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Creating Interactive Graphical Overlays in the Advanced Weather Interactive Processing System Using Shapefiles and DGM Files

Joe H. Barrett III ENSCO, Inc/Applied Meteorology Unit
Richard Lafosse, Doris Hood, and Brian Hoeth
Spaceflight Meteorology Group

Graphical overlays can be created in real-time in the Advanced Weather Interactive Processing System (AWIPS) using shapefiles or Denver AWIPS Risk Reduction and Requirements Evaluation (DARE) Graphics Metafile (DGM) files. This presentation describes how to create graphical overlays on-the-fly for AWIPS, by using two examples of AWIPS applications that were created by the Applied Meteorology Unit (AMU) located at Cape Canaveral Air Force Station (CCAFS), Florida. The first example is the Anvil Threat Corridor Forecast Tool, which produces a shapefile that depicts a graphical threat corridor of the forecast movement of thunderstorm anvil clouds, based on the observed or forecast upper-level winds. This tool is used by the Spaceflight Meteorology Group (SMG) at Johnson Space Center, Texas and 45th Weather Squadron (45 WS) at CCAFS to analyze the threat of natural or space vehicle-triggered lightning over a location. The second example is a launch and landing trajectory tool that produces a DGM file that plots the ground track of space vehicles during launch or landing. The trajectory tool can be used by SMG and the 45 WS forecasters to analyze weather radar imagery along a launch or landing trajectory. The presentation will list the advantages and disadvantages of both file types for creating interactive graphical overlays in future AWIPS applications.

Shapefiles are a popular format used extensively in Geographical Information Systems. They are usually used in AWIPS to depict static map backgrounds. A shapefile stores the geometry and attribute information of spatial features in a dataset (ESRI 1998). Shapefiles can contain point, line, and polygon features. Each shapefile contains a main file, index file, and a dBASE table. The main file contains a record for each spatial feature, which describes the feature with a list of its vertices. The index file contains the offset of each record from the beginning of the main file. The dBASE table contains records for each attribute. Attributes are commonly used to label spatial features. Shapefiles can be viewed, but not created in AWIPS. As a result, either third-party software can be installed on an AWIPS workstation, or new software must be written to create shapefiles in the correct format. To save development time, the AMU decided to use a third-party software package, the Shapefile C Library V1.2 (<http://shapelib.maptools.org>).

The DGM file format is not as well-known and was created specifically for AWIPS. DGM files are binary files, containing a series of commands stored in two byte integers (GSD 2006). Unknown or incorrectly formatted commands are ignored by AWIPS. There are three drawing commands and the rest are state commands that stay in effect until they are changed. There is one state command that cannot be used in AWIPS - the command to set the drawing color. The color of AWIPS graphical overlays can only be manually changed by the user with the AWIPS D2D application. Each DGM command is represented by a unique "opcode" in hexadecimal format. Absolute coordinates normally are in minutes of latitude or longitude; east and south are positive. For example, 30 degrees north latitude is encoded as "-1800" (-60*30), and 80 degrees west longitude is encoded as "-4800" (-60*80). The most useful commands are:

- Draw Linked Vectors,
- Draw Unlinked Vectors,
- Draw Text,
- Set Text Centering,
- Set Text Orientation,
- Select Absolute Addressing,
- Select Relative Addressing, and
- Set Frame Size.

References

ESRI. *ESRI Shapefile Technical Description*, July 1998.
<http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf>. Accessed March 7, 2007.

NOAA Earth System Research Laboratory, Global System Division. *DARE Graphics Metafile (DGM) Instruction Format*, 2006. Unpublished.

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