CSL COORDINATED SCIENCE LABORATORY

A DESCRIPTIVE LIST OF PLATO PROGRAMS

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Introduction

From 1960-1967 an automatic teaching system called PLATO (Programmed Logic for Automatic Teaching Operation) was developed in the Coordinated Science Laboratory at the University of Illinois in order to explore the possibilities of automation in individual instruction.[4,6,7,16] In the course of development over 300 programs (using about 50 logics) have been written for the system to illustrate or demonstrate its flexibility for teaching as well as for educational and other research.

In January, 1967, the University of Illinois organized the Computer-based Education Research Laboratory. Research with the PLATO system continues in the new laboratory. The laboratory has assumed responsibility for the direction of more intensive study of the educational aspects of the PLATO teaching system with particular emphasis on the development of a large-scale computer-based educational system.

The PLATO system utilizes a high speed digital computer as the central control element for teaching a number of students simultaneously. The rules governing the teaching process are included in the program read into the central computer. A complete set of rules is referred to as a "teaching logic". Experiments have been made with several different types of teaching logics significant among which are a "tutorial logic" and an "inquiry logic."[4,5,6,8]

This report supercedes CSL Report R-296.[17] It lists with brief descriptions the teaching lesson sequences which have been using tutorial logics, inquiry logics or combinations thereof. The version of the PLATO system for which the lessons were written is specified in each instance. PLATO I and PLATO II lessons are no longer operable because the PLATO I and PLATO II systems are now obsolete, but several of these lessons have been rewritten for the present version of the software and hardware of the system, PLATO III.

In addition to the instructive uses of the PLATO system, the system has also found application in other areas of research. These programs, each of which has its own logic, are listed in the report as research programs. They include learning theory experiments, psycholinguistic studies, on-line analysis of real experiments, etc.

In this report is also included a list of service programs which have been developed to aid PLATO authors and programmers in writing, editing, and evaluating their programs directly from PLATO terminals.

TEACHING PROGRAMS

A. Tutorial Logics

1. **Perimeter of Polygons** (PLATO I, II, III). A simple geometry demonstration lesson on perimeters designed to illustrate all the features of the PLATO system (i.e., control keys, help sequences, judging, evaluating, etc.), updated for each new version of the PLATO system.

2. **Addition of Fractions** (PLATO I, III). A demonstration lesson on fractions showing the use of the PLATO keyset and improvements (PLATO III version) in the flexibility of the teaching logic.

3. **Introduction to Automatic Digital Computing** (PLATO II).[11,12] Three lessons comprising the first week of material taught in Math 195 (U of I): I. The Word as a Number; II. A. The Biquinary Code, B. The Storage Unit; III. A. The Arithmetic Unit, B. Instruction Format, C. The Control Unit, D. Execution of Single Instructions. Data collected from student runs provided material for studying the learning ability of each student, lesson effectiveness, and data rate requirements of the PLATO system.

4. **Introduction to Computer Programming** (PLATO II). Seven lessons designed to teach programming for the ILLIAC computer and written with PLATO tutorial logic. Chapter titles included: I. Number Representations; II. Binary Arithmetic; III. Negative Number Representations; IV. The ILLIAC Order Code (Part 2); VII. The ILLIAC Order Code (Part 3).

5. **Network Synthesis** (PLATO II).[3] Two short lessons in network synthesis for electrical engineering students demonstrating circuit diagram construction by means of the PLATO keyset and a judging routine allowing a tolerance in numerical answers and a degree of freedom in the answer form.

6. **Maxwell's Equation** (PLATO II). Three lessons introducing material on Maxwell's Equations to senior engineering students taking EE 355 (U of I): I. Introduction to Maxwell's Equations; II. Boundary Conditions at a Surface of Discontinuity; III. The Wave Equations in Free Space.

7. _Things and Their Names_ (PLATO II). Two lessons in introductory secondary mathematics dealing with the subject of "Things and Their Names," designed for incoming sub-freshmen at University High School.

8. CHAOS (PLATO II). An exercise on number sequences written for use with the studies on physiological correlates of mathematical discovery in which student heart rates were recorded along with the lesson responses.

9. ZOO (PLATO II). A second grade level mathematics demonstration lesson (with a zoo theme) written for primary school children visiting the PLATO project.

10. TEXT TESTER (PLATO III). A program designed to test new text-books in which text materials are reproduced on slides with student answers inserted from the keyboard. Teacher comments and lesson modifications are also able to be inserted on line. TEXT TESTER has been used to present lessons in the following areas: a) Remedial Arithmetic from the University of Illinois Committee on School Mathematics 7th grade course (20 lessons); b) Politics Unit from experimental materials of the Social Sciences Curriculum Center (12 lessons).

11. _Circuit Analysis_ (PLATO III).[15] Lessons written for use in conjunction with a University of Illinois course for junior year electrical engineering students (Electrical Engineering 322). The PLATO material has been presented five semesters each time in a different manner with variations in either content, method of presentation, or amounts of material presented via PLATO.

12. ARITH DRILL (PLATO III). Arithmetic drill sequences for low achievers from sixth and seventh grades.

13. LIBUSE (PLATO III). 14 units (28 lessons) comprising a one semester course, "An Introduction to the Use of the Library," given to non-library science majors at the University of Illinois (Library Science 195).

14. _Fortran Programming_ (PLATO III). Ten lessons on the Fortran programming language written for students in business and commerce in which the material is presented so as to be incorporated eventually into a programmed textbook.

15. DEMO (PLATO III). A program illustrating various possible functions of the keys of a PLATO keyset, written as a preface to some of the courses given on the PLATO system.

16. ARRAYS (PLATO III). Four lessons for fourth grade pupils (about one hour each) using arrays of symbols.

17. SEQUENCES (PLATO III). Nine one-hour lessons on recursive definitions for high school students.

18. QUANTITIES (PLATO III). Test development and studies of quantitative aptitude in higher education students.

19. TEXT EDIT (PLATO III). (Some versions called BRAILLE) A tutorial type teaching logic that permits textual slides, questions stored in memory and plotted on the "blackboard," and student inputs from an auxiliary device (such as a BRAILLE typewriter), as well as on-line editing.

20. PROGMAT (PLATO III). A program using PLATO to collect and analyze data on Raven's _Progressive Matrices Test_ (non-verbal test of pattern-handling capabilities).

21. _Language Instruction_ (PLATO III). Program designed to teach reading and writing of any major European language. Initially used for teaching reading skills in French.

22. GEOM1 (PLATO III). A lesson which introduces the keys used by the PLATO student to construct geometric figures on the screen. Subsequent lessons ask questions which may be answered by the construction of such figures.

B. Inquiry Logics

1. REPLAB (Responsive Environment Programmed Laboratory) (PLATO II and III).[9]
A lesson in scientific inquiry based on the properties of a bimetal strip in which the students inquire into the physical phenomenon in order to describe, analyze, predict, control and explain it. Important data is provided from student input for the multi-dimensional analysis of the inquiry process. The lesson uses an auxiliary film sequence to show the bimetal strip experiment.

2.   PROOF (PLATO II and III).[13] A program (with several versions which enables students to compose proofs of mathematical problems in a logical manner, each solution or proof being judged only for violations in logic. The most recent version of the program allows for insertion of lemmas in the proofs. The program provides a system for collecting data on thought processes during mathematical problem-solving or for preparing instructional programs in the mechanics of rigorous mathematical proof.

3.   MEDICARE (PLATO II).[10] A lesson for student nurses in the care of a patient with myocardial infarction using an auxiliary film sequence to provide the background material for the problem posed the students. Student input provided data for analysis of each student's approach to the solution of the problem.

4.   ORDER (PLATO II).[1,2] A timed exercise in numerical pattern recognition (more simple than CHAOS) used with the studies on physiological correlates of mathematical discovery.

5.   ARCH (Archimedes) (PLATO II and III). A demonstration lesson using PLATO as a simulated laboratory in which experiments based on Archimedes' Principle can be performed such as making volume or weight measurements.

6.   ALPHABAT (Alphabet Automatic Teaching) (PLATO III). A program designed for experimenting with the teaching by PLATO of the letters of the alphabet to two- and three-year old children.

7.   MAKING THINGS MOVE (PLATO II). An elementary science lesson based on a second grade science unit written as a demonstration for primary school children.

8.   TEACHER (PLATO III). A lesson designed to demonstrate the operation of the PLATO system to non-technical persons interested in preparing lessons for PLATO.

9.   Circuit Analysis (PLATO III).[15] A portion of the PLATO material for the circuit analysis course (see A-11) presented in the inquiry teaching style.

10. GENO (PLATO III). A simulated genetics laboratory for junior high school science students including an arithmetic computation facility for data calculations.

11. CNTBMDS (PLATO III). An experimental program for on-line design of structures such as continuous beams.

12. AUTOLAB (PLATO III). A simulated laboratory program introducing students to the techniques of collection, recording and analysis of data derived from measuring the stretch of springs.

13. MATRIX (PLATO III). Sequence designed to teach step by step matrix manipulation.

C. Combination Logics

1.   IMNURSE (PLATO III). A 12-unit course in maternity nursing for use in a 2-year diploma nursing curriculum. Emphasis is laid on inquiry training techniques although material is also presented tutorially. The twelve units represent approximately 48 student hours of lesson material. The general inquiry-tutorial logic is adaptable to any lesson material.

2.   GENET1 (PLATO III). Program for genetics problem-solving designed for use as a basic college genetics review.

RESEARCH PROGRAMS

1.   TALK (PLATO III). Short program to demonstrate communication between student stations.

2.   EXPERIMENT (PLATO III). A program which controls real-time on-line experiments in secondary emission surface physics study and immediately analyzes the experimental data, displaying the desired analysis on the PLATO screen.

3.   VERBOSE (PLATO III).[14] A program making possible an elementary analysis, in real time, of a word chain generated by a subject's free association.

4.   KEYSET 1 (PLATO III). A program to provide data for assessment of the relative efficiency of different configurations of the keys on the keyset input with input by long-hand writing.

5. <u>KEYSET 2</u> (PLATO III). Sequence designed to test keyset entry devices. Measures length of time for subject input and error formats.

6. <u>PAVLEW</u> (PLATO III).[21,18] (replaces CEWCODE) Basic program providing means of running verbal learning experiments on many subjects simultaneously under a variety of procedural, timing and materials conditions.

7. <u>CIRCLE</u> (PLATO III). Program designed for use in the production with the PLATO system of short, animated films for a language-free test of interpersonal norms. Each film strip, or scenario, portrays an interpersonal intention composed of discrete sequences of visual events identified with abstract, theoretical components.

8. <u>CONCEPT</u> (PLATO III).[19] A general concept attainment program allowing up to three logical types of concept rules and four methods of presenting stimuli.

9. <u>COMICAT</u> (PLATO III). (replaces GIN-1) A basic program permitting participants in group negotiations from PLATO stations to read, write, send and receive information, the sending and receiving under communication rules controlled by decision makers.

10. <u>VRBADV</u> (PLATO III). A program designed to test C. E. Osgood's theory of meaning by satiating components of denotated meanings, the effects of satiation being demonstrated by disturbed performance on a non-related task. The program invidually administers experimental sequences and allows measurements of latencies in situations where the speed of presentation is critical.

11. <u>VERB4</u> (PLATO III). Program to test attention control of subjects.

12. <u>MOVIE</u> (PLATO III). Program allowing slide sequences presentations at optional speeds.

13. <u>SAT TWO</u> (PLATO III). The second in a series of experiments testing Osgood's theory of meaning (see Research Program 10).

14. <u>SCRAMBLE</u> (PLATO III). Program controlling experiment in discovery learning for a basic human learning study.

PLATO III SERVICE PROGRAMS

1. <u>MONSTER</u>. Fast, flexible, time-shared editing system, allowing two PLATO users to edit CATO programs simultaneously using PLATO student terminals as input media. System includes subroutines for constructing PLATO FORMAT statements, and designing characters.

2. <u>COMMENT</u>. Program to sort student responses and print out comments.

3. <u>SPECTRE</u>. Simulation of subject sessions by rerunning the sessions as constructed from the recorded response data.

4. <u>TUDOPE</u> (replaces TUDOPE). Program presenting summary information about student responses to tutorial logic either on the PLATO display or as hard copy. Lists of student responses, response latencies or listogram plots are available.

5. <u>DODAD</u>. Diagnostic routine (giving labelled dumps of variables and subroutines) useful in debugging or interpreting CATO programs.

6. <u>NEWSORT</u>. Analysis program for selecting subsets of stored response parameters in which all records of keypushes have common characteristics. Also provides point graphs of response parameters. Records and graphs are available on the PLATO display or as hard copy.

7. <u>CLASSIFY</u>.[20] Routine to search and classify response data for specified patterns of student input.

8. <u>CATABLE</u>. Diagnostic routine giving labelled dumps, ordinal numbers, and absolute starting addresses of significant items in a CATO program.

9. <u>CHARPLT</u>. Routine to allow on-line design and construction of PLATO program characters on the PLATO screen, output in proper format for character listing being written onto magnetic tape.

10. <u>SETPLOT</u> and <u>PLOTTER</u>. Routines to prepare and output on the PLATO screen all information prepared by FORTRAN output statements (PRINT, WRITE, OUTPUT TAPE, PUNCH).

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13. ABSTRACT

This report supersedes CSL Report R-186 and CSL Report R-296 (June, 1966). It lists with brief descriptions the teaching lesson sequences which have been using tutorial logics, inquiry logics, or combinations thereof. The version of the PLATO system for which the lessons were written is specified in each instance. PLATO I and PLATO II lessons are no longer operable because the PLATO I and PLATO II systems are now obsolete, but several of these lessons have been rewritten for the present version of the software and hardware, PLATO III.

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