVE THE INTENDED RESULTS FOR OPTIMUM READABILITY BY THE PERSONS WORKING AT ON DISPLAY TERMINALS. HARDCOPY OUTPUT MUST ALSO BE COORDINATED WITH VISUAL DISPLAY OUTPUT TO ASSURE THAT THE FINAL DRAWINGS ARE IN AN ACCEPTABLE FORMAT. THIS TASK CAN BE PARTICULARLY DIFFICULT SINCE HARDCOPY VARIES FROM DEVICE TO DEVICE, I.E. PEN PLOTTERS VS. ELECTROSTATIC.
PHILOSOPHICAL PROBLEMS

AS A STUDENT YOUR SPECIFIC ORGANIZATIONAL PROBLEMS WILL ALSO BE CLOSELY LINKED TO YOUR PHILOSOPHICAL APPROACH TO YOUR PARTICULAR APPLICATION.

FOR MOST APPLICATIONS OF COMPUTERS TO PROBLEM SOLVING WE CAN FIND WELL DEFINED METHODS OF APPROACH THAT HAVE RESULTED IN SOME FORM OF TANGIBLE IMPROVEMENT OVER PREVIOUS METHODS. DUE TO THE NATURE OF THE ARCHITECTURAL DESIGN PROCESS, WE CAN NOT RELY ON THESE OTHER METHODS THAT HAVE BEEN DEVELOPED AS ANALYTICAL AND/OR ENGINEERING RELATED TOOLS. WE CAN SEE THIS PROBLEM CLEARLY BY THE EARLIER EXAMPLE OF HOW THE CONTENT OF EARLY VS LATE WRITTEN MATERIAL DEALT WITH ARCHITECTURAL DESIGN AND MORE SPECIFIC TASKS RESPECTIVELY. AS A STUDENT, ONE CAN DECIDE TO EXPLORE THE USE OF THE COMPUTER AS A TOOL TO DESIGN 'ARCHITECTURAL SPACES', WITH THE BELIEF THAT COMPUTERS ARE BETTER DESIGNERS THAN PEOPLE, OR ANY OTHER SPECIAL IDEA THAT THEY FEEL IS IMPORTANT. IN THE MOST BRIEF FORM WHAT THE AUTHOR WOULD EXPECT TO SEE IN AN ORGANIZATION IS A REFLECTION OF A STUDENTS BAREBONES DESIGN METHOD TO GENERAL PROBLEM SOLVING, MESCHED WITH THE LIMITATIONS OF A PARTICULAR COMPUTER SYSTEM.

OTHER PROBLEMS THAT MIGHT HAVE A LARGE IMPACT ON A STUDENT COULD BE PEER PRESSURE FROM FELLOW STUDENTS WHEN NOT WORKING ON A TYPICAL ARCHITECTURAL DESIGN PROJECT, I.E. A BUILDING. CLOSELY LINKED TO THIS PROBLEM IS THE INTERNAL DESIRE TO DESIGN WITHIN THIS SAME CONTEXT. THE AUTHOR'S ADVICE IS THAT TIME SPEND ON PROJECTS THAT EXPLORE THE USE OF CAD AS A TOOL FOR EVEN THE SIMPLEST PROJECT IS WORTH WHILE. FOR THOSE WHO TACKLE THE DESIGN ISSUES YOU WILL HAVE ATTAINED A CERTAIN INTIMATENESS WITH YOUR SPECIAL WAY OF DESIGNING THAT HAS NEVER BEEN ACHIEVED BEFORE IN YOUR DESIGN CAREER.
EXPLANATORY PROBLEMS

EXPLANATORY PROBLEMS, AS MENTIONED EARLIER, ARE GENERALLY NOT A MAJOR SOURCE OF EATING UP TIME. BUT AS A STUDENT WORKING WITH A RELATIVELY NEW TECHNOLOGY YOU WILL FIND YOURSELF QUICKLY OUTSTRIPPING YOUR ASSOCIATES IN HOW MUCH YOU KNOW IN REGARDS TO BEING ABLE TO FUNCTION ON A PARTICULAR SYSTEM. THIS SITUATION WILL MAKE PROJECT REVIEWS GRAVITATE TOWARDS ISSUES THAT CENTER ON TECHNICAL ISSUES. IT WILL BE YOUR JOB TO LIMIT TIME SPEND ON THESE AREAS BY NONEXPERTS AND STEER THEM TOWARDS THEIR AREAS OF EXPERTISE AND/OR YOUR SPECIAL AREA OF INTEREST. IT WAS FOR THIS SPECIFIC REASON THAT THE AUTHOR DEVELOPED THE FOUR PART PROBLEM CLASSIFICATION SYSTEM. BY CATEGORIZING QUESTIONS INTO EITHER THE TECHNICAL, ORGANIZATIONAL, PHILOSOPHICAL OR EXPLANATORY AREAS ONE CAN MORE EFFECTIVELY DEAL WITH MYRIAD OF PROBLEMS AND QUESTIONS. AS WE WILL SEE THIS PROBLEM BECOMES MUCH MORE ACUTE WHEN DEALING WITH REAL LIFE SITUATIONS.

ANOTHER PROBLEM RELATED TO PROJECT REVIEWS ARE ‘SMART QUESTIONS’ THAT FALL OUTSIDE THE SCOPE OF YOUR PROJECT AND/OR HAVE ALREADY BEEN CONSIDERED. THE TIME REQUIRED TO EXPLAIN THE REASONS WHY THESE ISSUES ARE NOT APPROPRIATE WILL BE CONSIDERABLE, AND FOR THE MOST PART INTERESTING AND HELPFUL. BUT THE PROBLEM IS, THE CONSUMPTION OF TIME AND THE TENDENCY TO STEER THE STUDENT IN A EVER BROADING DIRECTION INSTEAD OF ON A FOCUSED PATH.
IV. PROBLEMS RELATED TO THE NON-ACADEMIC WORLD

As we start to consider the four specific problems categories in a non-academic environment or professional dollars and cents point of view, we have a different set of parameters to consider. The first is to recognize that we are not dealing with a single person but rather a multifaceted operation composed of many experts. These people are operating under a office procedure that has been developed over many generations of architects, engineers and designers.

While computer-aided design and drafting has been touted to bring about significantly improved productively to the AEC office, one must be aware of the pitfalls. From the authors experience the biggest factor of success of implementing CAD technology involves the attitudes of the complete body of workers within the company. Ideally this interrogative process will begin before any selection of hardware or software starts. The importance of finding out what kinds of perceptions and expectations your personnel have in regard to CAD can not be overemphasized. These perceptions will affect all the problems areas to such an extent that the perceptions could render the most sophisticated computer graphics system worthless as well as cause the financial collapse of the firm. For example, company XYZ decides to buy the best system in the world in order to be a "world class company" and spends 1 million dollars in the process. The idea is, that the system will pay for itself in reduced drafting costs within 3 years. During the first year instead achieving 5:1 productivity as planned productivity is barely 1:1, payback increases to 4 years. During this time negative management attitudes toward the CAD system (the 10 principles personally financed the system) influence middle management to get more out of the system. The second year productivity makes it 2:1 over manual drafting, but is still less than the predicted 5:1. Disgruntled non-CAD designers and drafting staff blame small Christmas bonuses and no profit sharing on CAD system and people. The third year the economy turns down, unrealistic demands are made of CAD staff. 3 of the 10 partners decide to retire and sell off owner rights. Smaller non-CAD jobs predominante this year with CAD idle 75% of the time. The CAD staff slowly started to migrate to other companies due to high pressure and unrealistic demands. Six months later after losing 8 of 10 CAD people and 9 of the 50 other staff, things start to look up. After 3 years of CAD and still owning $750,000 the company decides to get out of CAD, only to find out their equipment is worth less than $100,000. The owners are now placed in position were their competitors can buy the same system for under $100,000 plus can benefit from the experience gained by the employees who left the company that first bought a system.
TO AVOID THIS TYPE OF SCENARIO SEVERAL STEPS COULD HAVE TAKEN. INSTEAD OF BUYING THE BIGGEST BEST SYSTEM, THE COMPANY COULD HAVE BOUGHT A LESS EXPENSIVE SYSTEM TO DO ONLY DRAFTING WHEREAS THE SYSTEM BOUGHT BY THE COMPANY HAD MANY FEATURES THAT WERE NEVER USED. SECONDLY THE ATTITUDE OF THE MANAGEMENT VIEWED THE CAD PROCESS AS A SEPARATE ENTITY FROM THE REST OF THE OFFICE. THIRDLY THE COMPANY DID RETAIN THE HIGHLY TRAINED PEOPLE WHO WORKED ON THE CAD SYSTEM (THEY WENT ON TO WORK WITH COMPETITORS). THESE PEOPLE WERE THE BEST ASSET TO A LONGTERM RECOVERY.
TECHNICAL PROBLEMS

THE TECHNICAL PROBLEMS FOR NON-ACADEMIC APPLICATIONS CENTER AROUND THE SELECTION OF APPROPRIATE HARDWARE AND SOFTWARE. THE METHODS OF DOING RESEARCH FOR THE PROFESSIONAL TO EDUCATE THEMSELVES ABOUT CAD SHOULD FOLLOW A COURSE SIMILAR TO STUDENT WITH THE EXCEPTION THAT A SPECIAL COMPUTER GRAPHIC CONSULTANT MAYBE ALSO APPROPRIATE. AN GOOD SOURCE OF INFORMATION FOR THE PROFESSIONAL ABOUT SPECIFIC EQUIPMENT AND ALSO A GOOD INDICATION OF STRENGTH WITHIN AN SPECIALIZED APPLICATION AREA WOULD BE USER GROUPS. THESE GROUPS GATHER TO SHARE INFORMATION AND TO MAKE SUGGESTIONS FOR SPECIFIC IMPROVEMENTS IN REGARDS TO PRODUCT USAGE. SPECIFIC MANUFACTURERS SHOULD BE ABLE TO DIRECT YOU TO THESE PEOPLE.

AFTER SELECTING A SYSTEM BASED ON YOUR APPLICATIONS THE PROBLEMS OF INSTALLATION, MANAGEMENT AND TRAINING BECOME TECHNICAL PROBLEMS.

INSTALLATION OF A SYSTEM MAY CALL FOR RELATIVELY MINOR WIRING FOR INDIVIDUAL STAND-ALONE TERMINALS TO COMPLEX COMMUNICATION SIGNAL SYSTEMS FOR TERMINALS AND SPECIALIZED ROOMS TO HOUSE COMPUTER EQUIPMENT. IN THE AUTHORS MIND THE IMPORTANT CONSIDERATION OF ANY CAD TERMINAL IS A PROPER PHYSICAL ENVIRONMENT. WHAT THIS MEANS IS A CORRECTLY ILLUMINATED ENVIRONMENT WITH COMFORTABLE SEATING AND A PLACE THAT CAN BE CONTROLLED FOR ACOUSTICAL DISTURBANCES. AREAS FOR PRODUCTION SHOULD BE SEMI OR COMPLETELY PRIVATE TO AVOID DISTRACTIONS TO THE OPERATOR. UNLIKE A DRAWING BOARD WHERE ONE CAN STOP RELATIVELY EASILY AT ANY POINT FOR BREAKS OR EVEN CHAT WHILE WORKING, WORKING ON A CAD TERMINAL REQUIRES MORE CONCENTRATION TO YIELD GOOD PRODUCTION. PROPER PLANNING SHOULD BE ABLE TO MINIMIZE PROBLEMS OF THE OTHER EXTREME WHEN THE SAME TERMINAL(S) ARE TO BE USED FOR PRESENTATION OF WORK TO CLIENTS IF DESIRED.
TRAINING PEOPLE TO WORK ON CAD SYSTEM
CAN BE CLASSIFIED AS A TECHNICAL PROBLEM IN THAT
THE OPERATORS AND MANAGEMENT MUST UNDERSTAND THE TECHNICAL
LIMITATIONS OF THEIR SYSTEM TO EFFECTIVELY USE IT.
TRAINING SHOULD BE AN ON GOING TASK FOR ALL THE STAFF OF
A FIRM, INCLUDING THOSE INVOLED IN CLERICAL TASKS, AS WELL
AS THOSE WHO ARE LEADING THE PACK. AN IMPORTANT AREA THAT
IS OFTEN OVERLOOKED IS THE TRAINING OF A TEAM OF PEOPLE
SO THAT THEY HAVE THE KNOWLEDGE TO MANAGE THE OPERATION OF THE
SYSTEM. NORMALLY ONE 'COMPUTER PERSON' SEEMS TO TAKE
CHARGE AND KNOW EVERYTHING ABOUT THE SYSTEM. THIS
SITUATION IS ANALOGOUS TO LETTING ONE PERSON DRIVE HOME
EVERY NIGHT WITH ALL OF THE DRAFTING INSTRUMENTS, DRAFTING
BOARDS, CURRENT AND ARCHIVED DRAWINGS. THIS PERSON WOULD
POSE A GREAT RISK TO THE COMPANY EVERY TIME HE LEFT.
WHAT WOULD HAPPEN IF THERE WAS AN ACCIDENT? WOULD THE
OFFICE SHUT DOWN UNTIL THE TOOLS WERE REPLACED AND
SOMEONE WAS HIRED TO TAKE THE MANAGERS PLACE?

OTHER TECHNICAL PROBLEMS INCLUDE THE DEVELOPMENT OF
INHOUSE SOFTWARE FOR SPECIAL APPLICATIONS AND/OR INCREASED
PRODUCTIVITY. ARCHITECTURAL, ENGINEERING AND CONSTRUCTION
FIRMS TYPICALLY SPENT $3 FOR SOFTWARE FOR EVERY $1 SPENT
ON HARDWARE. IN-HOUSE SOFTWARE STAFF CAN HELP LIMIT THESE
COSTS IF MANAGED WELL. SECURITY OF INFORMATION, STORAGE
AND RETRIVAL OF PAST AND CURRENT WORK AND HOW TO HANDLE
EQUIPMENT BREAKDOWNS ARE ALSO TECHNICAL PROBLEMS OF THE
NEW CAD SYSTEMS. PERHAPS THE BIGGEST PROBLEM FOR MOST
COMPANIES WITHIN THE TECHNICAL PROBLEM AREA IS THAT THE TIME
AND PEOPLE ALLOCATED TO THIS AREA ARE NONPRODUCTIVE
OVERHEAD AND THEREFORE TRY TO LIMIT WORK IN THIS VITAL
AREA. ONE OF THE BEST THINGS A COMPANY CAN DO IS HIRE
SEVERAL PEOPLE INTO A COMPANY TO BRING IN SOME EXPERIENCE
FROM COMPANIES THAT HAVE ALREADY FOUNT SOME OF THE PITFALLS
THE HARD WAY.
ORGANIZATIONAL PROBLEMS

ORGANIZATIONAL PROBLEMS FOR REAL WORLD APPLICATIONS INCLUDE THE SAME KIND OF PROBLEMS AS FOR THE STUDENT, BUT WITH A FEW ADDED TWISTS. FIRST OF ALL YOU ARE DEALING WITH A GROUP OF PEOPLE WHO TEND TO WANT TO DO THINGS THEIR OWN SPECIAL WAY. TRYING TO GET THEM TO AGREE ON STANDARDS FOR TERMINAL DISPLAY CONVENTIONS AND HARDCOPY OUTPUT (PLOTS) IS LIKELY TO BE BIG JOB, BUT IT WILL PROVE TO SMALL IN COMPARISON TO THE OTHER ORGANIZATIONAL PROBLEMS. THE COORDINATION FOR INTERDISCIPLINARY DRAWINGS CAN ALSO PRESENT PROBLEMS THAT NEED TO HANDLED WITHIN THE ORGANIZATIONAL CONTEXT.

PERHAPS THE HEAVIEST INFLUENCE ON THE SCOPE OF A COMPANIES ORGANIZATIONAL PROBLEMS WILL BE THE COMPANIES ATTITUDE TOWARDS THE CAD SYSTEM. IF THE PHILOSOPHICAL COMMITMENT TO THE SYSTEM IS A HOLISTIC ONE, THEN THE ORGANIZATIONAL PROBLEMS WILL BE MUCH MORE COMPLEX THAN IF A COMPANIES PHILOSOPHY IS TO ONLY PRODUCE CONSTRUCTION DOCUMENTS RELATING TO 'PLAN' TYPE DRAWINGS, WITH THE REMAINDER TO BE 'ON THE BOARD'. NOT QUESTIONING THE PHILOSOPHICAL MOTIVES, THE IMPORTANT THING TO NOTE HERE IS THAT WITHOUT SOME TYPE OF DEFINED ATTITUDE THE ORGANIZATIONAL PROBLEMS CAN NOT BE DEFINED.

FROM THE AUTHOR'S EXPERIENCE WHAT HAPPENS IN THE ABSENCE OF A ORGANIZATIONAL PLAN, BASED ON A DEFINED POSITION AS TO THE RELATIONSHIP OF CAD IN AN ORGANIZATION, IS THAT IT ENDS UP BEING A POORLY MANAGED ELECTRONIC DRAWING BOARD VIEWED AS A EXPENSIVE TOY. THE ONLY EXPECTATION OF THE EQUIPMENT IS THAT IT DO THINGS FASTER THAN ON THE BOARD AND THAT IT PRODUCE IMMEDIATE RESULTS AT THE PUSH OF A BUTTON. NO CHANGE RESULTS IN THE WAY INFORMATION IS DELIVERED TO THE PEOPLE RESPONSIBLE FOR ENTERING IT INTO THE COMPUTER. THE FUNDAMENTAL PROBLEM HERE IS THAT IN THE PAST A GOOD DRAFTSMAN WAS EXPECTED, AND HAD THE ABILITY TO FUDGE AND MASSAGE THE MEDIUM OF PAPER AND PENCIL, SO AS CREATE BOTH, INFORMATIVE AND AESTHETICALLY PLEASING DRAWINGS, WITHIN A REASONABLE TIME PERIOD. WHEN WORKING WITH CAD ONE HAS LOST BOTH THE ABILITY TO FUDGE AND TO A CERTAIN DEGREE THE AESTHETIC TOUCH OF THE PENCIL. THE END RESULT IS THAT MORE TIME IS SPENT WORKING OUT DETAILS JUST TO GET THEM ON THE CAD GRAPHICS SYSTEM, AND SOMETHAT STERILE DRAWINGS THAT LOOK LIKE THEY DUMPED OUT BY A THOUGHTLESS COMPUTER.
PHILOSOPHICAL PROBLEMS

AS MENTIONED IN THE SECTION CONCERNING ORGANIZATIONAL PROBLEMS THE REAL KEY TO THE EFFICIENT USE OF ANY COMPUTER GRAPHIC SYSTEM IS THE ESTABLISHMENT OF SINGLE COMPANY PHILOSOPHY TOWARDS THE APPLICATION OF THE SYSTEM. THE IMPLEMENTATION OF THE COMPANY PHILOSOPHY WILL MANIFEST ITSELF IN THE WAY THE SYSTEM IS ORGANIZED AND OPERATED.

THE COMPANY PHILOSOPHY WILL LET ALL THE PEOPLE IN THE ORGANIZATION KNOW IF AND HOW CAD MIGHT AFFECT THEIR CURRENT JOB. IF CAD IS TO BE REGULATED TO ONLY CERTAIN TASKS OR AREAS OF APPLICATION, THEN THAT NEEDS TO BE MADE CLEAR. IN THIS WAY THOSE WHO DIFFER WITH THIS PHILOSOPHY CAN BE CONSIDERED WHEN DEVELOPING HOW THE SYSTEM IS TO BE ORGANIZED. IN SOME CASES IT MAY BE BEST FOR THOSE WHO HAVE SUCH A LARGE CONFLICT TO RE-ALIGN THEMSELVES WITH A DIFFERENT ORGANIZATION. AGAIN THIS MAY SEEM TO BE A DRAMATIC STEP TO SUGGEST BUT IS IMPORTANT FOR THE EFFICIENT AND SUCCESSFUL OPERATION OF THE COMPANY AND THE COMPUTER GRAPHIC SYSTEM. IT IS THE AUTHOR’S FIRM BELIEF THAT CAD SYSTEM EXTEND WELL BEYOND THE LIMITS OF THE COMPUTER HARDWARE. I BELIEVE YOU CAN TAKE THE WORLD’S MOST SOPHISTICATED HARDWARE AND SOFTWARE AND WITHOUT THE RIGHT APPROACH TO INTERFACING IT WITH PEOPLE, THE SYSTEM CAN BE RENDERED USELESS.

LIKE IT OR NOT THE MOVE TO CAD IS A STRONG SIGNAL OF CHANGE AND A RADICAL BREAKING WITH PAST TRADITIONS. FOR SOME PEOPLE, THE EXISTENCE OF COMPUTERS IN GENERAL, REPRESENTS A TYPE OF THREAT. IT IS IMPORTANT FOR THE COMPANY TO SEEK OUT THE THREATENED, OPENLY RECOGNIZE THEIR VALUE AND ASSURE THEM THAT THEY ARE INTERNAL TO THE WELL BEING OF THE COMPANY, IF THIS IS INDEED PART OF THE COMPANY PHILOSOPHY. THIS POSITION MUST BE CARRIED THROUGH TO THE OVERALL COMPANY ORGANIZATION. ONE TYPICAL PROBLEM DIRECTLY RELATED TO THIS AREA IS TO SAY ‘OLD JOE WON’T WANT TO LEARN ABOUT THE CAD SYSTEM, HE’S GOING TO RETIRE NEXT YEAR’. CHANCES ARE OLD JOE MAY BE ABLE TO APPRECIATE THE CAD SYSTEM MORE THAN ANYONE ELSE, IF APPROACHED IN THE RIGHT MANNER. OLD JOE COULD ALSO BE PART OF AN VERY IMPORTANT RESERVE OF FLEXIBLE SERVICE EMPLOYEES, THAT SEEM TO BE PART OF A LARGE NUMBER OF PROGRESSIVE, FORWARD LOOKING COMPANIES APPROACH TO HIGH TECH LABOR PROBLEMS. IT IS VERY IMPORTANT TO LOOK AT ALL THE LONG TERM RAMIFICATIONS OF INITIALLY SETTING UP A SYSTEM. EACH ACTION WILL SET A PRECEDENT AND ESTABLISH CERTAIN PERCEPTIONS WITHIN THE WHOLE COMPANY FOR GENERATIONS TO COME.
IF THE COMPANY DECIDES TO POSITION THE COMPUTER GRAPHICS SYSTEM IN A VERTICAL POSITION WITHIN THE COMPANY INSTEAD OF THE TYPICAL HORIZONTAL APPLICATION OF DRAFTING, THEN THE COMPANY WILL BE MOVING INTO RELATIVELY UNCHARTED TERRITORY. LESS THAN 10% OF THE COMPUTER GRAPHICS SYSTEMS INSTALLED IN THE WORLD FOR USE IN ARCHITECTURAL OFFICES, USE THE SYSTEM FOR TASKS OTHER THAN DRAFTING. IT IS SURPRISING, THAT BETTER USE OF THE SYSTEMS HAS NOT BEEN IMPLEMENTED, IN THAT THE COMPUTER GRAPHIC SYSTEMS SEEM TO HAVE THE ABILITY TO BOTH INCREASE THE QUALITY OF THE BUILT ENVIRONMENT AND ENHANCE ONES BUSINESS. INDEED, A COMPANY PHILOSOPHY THAT STRESSES THE QUALITY OF SERVICES TO CLIENTS WILL NO DOUBT TRIUMPH OVER A COMPANY THAT MERELY PRODUCES DESIGNS THAT ARE PRODUCED ECONOMICALLY VIS-A-VIS AN AUTOMATED DRAFTING SYSTEM. IF ONE CAN NOT PRODUCE BUILDINGS THAT ARE PERCEIVED TO BE OF A HIGHER LEVEL OF DESIGN ON THE COMPUTER THAN BY TRADITIONAL TECHNIQUES, THEN HOW DOES ONE JUSTIFY THE COST OF A CAD SYSTEM IN A DESIGN ORIENTED FIRM. BUILDINGS PRODUCED FOR CHEAP FEES, DUE THE REDUCED DRAFTING COSTS, FEES WILL NOT RESULT IN LONG TERM CLIENT RELATIONSHIPS. IF COSTS ARE THE SOLE JUSTIFICATION FOR THE PURCHASE OF A CAD SYSTEM, THEN THE AUTHOR CAN PRESENT MANY MORE LESS EXPENSIVE AND MORE EFFECTIVE TECHNIQUES TO REDUCE OVERALL BUILDING COSTS COMPARED TO A CAD SYSTEM.

THE FOLLOWING QUOTE, WHILE IN ONE SENSE IS LIKE COMPARING APPLES AND ORANGES, HAS SOME RELEVANCY TO THE ARCHITECTURAL COMMUNITY.

"However, even though a host of computer-aided design systems have been developed in the past 20 years for use by architects, their impact on the architectural design process as a whole has been marginal. In fact, the productivity of most architectural offices that use computers has improved only slightly, if at all, and the complexity of buildings has been virtually unaffected by them. In comparison, the use of computer-aided design systems by electrical engineers has enabled them to increase the complexity of interrelated circuits by several orders of magnitude, while significantly reducing their design time.

WHAT THE ELECTRONICS INDUSTRY HAS BEEN ABLE TO DEVELOP IS COMPLEX SYSTEMS FOR THE DESIGN, COMMUNICATION AND TESTING, THAT COULD BE LABELED EXPERT SYSTEMS, FOR THEIR PARTICULAR APPLICATIONS. THE PROBLEM OF TRYING TO DO THIS TYPE OF THING FOR THE ARCHITECTURAL DESIGN PROCESS IS THAT IT IS NOT LIKE OTHER ENGINEERING RELATED DESIGN PROCESSES."
TO SHOW THE RELATIVE COMPLEXITY OF DEVELOPING AN EXPERT SYSTEM FOR THE DESIGN OF BUILDING COMPARED TO INTEGRATED CIRCUIT DESIGN ONE CAN NOTE THAT THERE ARE OVER 50 EXPERT SYSTEMS CURRENTLY BEING USED FOR THAT APPLICATION. TO THE AUTHOR'S KNOWLEDGE, ONLY SEVERAL SYSTEMS ARE CURRENTLY BEING DEVELOPED FOR ARCHITECTURAL APPLICATIONS. ONE SUCH SYSTEM CALLED 'AIBES' (ARTIFICIAL INTELLIGENCE-BASED EXPERT SYSTEM), IS BEING DEVELOPED BY JUNG/BRANNEN RESEARCH AND DEVELOPMENT. TO SHOW THE COMPLEXITY OF THEIR SYSTEM THE AUTHOR PRESENTS THE FOLLOWING QUOTE FROM THE PROJECT DIRECTOR, BRUCE K. FORBES,

"there will be over 600 expert systems that have to be designed and implemented before we even approach an expert-based system for the design of the building environment".

The amount of work required translates into something like 7 million working hours or 3,365 working years, or if each of the 65,000 registered architects in the U.S. were to spend 17 working days on this project, the whole system could be implemented."
PRE-CAD PROBLEMS THAT EXISTED BEFORE COMPUTERS WERE EVER APPLIED TO ARCHITECTURE, ENGINEERING OR CONSTRUCTION, COME TO A HEAD WHEN ONE STARTS TO DEVELOP A VERTICAL AND/OR DESIGN ORIENTED USE OF THE COMPUTER. UNLIKE OTHER ENGINEERING ORIENTED DESIGN TASKS, THE ACT OF ARCHITECTURE DESIGN HAS VERY FEW IF ANY ABSOLUTES, OUTSIDE OF MODERN BUILDING CODES. EVERY PROJECT HAS A DIFFERENT TIME/PLACE, FUNCTION AND BUDGET THAT HAS AN ULTIMATE IMPACT ON ANY RESULTANT PROJECT. EACH PROJECT ALSO HAS A DIFFERENT SET OF PEOPLE INVOLVED IN THE PROCESS. THESE PEOPLE MIGHT ONE, SEVERAL OR MANY CLIENTS, ARCHITECTS, CONTRACTORS, BANKERS, LAWYERS, ZONING OFFICIALS, AND/OR NEIGHBORS TO A PROJECT, DEPENDING ON THE PARTICULAR THING TO BE CONSTRUCTED AND/OR DESTRUCTED.

BEFORE THE ADVENT OF CAD, IT WAS VERY EASY FOR DESIGN PROFESSIONALS, WHO WERE TRAINED VIA THE SCHOOLS AND/OR IN THE FIELD, TO USE THE RETORIC OF THE DESIGN PROFESSION TO OFFER A COMPANY MANIFESTO TO PERSPECTIVE CLIENTS. ONE SUCH STATEMENT MIGHT BE TO OFFER 'THE VERY BEST IN DESIGN SERVICES AT A FAIR AND REASONABLE FEE'. THE QUESTION THAT THE AUTHOR ASKS ABOUT THIS OR ANY OTHER PHILOSOPHY IS, WHAT DOES THIS MEAN IN REAL TERMS IN REGARD TO A DESIGN METHODOLOGY, OR WHAT KIND OF IMPACT WILL THIS PHILOSOPHY HAVE FOR A PARTICULAR COMMISSION? IN REAL TERMS I SUSPECT THAT IT HAS NO RELATIONSHIP WITH ANYTHING OTHER THAN SECURING A COMMISSION AND ESTABLISHING A DIALOGUE BETWEEN CLIENT AND PRACTITIONER.

THE AUTHOR DOES NOT REGARD THIS TYPE OF DIALOGUE AS BEING NEGATIVE, QUITE TO THE CONTRARY, IT AN INTERGAL PART OF DOING BUSINESS. FROM A DESIGN POINT OF VIEW, THIS METHOD OF DOING BUSINESS HAS BEEN PART OF THE 'NORMAL PROCESS'. THE ACTUAL PROCESS OF DOING A DESIGN FOR CLIENT WOULD PROCEED ALONG A MORE OR LESS STANDARD METHOD OF SCHEMATIC DESIGN, DESIGN DEVELOPMENT AND THE PRODUCTION OF CONSTRUCTION DOCUMENTS. FROM A DESIGN METHODOLOGY PERSPECTIVE, EACH PROJECT WAS BASED ON SOME CONCEPT AROUND A SINGLE PERSON'S, OR GROUP OF PEOPLE, PERCEPTIONS TOWARDS THE OVERALL PROGRAM REQUIREMENTS.

IF WE LOOK AT THE TECHNIQUES USED BY THE DESIGNER OR DESIGNERS WE COULD TRY TO CLASSIFY IT INTO ONE OF THE HANDFUL OF BASIC GROUPS OF DESIGN METHODS. WHAT I SUSPECT WOULD HAPPEN WOULD BE THAT WE COULD NOT EASILY CLASSIFY OR PIGEON HOLE THEIR APPROACH. THIS PROBLEM OF CLASSIFICATION, WOULD BE EXTREMELY COMPLEX IF NOT IMPOSSIBLE, SINCE THE DESIGN METHODOLOGISTS DO NOT AGREE AMONG THEMSELVES. I FURTHER SUSPECT THAT ON THE NEXT PROJECT WE WOULD HAVE A SOMEWHAT DIFFERENT TECHNIQUE, BASED ON WHO PARTICIPATED IN THE DESIGN PROCESS. TO SUM THIS EXERCISE UP, THE AUTHOR SUGGESTS THAT THESE PROCESSES ARE UNIQUE TO INDIVIDUAL PERSONS AND THAT GROUPS OF PERSONS WHO DESIGN TOGETHER, DRAW ON INDIVIDUAL PROCESS FOR GROUP CONTRIBUTION. THE INDECISIVE NATURE OF THIS PROCESS HAS NEVER BEEN A PROBLEM OUTSIDE OF THE FACT THAT NO ONE REALLY HAD A FIRM GRIP AS TO WHAT THESE DESIGN PROCESSES WERE. BY LOOKING AT ONE OF THE CLASSIC MODELS OF DESIGN METHODOLOGY WE CAN SEE WHY MOST PEOPLE DO NOT HAVE A DESIGN PROCESS THAT WOULD BE EASY TO EMULATE ON A COMPUTER.
TWO EXTREMES TO THE APPROACH TO DESIGN CAN BE ASCRIBED TO SCHOOLS AND PEOPLE THAT PROFESS ARCHITECTURE. THE FIRST AND WELL DOCUMENTED METHOD IS THE ITERATIVE APPROACH OR ANALYSIS, SYNTHESIS AND EVALUATION, SO ON AND SO FORTH. THE SECOND, METHOD OR PERHAPS MORE CORRECTLY AN ATTITUDE, IS THE INTUITIVE, SECRETE, OR MYSTICAL APPROACH THAT IS FOSTERED BY SOME DESIGNERS AND FELT BY STUDENTS BUT NEVER DEFINED. THIS METHOD CLOSELY FollowS THE CLASSIC MODEL DEVELOPED BY J. CHRISTOPHER JONES.

AGAIN THIS DOES NOT REALLY PRESENT ANY PROBLEMS. INDEED MOST IF NOT ALL OF OUR ENVIRONMENT HAS BEEN DESIGNED WITH VARYING DEGREES OF THESE INFLUENCES. WHERE IT DOES ARISE IS IN REGARD TO USING COMPUTERS FOR DESIGN APPLICATIONS. FOR THE COMPUTER TO ASSIST AND/OR ACTUALLY DEVELOP DESIGNS SOME DEFINITIVE PROCESS MUST BE STAKED OUT SINCE THE COMPUTER CAN NOT THINK. AT LEAST IN THE TERMS THAT WE ASCRIBE TO PEOPLE. THE AUTHOR CALLS THIS SITUATION A PER CAD-PROBLEM, ONE THAT EXISTED BEFORE THAT ADVENT OF CAD.

ANOTHER LARGE PRE-CAD PROBLEM CLOSELY ASSOCIATED WITH DESIGN METHODS OR IN THE AUTHOR’S TERMINOLOGY, THE NATURE OF THE ARCHITECTURAL DESIGN PROCESS, IS THE AMOUNT OF TIME DOING NON-DESIGN WORK OR MORE CORRECTLY, INFORMATION GATHERING. FOR EXAMPLE, IF LOOKS AT THE AIA DOCUMENT D200 ONE FINDS THAT OF THE 212 SEPARATE AREAS DEFINED OVER 95% ARE RELATED TO NON-DESIGN TASKS. BASED ON PAST EXPERIENCE, WE CAN SAFELY SAY THAT THE USE OF COMPUTERS IN THE AREA OF INFORMATION MANAGEMENT HAS PROVEN UTILITY. WHEN ONE SUBJUGATES A COMPUTER GRAPHICS SYSTEM TO THE ROLE OF AN ELECTRONIC DRAFTING BOARD, IT IS NOT SURPRISING THAT SOME OF THE SIMPLEST YET ROUTINE INFORMATION MANAGEMENT APPLICATIONS ARE NOT INTERGRATED. THIS IS ESPECIALLY IRONIC SINCE THE COMPUTERS THAT POWER THE LARGER GRAPHICS SYSTEMS ARE EXPONENTIALLY FASTER THAT MOST OFFICE COMPUTERS THAT ARE CURRENTLY IN USE.

RELATED TO THE ABOVE PROBLEM IS THE SET OF PREJUDICES OR MIND SETS THAT PEOPLE BRING TO THE AREA OF COMPUTERS. ONE PRIME EXAMPLE IS NOT USING THE COMPUTER TO DESIGN. THESE FEELINGS ARE GENERALLY BASED ON EMOTION AND TO A LESSER DEGREE ON PHILOSOPICAL IDEALS OR PRINCIPLES. STILL OTHER VIEWS MAY BE SUPPORTED BY PERSONAL OR COLLECTED RESEARCH. SINCE THE AREA OF CAD IS RELATIVELY NEW TO AEC APPLICATIONS WE TEND TO OPERATE UNDER ALL THREE AREAS OF SOME FACT, SOME FICTION AND SOME FEELING. TIME AND EXPERIENCE WILL BE THE SOLUTION TO THIS PROBLEM AREA.

THE LAST PRECAD PROBLEM IS THE TRADITIONAL AREA OF PRODUCING CONSTRUCTION DOCUMENTS. AS IN THE CASE OF CONSIDERING THE PRECAD PROBLEM OF ILL-DEFINED DESIGN METHODS, PROBLEMS THAT EXISTED IN THE PRODUCTION OF DRAWINGS BEFORE THE ADVENT OF CAD WILL ONLY BE ACCENTUATED WITH THIS NEW MEDIUM. NEW CAD RELATED PROBLEMS WILL ALSO BE INTRODUCED IN THE FORM OF MULTI-SHIFT OPERATIONS, SYSTEMS MANAGEMENT, DOWNTIME AND THE HOST OF OTHER PROBLEMS ALREADY TOUCHED UPON IN THE AUTHOR’S FOUR PROBLEM AREAS.
TO SUM UP THE PHILOSOPHICAL PROBLEMS THE AUTHOR SUGGESTS THAT THE DEVELOPMENT OF A COMPANY PHILOSOPHY BE DEFINED SO THAT THE PERSONS RESPONSIBLE FOR IMPLEMENTING THIS APPROACH HAVE SOMETHING TO WORK FROM DUE TO DEFINITIVE NATURE OF COMPUTERS. THE RESULTANT SYSTEM WOULD PROBABLY HAVE ONE OF THE TWO FOLLOWING CHARACTERISTICS. THE FIRST WOULD BE A MELTING POT OF DESIGN METHODS HAMMERED OUT BY THE PEOPLE WHO HAD THE DESIGN RESPONSIBILITY. THE END RESULT WOULD BE A GENERIC SET OF METHODS TO BE SHARED WITHIN THE COMPANY AS A WHOLE. THE SECOND APPROACH WOULD BE WHERE EACH DESIGNER HAD PERSONAL DESIGN PACKAGES. THESE INDIVIDUAL APPROACHES WOULD BE UNITED UNDER THE COMPANIES COMMON PHILOSOPHICAL AND ORGANIZATIONAL PLAN.
EXPLANATORY PROBLEMS

THE EXPLANATORY PROBLEMS ASSOCIATED WITH NON-ACADEMIC APPLICATIONS ARE CONCERNED PRIMARILY WITH PEOPLE WITHIN THE COMPANY. A SECONDARY AREA RELATES TO EDUCATING CLIENTS ABOUT CAD USES AND APPLICATIONS FOR PROBLEM SOLVING.

THE BURDEN OF EXPLANATORY PROBLEMS WILL GRAVITATE TO THE PEOPLE WHO HAVE A GOOD BASE OF SKILLS RELATED TO THE OPERATION OF CAD EQUIPMENT. THESE DEMANDS WILL COME FROM ALL LEVELS WITHIN AN ORGANIZATION IN RELATION TO QUESTIONS THAT RANGE FROM THE BASIC OPERATION OF THE SYSTEM TO COMPLEX QUESTIONS RELATING TO PROGRAMMING AND DATABASE APPLICATIONS. TO LIMIT CONFUSING DIFFERENT TYPES OF PROBLEMS THE AUTHOR AGAIN RECOMMENDS Categorization along the lines of technical, organizational, philosophical and explanatory problem categories. These problems could be covered weekly in company wide communication sessions so that all involved can be kept informed, or as per any other specified company procedure. Many explanatory problems can be deferred by a comprehensive training program that would relate to all three of the other problem categorization areas. The author feels that through a well implemented approach to using CAD technology the consumption of large amounts of time for explaining can be greatly reduced, but will always exist as part of the price to pay for the use of CAD technology.

THE PROBLEM OF EDUCATING CLIENTS AS TO THE USE AND MISUSE OF CAD IS A PROCESS THAT WILL TEND TO BECOME LESS AND LESS IMPORTANT AS CAD TECHNOLOGY STARTS TO BECOME PART OF A NORMAL VOCABULARY WITH THE AEC INDUSTRY. THIS SITUATION IN THE COMPUTER GRAPHIC/AEC INDUSTRY SHOULD BEGIN TO BALANCE OUT WITHIN THE NEXT FIVE YEARS WITH A VERY MATURE STATE OF GRAPHIC HARDWARE, STANDARD SERVICES OFFERED BY THE AEC INDUSTRY AND CERTAIN EXPECTATIONS BY CLIENTS AS TO THE DELIVERY OF THESE SERVICES.
CONCLUSION

IN CONCLUSION, THE AUTHOR HAS NOTED THE MAJOR PROBLEM OF TIME CONSTRAINTS AND OFFERED THE FOUR APPROACHES TERMED THE DIRECT METHOD, THE INDIRECT METHOD, THE BEST ALTERNATIVE AND THE SECOND BEST ALTERNATIVE. NEXT THE AUTHOR PRESENTS A PROBLEM CLASSIFICATION SYSTEM TO HELP SIMPLIFY THE LARGE NUMBER OF PROBLEMS INHERENT TO CAD PROJECTS. THESE PROBLEMS WERE THEN RELATED TO THE AREA OF ACADEMIC AND REAL WORLD PROBLEMS TO ILLUSTRATE THE USE OF THE FOUR PART PROBLEM CLASSIFICATION SCHEME AND TO RELATE GENERAL PROBLEMS THAT THE AUTHOR PRECEDES TO BE OF VALUE TO PERSONS INVOLVED IN COMPUTER GRAPHICS AND AEC APPLICATIONS. IF THIS BODY OF WORK HAS HELPED SOMEONE SAVE TIME AND/OR SIMPLIFY THEIR PERCEPTIONS OF PROBLEMS RELATED TO CAD, THEN THE AUTHOR FEELS THAT HE HAS MADE A CONTRIBUTION THAT WILL EVENTUALLY RESULT IN A BETTER BUILT ENVIRONMENT AND THE PRESERVATION OF THE NATURAL ENVIRONMENT, WHICH IS THE ULTIMATE GOAL OF DESIGN ORIENTED PROFESSIONS. IN CLOSING REMEMBER THAT THE COMPUTER IS BUT ONE TOOL, TO BE INTERGRATED ALONGSIDE THE OTHERS.
FOOTNOTES

1 EDUCATIONAL COMPUTING: LOGO UNDER FIRE. PUBLIC BROADCASTING SYSTEM, 1986.


3 M. DAVID PRINCE, INTERACTIVE GRAPHICS FOR COMPUTER-AIDED DESIGN, (READING, MASSACHUSETTS: ADDISON-WESLEY PUBLISHING CO; 1971) PP 5-8.


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UTOPIA

or

A DESIGN PROCESS
RELATED TO ARCHITECTURAL APPLICATIONS
ON THE VAX BASED INTERGRAPH
COMPUTER GRAPHICS SYSTEM

TRACY COX
MAY 17, 1985
PREFACE

AUTHOR'S INTENTIONS AS INTERRUPTED BY SUSAN COX NOVEMBER 1986

MY PHILOSOPHY, IN ESSENCE, IS THE CONCEPT OF MAN AS A HEROIC BEING, WITH HIS OWN HAPPINESS AS THE MORAL PURPOSE OF HIS LIFE, WITH PRODUCTIVE ACHIEVEMENT AS HIS NOBLEST ACTIVITY. 1

I ECHO THESE WORDS FROM AYN RAND'S ATLAS SHRUGGED AS MY PHILOSOPHY AND THE BASIS FOR THIS THESIS REPORT. I CHOSE MY TOPIC, I DID MY RESEARCH, I FORMED AND I BENEFITED FROM THE HOURS OF WORK THAT WENT INTO THIS PROJECT. I MET MY PRIMARY SELF-INFLICTED PURPOSES WHICH WERE AS FOLLOWS:

1) TO BECOME COMPUTER LITERATE
2) TO MAKE MORE MONEY
3) TO DEVELOP AND REPORT AN ORGANIZATIONAL FORMAT FOR A SINGLE DESIGN PROCESS FOR MY OWN PERSONAL USE.
4) TO ATTEMPT TO COMMUNICATE A RELATIONSHIP BETWEEN COMPUTERS AND THE DESIGN PROCESS.

MEETING ONE REMAINING OBJECTIVE (I.E. TO GRADUATE FROM BALL STATE UNIVERSITY-COLLEGE OF ARCHITECTURE AND PLANNING) WILL BE DETERMINED BY A SELECT GROUP OF READERS.

BESIDES THE PRIMARY PURPOSES OF THIS PROJECT A NUMBER OF LESS IMPORTANT OBJECTIVES WERE ESTABLISHED AT THE INCEPTION. THESE ARE CONSIDERED SECONDARY AND DEAL WITH BENEFITS TO THE READER OF THIS THESIS. SPECIFICALLY, THESE OBJECTIVES ARE (1) TO REPORT PROBLEMS ENCOUNTERED IN THE DEVELOPMENT AND IMPLEMENTATION OF MY WORK, (2) TO OFFER BUT ONE OPTION FOR SYSTEM ORGANIZATION, AND (3) TO COMMUNICATE CURRENT RESOURCE MATERIAL.
Introduction

The use of computer graphics for architectural design and drafting (CAD) has seen tremendous growth in the last several years. At the current rate of growth, 25% of the architectural/engineering firms will be utilizing some type of CAD system by 1990. This trend warrants a study of computer graphics since it appears that CAD will become important a tool alongside the pencil and straightedge.

While its use as a tool for graphic communication (construction documents) seems to be well accepted, its value as a tool for early architectural design work is less clearly quantifiable, defined or practiced.

This work develops a method that is intended to be a starting point for further exploration of computer graphics and the design process. It is organized by three sections that reflect the chronological development. The beginning is very broad-based, the middle specifies an organizational framework for the intergraph computer graphic system and the end presents a design philosophy/process model that can be applied both dependent and independent of computers.

Each section is followed by problems & questions that were typical for that phase of the project.

An evaluation includes an example use of the combined information management/graphic/analytical system.

Several references from the bibliography are also included in the appendix since they are both very informative and difficult to locate.

The appendix contains several articles that relate to ideas or information that were out of the original scope of the thesis project but nonetheless were some of the most interesting aspects of the work.
THE BEGINNING

EARLY RESEARCH FOLLOWED A TRADITIONAL ACADEMIC MODEL. LATER RESEARCH STARTED TO DRAW FROM REAL WORLD PROBLEMS USING THE "PARTICIPANT OBSERVER" METHOD OF RESEARCH.

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ANALYSIS
AFTER RESEARCH IT WAS OBVIOUS THAT MY NEEDS/EXPECTATIONS COULD NOT BE SATISFIED BY EQUIPMENT ON HAND. IT WAS NECESSARY TO LOOK FOR A WAY TO OVERCOME THE PROBLEM. THE SOLUTION CAME WITH FINDING WORK AT A COMPANY THAT HAD EQUIPMENT THAT WENT BEYOND THE RANGE OF THE UNIVERSITY RESOURCES.

"PARTICIPANT OBSERVER" CURRENT TECHNOLOGY

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REAL WORLD APPLICATIONS
ARCHITECTURE INDUSTRIAL AS BUILT

THE INTERGRAPH 2D GRAPHICS
SOFTWARE

ALONG WITH SEARCHING FOR HARDWARE IN THE BEGINNING
CERTAIN PROCESSES WERE DEEMED APPLICABLE, SEMI-APPLICABLE AND TOTALLY NON-APPLICABLE
IN RESPECT TO DESIRABILITY FOR ARCHITECTURAL APPLICATIONS

APPLICABLE
ENERGY ANALYSIS
RECORD KEEPING
LIGHTING ANALYSIS
SCHEDULING
COST ESTIMATING

PROGRAM REDUCED

1st PROGRAM

ENERGY

FUTURE DEVELOPMENT

SEMI-APPLICABLE
STRUCTURAL ANALYSIS
DIGITAL TERRAIN MODELING
CUT & FILL
RUNOFF

AFTER 9/84

UNIVERSITY GRAPHICS

NON-APPLICABLE
SPACE PLANNING

AUTHOR'S PREJUDICE
SEE PAGE 32
PROBLEMS

SOCIAL PRESSURES TO DO 'ARCHITECTURE' MADE DIRECTIONS LESS CLEAR
START DIRECTLY WITH MORE COMPUTER EMPHASIS

DIFFICULT NOT TO DESIGN

WHAT KIND OF PRODUCTS ARE AVAILABLE
VISIT SHOWS FOR FIRST HAND COMPARISON OF EQUIPMENT
READ MAGAZINES RELATED TO COMPUTER GRAPHICS

PROJECT WAS SO WIDE BASED IT APPEARED UNORGANIZED
GRIN AND BEAR IT
LIMITS CAN BE BOTH A VIRTUE AND A VISE

WHY SHOULDN'T THE PROJECT BE WIDE BASED?
IS IGNORING THE REALITY OF TECHNICAL/INFORMATIONAL SOCIETY REALLY BEST FOR THE
ACADEMIC STUDY OF ARCHITECTURE?

PLAN ON MORE THAN 3 QUARTERS WORK UNLESS YOU ARE ABLE TO FIND
AN OUTSIDE CRITIC WHO CAN HELP YOU REFINE YOUR IDEAS TO A TRADITIONAL
ANALYSIS/SYNTHESIS/EVALUATION FORMAT
OR PERHAPS TEST AN IDEA THAT THE CRITIC HAS CONCEIVED

IF YOU CAN NOT LIMIT THE PROJECT AT THE BEGINNING THEN SET SOME BENCHMARK
FOR THE FUTURE WHEN YOU MOVE FROM AN EXPLORATORY ATTITUDE TO AN POSITION
THAT HAS IDENTIFIED SPECIFIC PROBLEMS OR AN AREA OF STUDY

TOO MANY SYSTEMS TO LEARN
FIND A SYSTEM THAT APPEALS TO YOU, STICK WITH IT AND
SUPRESS THE URGE TO COMPUTER HOP
Work experiences indicated that the computer graphics systems were segregated from informational structures normally associated with computers, i.e., use of automated job timekeeping procedures that could easily be integrated.

This diagram shows in an ideal system, how all information would be input and output via the VAX based graphic system.

The concept behind the Design Management System (DMS) is to organize a system that facilitates information management and the design process through a series of graphic files, cell libraries, tutorials, menus and user commands.

The first goal of DMS is to address the idea that 90% of an designers time is used to do non-design tasks. These tasks range from completing time sheets to verifying insurance coverage of building contractors. These tasks would be applicable to different projects many times over and over again.

Another goal of DMS is to improve communication for the team of people who work on a project. Non-design information is generally gathered by the team from many different sources and mediums. Information seekers have different questions at different times but share the need to resolve problems to be able to continue their work. The long term storage of this bank of data is important and is a task associated with each project.

A third goal of DMS is to control access to the different programs available to the designer while working in a graphics design file. For instance, after graphically constructing a specific design, some type of program may be desired to help evaluate the work.

DMS Organization
WE WILL NOW LOOK AT FIVE AREAS THAT COVER THE TECHNIQUES THAT ARE USED TO IMPLEMENT THE DETAILS OF THE DMS SYSTEM ORGANIZATION TO MEET THE THREE GOALS AS DEFINED ON THE PREVIOUS PAGE. THE FIRST PART WILL LOOK AT DESIGN AND REFERENCE FILES IN RELATIONSHIP TO COMMUNICATION AND INFORMATION MANAGEMENT. NEXT WE WILL LOOK AT THE AUTHOR'S CUSTOM DIGITIZER MENUS THAT ARE USED TO WORK INTERACTIVELY IN THE DESIGN AND DMS REFERENCE FILES. THE THIRD SECTION PRESENTS CUSTOM SCREEN MENUS THAT ARE USED TO QUICKLY INTERFACE DIFFERENT TASKS. IN THE FOURTH PART WE LOOK AT ONE SPECIFIC TASK, AN ANALYTICAL PROGRAM, RELATED TO ENERGY.

DESIGN & REFERENCE FILES

THE DESIGN FILE IS LIKE TRACING PAPER WITH THE ABILITY TO ACCOMODATE THOUSANDS OF OVERLAYS. OVERLAYS ON THE BOTTOM CAN BE EASILY MOVED TO THE TOP OR MADE ACTIVE SO THAT THE USER CAN IMPUT DATA.

THE 'EXCHANGE DESIGN' COMMAND ALLOWS ONE TO READILY SWITCH FROM ONE FILE TO ANOTHER IN A MATTER OF SECONDS.

IF THE PROJECT IS STRUCTURED SO THAT ONE FILE IS USED TO MANAGE INFORMATION (90% TEXT), AND THE OTHER FOR DESIGN (90% GRAPHICS), THEN A DYNAMIC RELATIONSHIP IS ESTABLISHED BY BEING ABLE TO VISUALLY REFERENCE CONTRASTING DATA STRUCTURES (TEXT & GRAPHICS).

IT IS THIS AUTHOR'S CONTENTION THAT THIS METHOD IS WELL SUITED TO DOCUMENT AND MANAGE THE CONSTANT GEARCHANGING NATURE OF ARCHITECTURAL DESIGN.

IT IS THIS TYPE OF SITUATION THAT I HOPE TO EMULATE (IN RELATION TO SPEED/ACCESSABILITY) FOR OTHER DESIGN TASKS.
THE ORIGINAL CONCEPT FOR THE DMS REFERENCE FILE WAS TO HAVE 223 STEPS AS OUTLINED IN THE AIA PROJECT CHECKLIST (DOCUMENT D200) ACROSS THE TOP OF WHAT WOULD NORMALLY BE A DRAWING.

THE INFORMATION WOULD THEN BE INPUT ON OR UNDER THE APPROPRIATE STEP, AS MORE INFORMATION IS COLLECTED, COLUMNS OF INFORMATION WILL FORM IDENTIFYING TAGS ARE LOCATED ABOVE EACH STEP OR COLUMN AND ARE SCALED SO THAT ONE CAN IDENTIFY WHERE TO PLACE OR FIND INFORMATION.

DESIGN FILE

IDENTIFYING TAGS IDENTIFYING TAGS
IDENTIFYING TAGS IDENTIFYING TAGS 223 STEPS

TIME

DMS REF*1

SINCE THE REFERENCE FILE CAN SIMULTANEOUSLY BE VIEWED BY ANY NUMBER OF USERS IT CAN PROVIDE A STANDARD MEDIUM OF INTERFACING INFORMATION, IDEAS, AND COMMUNICATION AS WELL AS SERVING AS THE PRIMARY MEDIUM OF PERMANENT DOCUMENTATION.

THIS METHOD IS BASED ON THE PREDEFINED IDEA THAT INFORMATION WILL BE CATEGORIZED BY THE 223 AIA STEPS AND CONTIGUOUS CHRONOLOGICAL DEVELOPMENT IN THE Y AXIS (TIME).
OTHER SCHEMES MAY SWAP THE X & Y AXIS AND EXPRESS TIME IN RELATION TO A SPECIFIC DEADLINE.
THE OPTIONS FOR CATAGORIZING ARE UNLIMITED ESPECIALLY IF ONE CAN UTILIZE THE 3RD DIMENSION COMBINED WITH THE 63 DIFFERENT LEVELS FOR EACH FILE.

THIS SYSTEM TRIES TO LIMIT THE COMPLEXITY AT THIS POINT BY TREATING THE DMS REFERENCE FILE AS A SERIES OF 8 1/2" x 11" 20 SHEETS ON A SINGLE PLANE THAT FLOATS UNDER THE 3D GRAPHIC FILES.

THE ORIGINAL CONCEPT TO USE THE AIA 2000 DOCUMENT DID MATCH THE ORGANIZATIONAL NEEDS OF THE THESIS.
THE DMS FILE WAS THEN RECATAGORIZED BY TOPICS RELATING TO THE THESIS AND HAS BEEN THE PRIMARY MEDIUM OF EXPRESSION FOR THIS THESIS.
CUSTOM MENUS

THE INTERGRAPH CAN BE CHARACTERIZED AS A MENU DRIVEN SYSTEM. SPECIAL TECHNIQUES ALLOW MENUS TO BE DEVELOPED BY INDIVIDUAL USERS. CUSTOM MENUS ALLOW RAPID SELECTION OF USER DEFINED FUNCTIONS SUCH AS CELLS (FREQUENTLY USED ITEMS I.E. DOORS WINDOWS), USER COMMANDS (PROGRAMS) OR EVEN SPECIAL SCREEN MENUS.

THIS MENU WAS DESIGNED SPECIFICALLY FOR SCHEMATIC DESIGN WORK

2D FUNCTION KEY MENU

TUT XD = AA = RD = AC = RV = AS = ON = LV = OF = TX = DX = DL = DI

3D FUNCTION KEY MENU

TUT XD = DI = DL = AC = RV = RV = RV = X = Y = Z = Y = -Y = +Z = -Z

FUNCTION KEY MENUS ARE NICE FOR FREQUENTLY USED KEYS. THE TUT KEY IS FOR ACCESS TO SCREEN MENUS. XD= MAKES THE DMS INFORMATION FILE ACTIVE. THE XYZ'S ARE SPECIFIC PERCISION INPUTS FOR 3D.

SEE THE REFERENCE "INTERACTIVE GRAPHICS DESIGN SOFTWARE OPERATING MANUAL" FOR AN EXPLANATION OF THE OTHER 2-CHARACTER KEYS.

CURSOR BUTTON MENU

98% OF ONE'S OPERATING COMMANDS CAN BE SELECTED FROM THE CURSOR BOTTOM MENU
These special screen menus allow rapid interfacing similar to regular menus. Tutone is a key entry point to all other screen menus. By placing a point in the box of choice one is automatically presented with another screen menu to allow further definition of the specific task of interest.

For instance, by identifying energy in Tutone, one is presented with another screen menu called Aenerg, that provides several choices of energy-related analysis tools or the ability to return to the master point of entry.

These menus can be structured to allow quick access to an infinite number of tasks as per the designers' needs and wishes.
AN ANALYTICAL PROGRAM

THE ANALYTICAL TOOL DEVELOPED WAS BASED ON THE SOLAR SAVINGS FRACTION METHOD. INPUTS CONSIDER HEAT LOSS, SOLAR GAIN, ORIENTATION, TRANSMITTED ENERGY AND OVERHANG CONFIGURATION.

OUTPUT IS TOTAL ANNUAL AUXILIARY HEAT REQUIRED PER MONTH OR YEAR.

IT IS PROGRAMMED IN THE STANDARD INTERGRAPH USERS 'COMMAND LANGUAGE'.

THE INTERFACE IS MADE BY 8 SCREEN MENUS AND INTERACTIVE PROMPTS.

OUTPUT IS DUMPED THROUGH A STANDARD DISPLAY FOR THE USERS PERMANENT RECORDS.

SEE APPENDIX B FOR A COMPLETE OVERVIEW OF THE SOLAR SAVINGS FRACTION (SSF)
SCREEN MENUS USED WITH ENERGY PROGRAM

- INDIANAPOLIS
- GAINSVILLE
- PHOENIX

- 'AT-CITY'
- 'AT-BTUTBL'

- 'AT-ORIENT'
- 'AT-OVERH'

- 'AT-OVERH1'
- 'AT-OVERH2'

- EFFECTS OF OVERHANG

- 'AT-SSF1'
- 'AT-SSF2'

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PROBLEMS

TIME EXTENSIVE TASK OF CREATING DETAILED 3D CELLS.
TRY TO LIMIT THE SIZE AND COMPLEXITY BY SIMPLIFYING THE OBJECT.
CREATE SYMBOLS OR A SPECIAL FONT LIBRARY

TIME REQUIRED TO LEARN TO OPERATE 2D GRAPHICS (APPROX 500 HRS)
LEARN BY WATCHING TECHNIQUES OF EXPERIENCED OPERATORS

EXPLAINING PROCESSES TO THE UNFAMILIAR
EXPLAIN ONCE, CITE REFERENCE & MOVE AHEAD

CONVERTING 2D TO 3D
USE PROGRAM CALLED 2T3
THE GOAL OF THE DESIGN PROCESS IS THE CREATIVE RESOLUTION OF BOTH DEFINED PROBLEMS AND UNDISCOVERED PROBLEMS NECESSARY TO REACH YOUR OBJECTIVES

THIS DESIGN APPROACH CENTERS AROUND THE IDEA OF MAKING DECISIONS AS EARLY AND AS QUICKLY AS POSSIBLE FOR THE FOLLOWING 2 REASONS.