Notes on an Educational Program for
Computer-Oriented Remote Sensing Data Analysis

by

P. H. Swain and J. C. Lindenlaub

Outline

1. Background
   a. LARS Information Note 110471, "Remote Sensing Analysis:
      A Basic Preparation"
   b. Selected reading from LARS Annual Reports, Information
      Notes and the remote sensing literature

2. Introduction to LARS' multispectral image data processing system
   (LARSYS)
   a. "The LARSYS Software System: An Overview" (cassette tape
      with slides or figure notebook)

3. Introduction to the computer terminal
   a. "A Demonstration of the 2780 Remote Terminal" (lecture -
      demonstration)

4. On-line use of the computer terminal
   a. "How to Use the 2780 Remote Terminal: A Hands-on Experience"
      (tape/computer terminal)
   b. Selected reading from the "LARS Computer User's Guide"

5. Using LARSYS at the computer terminal
   a. "LARSYS Case Studies"
   b. LARSYS control card summaries

6a. Further work with LARSYS - applications viewpoint
   a. "Multispectral Data Analysis Using LARSYS: A Guided Tour"*
   b. Information Notes, LARSYS program documentation (as avail-
      able), etc.
   c. Applications-oriented data analysis problem

6b. Further work with LARSYS - data processing and analysis viewpoint
   a. "Multispectral Data Analysis Using LARSYS: A Guided Tour"*
   b. Program abstracts, Information Notes, etc.
   c. Intensive reading of "LARS Computer User's Guide"
   d. An introductory programming and analysis problem
   e. LARSYS documentation (as available)

7. Theoretical foundations for LARSYS
   a. "Pattern Recognition: A Basis for Remote Sensing Data Analysis"
      (short-course notes)

* Not yet available

Program Description

1. Background

    a. LARS Information Note 110471, "Remote Sensing Analysis:
A Basic Preparation." This Information Note is an introduction
to remote sensing stressing the importance of pattern recognition
in numerically-oriented remote sensing systems. Its specific
purpose is to provide a common background and orientation for
those who expect to make use of the LARSYS data analysis computer
software system. For newcomers to remote sensing, this manual
introduces concepts and terminology which are needed later on;
remote sensing veterans will be introduced in this material to
numerically-oriented remote sensing data analysis.

    The format of this Information Note resembles that of a pro-
grammed text. It is self-contained and the reader should require
no external assistance.

    b. Selected reading from LARS Annual Reports, Information
Notes, and the remote sensing literature. This material will
vary according to the specific application of remote sensing
in which the student is interested. Typical selections from the
LARS Annual Reports might include the following:

Volume	Pages	Subject
1	all	Concepts
2	33-43	Data Collection
	47-51	Data Handling
	57-63	DK-2 Data Analysis
	64-67	Future Experiments
	72-75	Satellite Test Site
3	6-58	Agricultural Remote Sensing
	148-160	The Potential for Remote Sensing
	165-171	Data Handling
4	11-41	Data Processing
	52-76	Applications Research
	76-86	Laboratories Studies

    Information Notes and/or selections from the remote sensing
literature may be selected to emphasize the discipline orientation
of the student.

2. Introduction to LARS' multispectral image data processing system
    (LARSYS)

    a. "The LARSYS Software System: An Overview". This material
consists of a tape-recorded text together with either a set of
slides or a notebook containing illustrations. It includes a
brief review of the "Basic Preparation" Information Note and gives
a sketch of many of the facilities for data analysis available in
the LARSYS Software System.

This unit of instruction is entirely self-contained and requires no external assistance except possibly some instruction on use of the audio-visual equipment.

3. Introduction to the computer terminal

a. "A Demonstration of the 2780 Remote Terminal." This material provides the student with an introduction to the data processing hardware which he will actually be working with and provides an opportunity to become more familiar with the LARSYS program package. Several LARSYS jobs are run from the 2780 remote terminal. The demonstration takes about an hour and requires a demonstrator to present the material and guide the student.

Required materials include a demonstrator's guide, a handout sheet for the student, and a deck of control cards to be used in running the LARSYS programs. The demonstration is very straight-forward and any person having some familiarity with the remote terminal hardware and LARSYS should be able to serve as the demonstrator.

4. On-line use of the computer terminal

a. "How to Use the 2780 Remote Terminal: A Hands-on Experience." This is the student's first opportunity to personally utilize the computer hardware. During this session he will receive an intro-duction and orientation to the hardware layout, use the 2780 off-line as a card lister, log in to the computer and initiate the LARSYS Control System, and run a set of sample LARSYS jobs utilizing the LARSPLAY and LARSYSAA programs. Approximately 90 minutes are required to complete this unit of instruction, and a consultant should be near-by to answer questions and assist the student should he encounter difficulty.

Required materials include a prerecorded cassette tape, tape player, and a set of instructions for the student. Any person having some familiarity with the remote terminal hardware and LARSYS should be able to serve as the consultant.

b. Selected reading from the "LARS Computer User's Guide"

Sections	Subject
1.1-1.4	Introduction
2.2	Software System
2.3	LARSYS
2.4	Data Library
3.0-3.3	How to Use the Computer
4.1-4.2	Documentation

At this point, the student should begin to become familiar with these sections of the LARS Computer User's Guide. A more comprehensive understanding of the materials in the User's Guide may be obtained by further study at a later time.

5. Using LARSYS at the computer terminal

   a. "LARSYS Case Studies". The "LARSYS Case Studies" is a set of problems which the student solves by using the computer terminal and the LARSYS programs. The purpose of these problems is to increase the student's experience in the use of LARSYS programs for multispectral scanner data analysis; and to help him develop an appreciation for the capabilities and limitations of the LARSYS Software System package. The educational material consists of a set of notes for the instructor and a set of problem statements for the student.

   The instructor should be reasonably familiar with the LARSYS programs. It is suggested that he assign the case study problems one at a time and interact with the student between problems.

   b. LARSYS control card summaries for the major LARSYS programs, intended to serve as reminders of control card format, may be obtained from the computer at any time the student is logged in at a computer terminal by typing "CTRLCARD" followed immediately by the name of the program for which the summary is desired. The student should obtain copies of the summary for LARSPLAY and LARSYSAA at this time and become familiar with them as he proceeds through the case studies.

6. Further work with LARSYS

   At this point, the student has been exposed to the facilities and capabilities of the LARSYS system. He now needs to gain enough familiarity with the system to feel comfortable in using it as a remote sensing data analysis tool. Precisely how he should go about this depends to some extent on whether he plans to utilize LARSYS for applications-oriented work or as a jumping-off point for further developing the data analysis technology. In either case, the instructor will want to suggest additional reading material and would do well to recommend a problem requiring further use of LARSYS and the computer system.

   At the present time, little user-oriented documentation of the LARSYS programs is available. This situation may be expected to be remedied in the future.

7. Theoretical foundations for LARSYS

    To make optimal use of LARSYS and to have the capability to
interpret the results with insight require that the user under-
stand the data analysis techniques implemented in LARSYS. These
are described, in elementary terms, in a set of short-course
notes entitled, "Pattern Recognition: A Basis for Remote Sensing
Data Analysis". The treatment presented in these notes is con-
siderably more extensive than that contained in the Information
Note studied earlier.

    This educational package contains basic materials and an outline
for general use of these materials. It is hoped that the individuals
using this package will be able to tailor it to satisfy their speci-
fic needs.

    The authors would greatly appreciate any comments or suggestions
users may have concerning these materials and their presentation.