

THE METEOROLOGICAL WORKSTATION AT FMI

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Summary: A meteorological workstation has been developed at FMI during the past few years. This workstation serves as a tool for the meteorologist to access and combine different kinds of meteorological data.

1. INTRODUCTION

1.1. Why a Workstation

During this decade computers have invaded meteorological offices: There are separate terminals for satellite and radar information, data communications (weather messages), word processing etc. Data is viewed on paper, and on different terminals having different scales and different user interfaces. An idea of a single workstation, capable also of the new ways of representing meteorological data, evolved at FMI.

There are also purely meteorological reasons, that speak for the workstation. There is a lot of observational material, and part of it gets discarded in the traditional handling. On the other hand, part of the material is superfluous in some situations. The workstation offers a tool to use only the material that is needed, but maximizes the amount of material available. Secondly, with traditional methods it is impossible to overlay pixel graphics with vector graphics i.e. satellite and radar pictures with plottings and isoline charts. Combining different kinds of observations gives new extensions to the use of each type of observation material.

1.2. History

In June 1987 a new regional office was to be established in Turku. Having no previous technical infrastructure, this office became the test ground for the meteorological workstation. During winter 1986/87 some possible equipments were studied and tested. Because the results were promising, and because no commercial software was available, fulfilling our needs and fitting our schedule and money funds, it was decided to make such a workstation software

in house.

The first version of the software was capable of handling Meteosat images and Synop data. It was tested at a popular scientific exhibition in May 1987. In June the first production version was running in Turku. At present the workstation is used in all our 6 regional offices and at the "headquarters". One equipment is in the use of the public in the Finnish Scientific Centre, that also has its direct communications line into our weather data. Also the University of Helsinki will soon have its own equipment for training purposes.

1.3. Goals

The long term goal was to develop "The Meteorological Smelting Works", a tool to access and combine all kinds of meteorological data. The new system should be easy to use, flexible and fast. In the long run this workstation should be the only interface to all data entries and exits.

The basic concepts in designing the software were maximum flexibility in data representation, minimum response time and a friendly user interface.

1.4. Technical Details

Hardware within the workstations in FMI is microVAX with 8 plane graphics memory. All data are gathered into one computer node in the FMI local area network and transmitted to regional offices via dedicated Decnet lines. The workstation software is written in FORTRAN, and for efficiency reasons uses VAX's own graphics and windowing routine library (UIS), so the present version is not portable. There are plans, though, to test the new X-windows standard, and rewrite the software to make it more portable.

The workstation consists of separate display programs. Their data stream goes through a common master program, that also lets only one program at a time be active. At present the programs are:

- Workstation program
- Radar network program
- Weather station program

In this paper we concentrate in the first one. The second one represents the output from the three Finnish weather radars either as individual pictures or

as movie loop. The third program allows the user to display any northern hemisphere weather station's latest Synop in text form. Selection of the station is made with the pointer from the map, where all observations arrived are marked. This program is made mainly to be used by the public in the said Scientific Center.

2. THE WORKSTATION PROGRAM

2. 1. User Interface

The user interface is done with mouse only. There is no command language and the keyboard is not needed at all in the present version. Parameter, area and time choices are made with mouse in appropriate windows. The program is running permanently, and no logging-in is needed to be able to use the program.

2. 2. Independent Parameters

All parameters (Meteorological ones, Area and Time) are independent: if one is changed, it does not affect the rest.

2. 3. Data Selection

There are no predefined standard products in the system. A duty meteorologist may freely choose parameters (within the available ones) and geographical area he/she wants to study, depending on the direction of interest in the current weather situation. Due to the free choice of parameters, the forecaster can concentrate on essential ones.

2. 4. Use of Colours

Colour is used heavily to make the data more easily readable. For example synoptic temperature may be coloured depending on the temperature value or depending on another synoptic parameter. Because normally all available observations are showed, the large scale analysis is seen at a glance, while the markings form unicoloured zones. Also weather phenomena have their individual colours giving a quick way of locating areas of rain, fog, thunderstorm etc. In the equipment used it is possible to use 256 different colours at a time, 16 (as in some systems) would be far too few.

2.5. Response Time

In duty work response time should be as short as possible. The short response time was achieved by keeping all data in central memory, using special type of programming (ASTs), finding out the fastest graphics routines (this counts especially for pixel data and zooming), and not using any extra software layers (e.g. GKS). The present version of the software is about 100 times faster than the first version.

2.6. Real Time

Basically the program does two things: it displays data on the screen and keeps the data in memory up to date (destroying older data when new arrives). If the user wants to do something else with the workstation, the program can be made "fall asleep": the windows are closed, but it still updates the data always when new data are available. When forced to "wake up" again, the program is at once ready to display the latest data.

2.7. Parameters

The present program version makes use of Meteosat and Radar images, Synop and Temp data. Also ECMWF forecast fields are included both in conventional isoline form and in form of pseudo-satellite images and other locally produced fields (e.g. cloud type and weather phenomena) combining data from several levels.

2.8. Making Analysis on the Screen

The meteorologist has the possibility to draw lines, shade areas and put markings on the workstation display. This means that he can make the analysis on the screen. The drawings are automatically zoomed, when the area is changed, so the area can be changed during the analysis, thus allowing to work in different scales. These drawings can also be output with the displayed observations on hardcopy devices.

2.9. Trajectory Model

The workstation program serves as an interface to a trajectory model. The model is 3-dimensional and based on ECMWF fields. The output from the model is represented on the screen as a polyline arrow.

2. 10. Hardcopies

There are two ways to get hardcopies from the display:

- using the system facility to copy part of the screen on some bit oriented device.
- letting the workstation program make a metafile of the display, that file is then converted into a suitable format for a desired device e.g. a raster or pen plotter.

2. 11. Plottings

Traditional plottings (Synop or Upper Air) are possible by a different interface. In the regional offices there are alphanumeric terminals connected to the equipment, which are used for starting plottings. The plottings are output with a pen plotter on A3 size paper, that is either blank or preprinted with geography. Our aim is to minimize the amount of paper products, and guide the forecasters to utilize the workstation program.

2. 12. On-line help facility

The software includes a help facility. Once activated, the on-line help gives instructions to the user of possible functions in each position of the pointer. The user can choose the language of the instructions from three alternatives (Finnish, Swedish, English).

3. FUTURE PLANS

There is the possibility to add new display programs to the software. Possible candidates are

- a program to display NOAA-satellite pictures (polar orbiting satellite)
- a movie loop to display Meteosat and pseudo-satellite pictures

Also it is planned to add frequently changing land observations to the radar picture program (Metar and automatic weather station observations).

As mentioned before, one of the tasks to be accomplished in the future, is to transfer the software into X-windows programming environment. This transfer implies, however, development of a new generation of workstation software and may therefore take time of the order of 1-2 years.