GRAPHICAL FACILITIES AT THE SWISS METEOROLOGICAL INSTITUTE

HP Roesli
Osservatorio Ticinese
Swiss Meteorological Institute
CH-6005 Locarno-Monti
Switzerland

1. Introduction

Many services of the Swiss Meteorological Institute (SMI) are geographically decentralized. This explains the relatively large number of computing and graphical facilities found in the offices. Those non-forecasting services, which are relying heavily on graphics, have either small local systems or are using university facilities. Their graphical products are plots of any kind, mainly for advice in problems in the field of solar radiation and of the boundary layer. In general, these services are working with their own meteorological data sets using off-the-shelf plot packages on plotters of various makes.

Only the weather forecasting branch, which is split into four regional forecasting offices, has common data processing and distribution systems. For the reception of graphics and image products all offices dispose of the same terminals. Plotting terminals hooked up to the main computing facility METEOR at Zürich present meteorological data from GTS and Switzerland. Satellite images are received centrally and distributed in real time to laser facsimile recorders. Two radars send their digitized pictures to colour TV monitors. In the near future better use of the capabilities of the satellite and radar terminals will be made by the insertion of the system DISAT in front of them. A further graphical device exists only as a pilot terminal: continuously updated through the Swiss network of automatic weather stations (ANETZ), it displays SWISS WEATHER on a colour TV screen.

In the following sections the graphical facilities of METEOR, DISAT and SWISS WEATHER are briefly described.

2. Graphics under METEOR

A mix of Siemens computers collects and retransmits to the forecasting offices the meteorological data received from the Swiss observation networks and via GTS. The development of METEOR dates back to the late sixties.

For graphics Siemens flat-bed pen plotters are used, which allow for two-coloured plots on paper sizes of up to 60*90cm2. The plot software is written in assembler language. The graphical products available under METEOR range from radiosonde plots over various surface, upper-air and climatological charts to contours of numerically forecasted fields. The second colour serves to enhance significant features. All products are plotted on printed forms which already display general references like geopolitical borders and scales. The single plots are ordered from a video terminal or a telex.

As the plotters have no local processing capabilities, the plot data transmitted from the computer are the individual pen motions. The plotting speed is very low. Typically, a surface chart with about 400 stations takes 100 minutes. Because of the slow speed (but also for back-up purposes) each forecasting office disposes of two plotters, which are connected with the central computer via 2400bd-channels.

3. Graphics and image processing with DISAT

There are two other terminals in the forecasting offices with graphical capabilities. So far, they have only been used for the display of satellite and radar imagery.

Satellite images are written to dry-silver paper in a laser facsimile recorder. The recorder has been designed to SMI-specifications. It offers several local processing capabilities like zooming and grey-scale transformations. All local functions are either under manual or remote control. The satellite images are received centrally and distributed to the recorders in analogue form over unconditioned telephone lines. A typical transmission time for one image is 200 seconds (METEOSAT WEFAX transmission).

Radar pictures are displayed on a colour TV monitor. The image information is resolved in 256 lines by 320 pixels. Each pixel is 4 bit deep (3 colour bits and 1 graphics bit). The four last images are retained in the terminal, with only limited (manually operated rotating switch) looping capabilities, however. Other switches on the front panel allow for the manipulation of the colour attribution and of the graphical information. The radar information comes from two weather radars, both of which have on-site data processing down to a single TV picture per volume scan. The digitized picture is regularly transmitted over a 2400bd-channel. The transmission time for a single picture is some 200 seconds. For further details of the radar system see (1).

In the near future project DISAT inserts a VAX-computer of DEC between the receivers of satellite/radar data and the two terminal types. In the case of a computer failure DISAT falls back on the (existing) direct distributions scheme.

The short-range goals of DISAT are to improve on the enhancement of satellite pictures, to transform them to other geographical projections and to combine the information of the two radars into a single picture with updates at 5-minute intervals. It is also planned to cross-transmit the information, i.e. the radar picture to the satellite terminal and vice-versa. Sending the satellite pictures to the colour TV monitor, for instance, its looping feature can be used. Or, on the laser recorder the zooming capability is used for the simultaneous transmission of two pictures side-by-side, with the local user zooming in on the picture of interest. Scheduling of the two data streams is forecaster-specific. On-line, the forecasters may change or switch the lists containing the schedules. A special command language is developed for this purpose.

The medium-range goals call for the inclusion in the picture processing of ground truth from the meso-scale network ANETZ. Combining these data, which arrive at 10-minute intervals from some 60 weather stations, with radar and satellite pictures various products of composite data can be foreseen. Several papers in (2) give an idea of the potential offered by such a kind of data

set. In addition, it is planned to produce cloud and precipitation climatologies of Switzerland from the satellite and radar information, respectively, and to take over some of the graphical products of METEOR, such as the numerical-forecast charts.

By the end of 1981 an interactive colour terminal (VS-11 of DEC-make) is added to the VAX-computer. It is mainly used as a fast imaging monitor for program testing. On the long run, it also serves as a test bed for future interactive graphics/image terminals in the forecasting offices.

Therefore, project DISAT is looking for a graphical subroutine package to be used for the presentation of observation data and of meteorological fields. For further details on DISAT see (3).

4. The presentation of SWISS WEATHER

The interrogating mini-computer of the meso-scale network ANETZ (4) produces various types of messages, which are retransmitted in real-time over the same telephone lines used for data collection. The main destination for these messages is METEOR.

One type of message distributed by ANETZ (besides e.g. SYNOP-messages) is a table containing all automatic data relevant to the regional forecasters of all the stations. The table is transmitted at one-hour intervals. SWISS WEATHER, basically an intelligent colour terminal (INTECOLOR 8001 by ISC), taps the ANETZ and directly reads out the tables to a floppy disk. The disk capacity is 48 hours by 60 stations by 21 parameters.

Based on this regularly updated data set various charts and diagrams of the more important weather elements may be displayed. In addition, a few, partly animated pictures show features of ANETZ and its measuring program. Using a mixture of coloured symbols and digital annotations the information content of a single picture is considerably increased without overloading it. The presentation of the pictures is menu-driven. When moving through the menu with the light pen, a short picture description is displayed on the screen for each touched picture item. The program suite is written in the terminal's ROM-based BASIC, which incorporates a set of calls to graphical routines. The terminal is a character-oriented device with semi-graphical capabilities

(graphical resolution 180 x 164 pixels with a foreground/background colour scheme).

SWISS WEATHER exists only as a prototype and has been developed to demonstrate to the forecasters the potential of ANETZ and of colour displays. But this way of presenting meteorological data also is very attractive to the general public. Due to its good transportability, SWISS WEATHER has been installed in meteorological booths at various exhibitions during the last three years. There, it has always been a focal point of the meteorological booth, because most pictures were easily understood by the visitors and the information was real-time.

5. References

1. Joss J 1978, Erfassung von Wetterrradardaten in der Schweiz Working reports of the Swiss Meteorological Institute, Nr.79.

2. Browning K A (editor) 1981, Nowcasting: Mesoscale observations and short-range prediction, Proc. IAMAP Symposium, Hamburg, 25-28 August 1981, ESA SP-165.

3. Gutermann T (editor) 1980, Digitale Satelliten- und Radarverarbeitung, Bericht der Arbeitsgruppe DIP, Swiss Meteorological Institute.

4. Gutermann T (editor) 1980, Projekt ANETZ 1974-1980: Automatisches Mess- und Beobachtungsnetz, Proc. ANETZ Kolloquien, Zuerich, 26-27 November 1980, Swiss Meteorological Institute.

Fig. 1 Example of output from Laser Facsimile Recorder