MICRO-MAGICS: METEOROLOGICAL GRAPHICS ON MICROCOMPUTERS

Gilberto Camara Neto
Elisa Nishimura
André Battaiola
Carlos Ho Shih Ning
Nandamudi L. Vijaykumar
Luis Massa

INSTITUTE FOR SPACE RESEARCH
BRAZIL

Jens Daabeck

EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

ABSTRACT

The MICROMAGICS 1.0 software system is described. This software is used for plotting and animation of meteorological charts in the micro-computer environment, and includes a user-friendly interface.

RESUMO

Este trabalho apresenta o produto MicroMAGICS 1.0, utilizado para plotagem e animação de cartas meteorológicas, que inclui uma interface amigável.

1. INTRODUCTION

The European Centre for Medium-Range Weather Forecasts (ECMWF) has developed a meteorological application software system called MAGICS/GKS (Meteorological Applications Graphics Integrated Colour System). The MAGICS/GKS system consists of a set of FORTRAN-callable subroutines which makes use of the GKS standard to assure computer and device independence. At ECMWF, it runs on CRAY X-MP, CYBER 800 and VAX 8350 series computers (Daabeck et alli, 1989).

This paper describes the MicroMAGICS 1.0 product, which is a version of the MAGICS/GKS software for a microcomputer environment, developed at INPE, through an agreement with ECMWF. It includes an interactive interface and an animation module, as well as suitable modifications to the original MAGICS/GKS code to enable it to run on a microcomputer.

2. CHARACTERISTICS OF MICRO-MAGICS 1.0

MicroMAGICS 1.0 was designed with the following user perspective in mind:

- The environment consists of a IBM-PC or compatible, using the MS-DOS operating system, with a standard EGA graphics board, or an INPE-developed SITIM-150/1 board (1024 x 1024 x 8 bits).

- The data is composed of observations, fields or graphical plots on standard formats, already resident on the micro-computer. The meteorological fields and observations abide by the standard GRIB and BUFR formats.

- The typical user is interested in generating and animating a sequence of plots.

On normal operation mode, the user first selects a sequence of fields (and/or observations) for examination, establishing what graphical function and geographical area are desired for each field.

As each plot is generated on the screen, the user may save it for creating an animation sequence, and for plotting on other graphical devices. In the first case, a slide is created, and in the second, a chart is generated. After a sequence of slides is generated, the user may view them in a carousel-like fashion.

The user can have complete control over the plots to be generated, since the plotting parameters are shown as a comprehensive list of English-language parameters.

MicroMAGICS 1.0 also enables the storage and retrieval of a set of parameters to generate the plots. This mechanism is very useful when making a predetermined sequence of plots or when the user already knows how he wants the output to appear.

3. MICRO-MAGICS 1.0 ORGANIZATION

3.1 INTERACTIVE INTERFACE

The interactive interface is composed of 4 command menus: DATASEL, VIEW, PARAMETER and UTILITIES.

The DATASEL option enables the user to select what he wants to visualize. He may choose from: GRIB-encoded fields, BUFR-encoded observations, charts (archived as metafiles) and carousels (animation sequences). To each field/observation selected, he must attach a pre-defined set of parameters.

The VIEW menu is where the graphical output is controlled, and the options available are: CREATE CHART (a new chart is created and shown to the user); VIEW CHART (a chart - already created - is viewed); CONTROL CAROUSEL (editing of a sequence of slides); ANIMATE (animate the sequence of slides selected by the user). The user also has some commands which control the graphical output: zoom, fit and activate (grid lines, coastlines and text).

The PARAMETER menu enables the user to inspect and modify the parameter values which control the generation of the plots.

The UTILITIES menu contains general book-keeping and maintenance functions.

3.2 FUNCTIONALITY

MicroMAGICS 1.0 enables the plotting of contours, observations, wind fields, text and legend. It generates plots in cylindrical and polar-stereographic projections, and allows the user the selection of a desired geographical area. For assuring better quality plots, the calculations are all performed in the latitude/longitude coordinate space and the final data is then projected into retangular projections.

The contouring method used is a linear one, with a smoothing procedure proposed by Akima (1970). The shading procedures available in Micro-MAGICS include dot and solid shading. In the first case, shades of varying dot densities may be chosen.

Wind fields in MicroMAGICS 1.0 may be plotted in four different ways: wind arrows, wind flags, streamlines and isotachs. A particularly useful type of chart is one where the wind information is combined with a temperature field; in this case, the colour of the arrow is determined by a slicing in temperature.

3.3 GRAPHICAL SUPPORT

The Image Processing Department of INPE agreed to develop a GKS implementation which supports the functionality needed in MicroMAGICS 1.0. This GKS implementation has been kept to a small size (Oliveira and Yamaguchi, 1989).

4. MILESTONES AND FURTHER DEVELOPMENTS

The first version of MicroMAGICS 1.0 will be available in the first quarter of 1989, and the second version of MicroMAGICS (to be developed during 1989) will include support for combining images and graphics and a version which will run on UNIX-based Sun workstations.

Since MicroMAGICS 1.0 is based on a very common and cheap environment, and offers a fairly large functionality, it is expected to be used by a large community. The World Meteorological Organization is considering adopting MicroMAGICS as a international standard software for meteorological graphics.

5. BIBLIOGRAPHY

AKIMA,H. "A new method of interpolation and smooth curve fitting based on local procedures", Journal of the ACM, October 1970.

DAABECK,J.; BESEV., G.; COLMAN, K.; O'SULLIVAN,P. "MAGICS/GKS - "The ECMWF Graphics package and its use for the production of video sequences". Fifth International Conferencce on Interactive Information and Processing Systems for Meteorology, Oceanography and Hydrology. American Meterological Society (AMS), Anaheim, USA, January 1989.

OLIVEIRA, J.R.F.; YAMAGUCHI, F.Y. "O Desenvolvimento do GKS-INPE". (The development of GKS-INPE). Submitted for presentation at II Brazilian Symposium on Computer Graphics and Image Processing. Águas de Lindoia (Brazil), April 1989 (in portuguese).