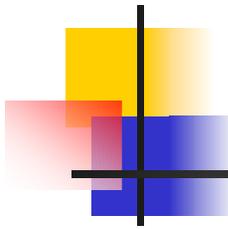


DAVE: Cooperative Development of Data Visualization and Analysis Software

Rob Dimeo

NIST Center for Neutron Research

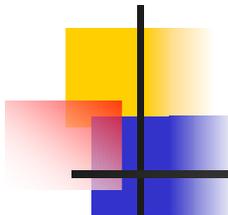
- What is DAVE?
- The DAVE team
- Motivation
- Development philosophy
- Development timeline
- Keys to success
- The DAVE development cycle
- DAVE users
- A look ahead



What is DAVE?

- *Data Analysis and Visualization Environment*
- Complete inelastic neutron scattering data treatment application from reduction through visualization and analysis
- Free software package available to all NCNR users
- A cooperative and iterative development process

IDL experience metric: 0.1-5% BL units



The DAVE team

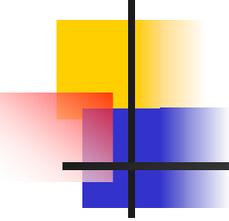
Data **A**nalysis and **V**isualization **E**nvironment, Version 1.0
NIST Center for Neutron Research

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Development team:

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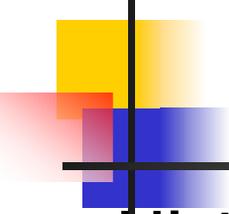


Motivation for DAVE

History

- Ad hoc collection of reduction, analysis and visualization programs for inelastic spectrometers

Addrun	(general purpose reduction, FORTRAN)
Fit	(general purpose analysis, FORTRAN)
Treat	(TOF reduction, FORTRAN/VMS)
Xtreat	(TOF reduction with GUI, FORTRAN/TCL/TK)
TANQENS	(TOF analysis, FORTRAN/TCL/TK)
MSLICE	(TOF visualization, MATLAB)
SQW	(TOF reduction, octave/perl/tk)
TASXP	(TAS analysis, IDL)
MUPHCOR	(TOF data corrections, FORTRAN)
XMGR	(general purpose viewing and fitting, UNIX)
FANS	(FANS reduction/visualization, perl/tcl/tk)
Kaleidagraph®	(general purpose visualization/analysis)
Origin®	(general purpose visualization/analysis)
Excel®	(general purpose visualization/analysis)

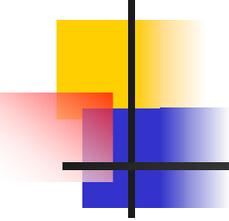


Motivation for DAVE

History

- No central repository for programs
- Software had “many different faces”
- No clear way to get programs to work easily at users’ home institutions
- Tied users to facility for data reduction and analysis unless they developed their own reduction and analysis code ⇒ not conducive to iterative “what if” types of analysis by novice users

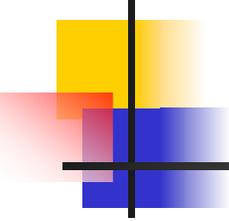
⇒ Clear need for user-friendly and coherent reduction, visualization, and analysis software



Motivation for DAVE

NCNR Response: software design goals

- Develop a common user-friendly toolbox addressing the software requirements of the NCNR user community very rapidly
- Provide a seamless environment of reduction, visualization, and analysis applications
- Instrument scientist should play key role in development, particularly data reduction aspects
- Freely available for multiple OS platforms at no cost to users

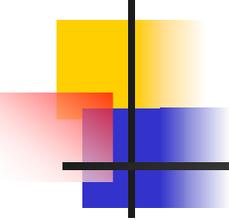


Software development philosophy

- Make it easy for scientists to code an application quickly and incorporate it into the DAVE suite
- Optimize this effort for immediate progress

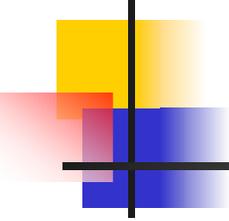
HOW?

- Choose a mature programming language with high level analysis and visualization features and a complete GUI toolkit allowing rapid application development
- Stimulate a “grass roots” effort to facilitate rapid distributed development



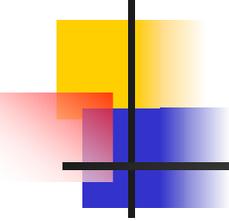
Development timeline

- November, 2001: Internal data structure decided by the original four members of the development team
- January, 2002: Internal beta release (NCNR)
- July, 2002: Public beta release (web deployment)
- December, 2002: Public release, v 1.0



Keys to success

- Mandate at the management level for data reduction software for all inelastic instruments within the purview of CHRNS to be developed within the DAVE framework
- IDL (Interactive Data Language) chosen for data manipulation capabilities, image processing, high level numerical analysis, GUI toolkit, and ability to distribute executable software on multiple platforms at no cost to end user
- Education and outreach: provide free training to scientists and interested users in application development (visualization and analysis)



Keys to success

- Development team: computer and instrument scientists with diverse talents and backgrounds and some programming experience with IDL
- Instrument scientists' expertise for data reduction and analysis requirements
- Computer scientists' expertise for software maintenance, deployment, bug report handling, web presence, etc.

Reduction

DCS
FANS
FCS
HFBS
TAS

Visualization

Trifenestra
Simple image slicer
Multiple data slicer

Analysis

PAN (Peak ANalysis)
Fixed window scan analysis

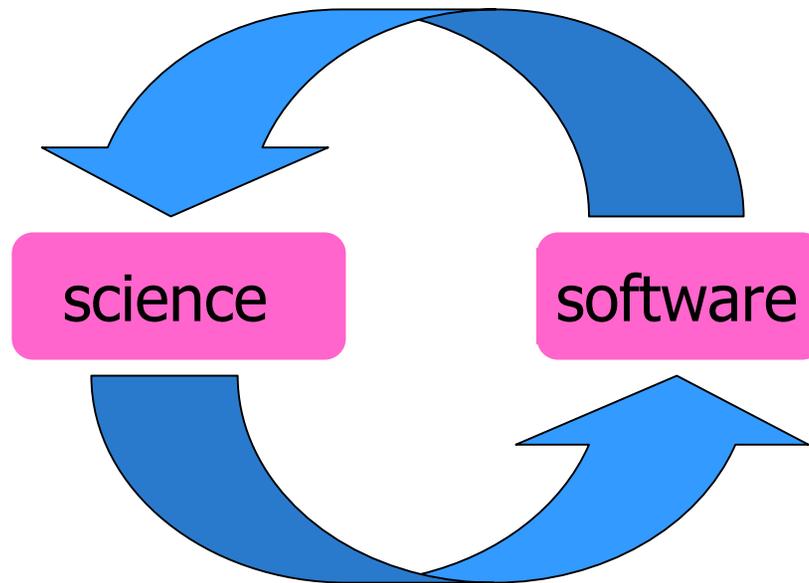
Experimental Planning

Neutron calculator
Self-shielding calculator
TOF instrumental configuration

Miscellaneous Tools

TAS spurion calculator
Hindered methyl rotations
Hindered diatomic rotations
Image digitization

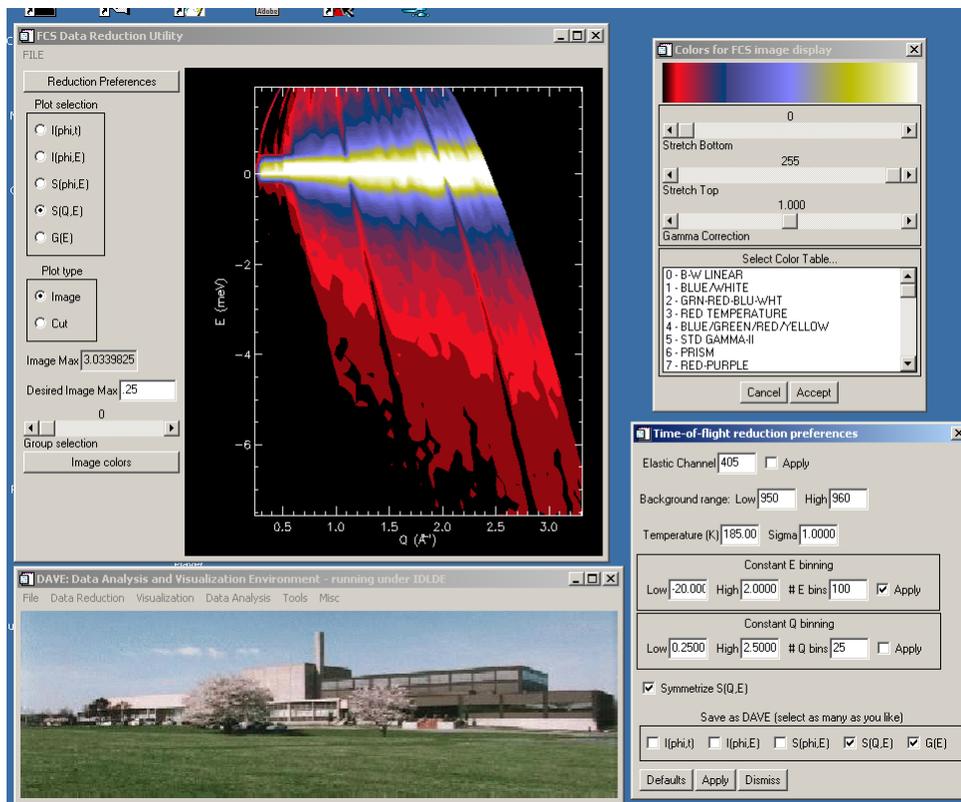
DAVE development cycle



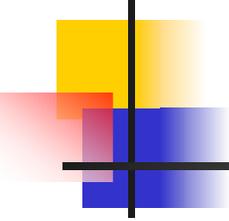
- Scientific needs drive application development
- Novel reduction and visualization techniques encourage use of novel measurement techniques

DAVE development cycle

Scientific needs drive application development \Rightarrow FCS data reduction application



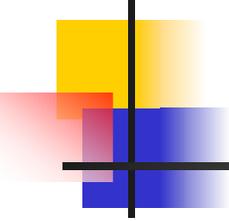
- Prototype written by DAVE developer
- Deployed in latest DAVE release (January 21, 2003)
- FCS instrument scientist extending code with additional enhancements
- Developer and instrument scientist will work closely on further development of program



DAVE users

- NCNR users of time-of-flight, triple-axis and backscattering spectrometers: BT4 (FANS), BT2, BT7, BT9, SPINS, DCS, FCS, HFBS
- Members of the US neutron scattering community analyzing data taken on neutron spectrometers from all over the world:

e.g. Grenoble, Argonne, Berlin, Switzerland, Oxford



DAVE users

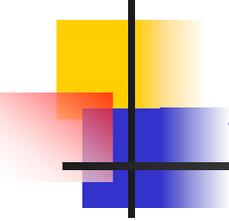
Total DAVE downloads: 892 = 540 (within NIST) + 352 (outside NIST)

- 87 unique IP addresses within NIST
- 144 unique IP addresses outside of NIST

Total DAVE website hits = 12339

- 967 unique IP addresses

Very positive user feedback since beta release in January 2002



A look ahead

- DATABROWSER: Easier interface to visualize and manipulate many data sets!
- MSLICE to be added to DAVE
- NSE data reduction to be developed
- As instrument data file formats convert to HDF, DAVE will support this format \Rightarrow allow visualization and analysis of data taken at other facilities without a proliferation of read filters
- Shared development effort with users outside of NCNR