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Note that any item given to a non-human must be checked for safety alone and in combination with other ingredients or medicines for that animal. Animals including dogs and cats have decreased tolerance for many common ingredients in things meant for human consumption.

I am not a veterinarian or a doctor or health care professional and this is not particular advice for any given situation. Read the disclaimers in the appendicies or text, take them seriously and take prudent steps to evaluate this information.

This work addresses a controversial topic and likely advances one or more viewpoints that are not well accepted in an attempt to resolve confusion. The reader is assumed familiar with the related literature and controversial issues and in any case should seek additional input from sources the reader trusts likely with differing opinions. For information and thought only not intended for any particular purpose. Caveat Emptor

Readers may experience discalimer fatigue. Doe not proceed if you are weary or unable to thnk clearly

MJMDatascope : A viewer for streamed numerical data

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MJMDatascope is designed to be a lightweight viewer or previewer for streaming numerical data from a variety of sources such as "R", FEM codes such as FreeFem++, and custom or proprietary numerical code with a current interface for c++. It is not designed to be particularly feature rich or generate publication quality output but mostly to monitor and compare number streams from disparate sources while providing a uniform user interface. The current form (2023-09-14) is proof of concept and not usable by most users except developers with an interest in numerical codes. Note that with a simple interface, it could be used to plot streams of numbers from stdin making it useful for a variety of monitoring tasks.

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1. INTRODUCTION

Many numerical codes exist in a spectrum of applications from comprehensive symbolic math packages such as Mathematica , distributed simulators running on supercomputers, personal FEM codes, to just generation of a list of numbers piped in from stdin. In most cases, results are sent to a file for analysis off line or plotted synchronously at various times. Display applications vary widely too. As the data types are diverse, it may be expected that diverse viewers also exist and are optimized for each type. However, for a range of applications a simple unobtrusive monitoring system may be useful and that is the niche targeted by MJMDatascope.

Numerical data generating code interfaces to the viewer only via a connection such as a linux fifo or UDP packets cleanly separating the generator from the unreliable consumer. Currently, interfaces are provided for Freefem++, R, and most c++ code although the range of sources should be easily expanded.

All aspects of MJMDatascope are currently being improved including the API. The current graphics implementation is largely in GLUT, as was my code from 2007. There is some possibility of doing this with a browser plugin but that removes the "lightweight" attribute.

2. HISTORY AND CONTEXT

Going back at least to 2007, I wanted to be able to stream simple data in real time into a display application and began writing some simple code but quickly dropped the project. While learning to use Freefem++, I noted that their graphics was organized in a similar way to my earlier interests but there was no obvious easy way to plot 1D data. In any case, I needed that to develop my own finite difference code and make comparisons easy.

In a quick discussion on the R devel mailing list, the package Trend was brought to my attention and this is very similar to my earlier interests. It is possible that that package or an adaptation of the Freefem++ graphics code may be made to work similarly to MJMDatascope.

3. DOWNLOAD, BUILD, INSTALL

Currently the proof of concept code has been put up on github under the mmarchywka account. The components include the viewer source code, configuration files, and interfaces with examples and their configuration files. All of the source code is written as c++ header files making it easy to use a given class in an app or as a standalone simple/test app. Building is just a matter of one compile and link step. Most of this code goes into a header library on my local machine but I just merged all the dependencies into this repo for now.

3.1. MJMDatascope

```
./run_datascope -compile
g++ -std=gnu++11 -DTEST_datascope__ -Wno-deprecated-declarations -gdwarf-3 -O0 -MMD -MF datascope.deps -I.
-I/home/documents/cpp/mjm/hlib/ -I/home/documents/cpp/mjm/num -I/home/documents/cpp/mjm/ -I/home/
documents/cpp/mjm/tcl -I/home/documents/cpp/mjm/include -I/home/documents/cpp/pkg/include -I/home/
documents/cpp/pkg -I../freefem -I/usr/include/GL -Wall -Wno-unused-variable -Wno-unused-function -Wno-
sign-compare -Wno-non-template-friend -Wno-misleading-indentation -x c++ ./datascope.h -o datascope.out
-lreadline -lpthread -lGL -lglut -lGLU -lglut -lpng -lavcodec -lswscale -lavutil
In file included from ./mjm_glut_scope_ii.h:7,
      from ./datascope.h:14:
./mjm_glut_saver.h:95:2: warning: #warning ate out deprecated crap [-Wcpp]
  95 | #warning ate out deprecated crap
      | ~~~~~~
./datascope.out -source listenraw.txt 2>&1
```

3.2. R interface

```
2340 R_util -buildins mjmdscope
```

```

build_ins()
{
  pnm="$1"
  pdir=`pwd`
  #cat << ---xxx---
  export PKG_CXXFLAGS=" -MMD -MF $pdir/$pnm.deps -I/home/documents/cpp/proj/datascope -I/home/documents/cpp/
    mjm/hlib -I/home/documents/cpp/proj/freefem -I/home/documents/cpp/mjm/num"
  export PKG_LIBS="-lpthread -lreadline "
  R CMD build "$pnm"
  R CMD INSTALL ${pnm}_1.0.tar.gz
  #---xxx---

```

3.3. Freefem++ interface

```
freefem_util -module mjm_dscope_freefem
```

```

# make new module
# https://doc.freefem.org/documentation/developers.html#a-first-example-myfunction-cpp
make_ff_module()
{
  fn="$1"
  #ff-c++ myfunction.cpp
  I=" -lpthread -lreadline -I. -I../datascope -I../mjm/hlib -I../mjm/num -I/home/ubuntu/dev/freefem/
    FreeFem-sources-4.12/src/fflib"
  # get deps
  echo making deps file first
  g++ -fPIC -c -g -MMD -MF $1.deps $I -I/home/ubuntu/dev/freefem/install/ff-petsc/r/include -I/home/ubuntu/
    dev/freefem/install/lib/ff++/4.12/include/ $I "$fn".cpp
  #g++ -bundle -undefined dynamic_lookup -g "$fn".o -o ./"$fn".dylib

  if [ "$SKIP_MODULE" == "" ]
  then
    ff-c++ $I "$fn".cpp
  fi

  #g++ -bundle -undefined dynamic_lookup -g "$fn".o -o ./"$fn".dylib
} # make_ff_module

```

3.4. A simple c++ app

This is not a minimal example but the results should compare to the Freefem++ example to illustrate the (vaporware) ability of MJMDatascope to compare similar data from various streams.

The compile command on my local machine is echoed by the script and can be modified to suit any local install,

```

!2298
. quickg++ -last
using mjm_simple_1d_dd.h
g++ -Wall -Wno-misleading-indentation -MMD -MF mjm_simple_1d_dd.deps -std=gnu++11 -DTEST_MJM_SIMPLE_1D_DD -
  I. -I../datascope -I../mjm/hlib -I../mjm/num -gdwarf-3 -O0 -x c++ mjm_simple_1d_dd.h -o
  mjm_simple_1d_dd.out -lpthread -lreadline
mjm_simple_1d_dd.h: In instantiation of 'void mjm_simple_1d_dd<Tr>::Run(const StrTy&, const StrTy&) [with
  Tr = Tr; mjm_simple_1d_dd<Tr>::StrTy = std::__cxx11::basic_string<char>]':
mjm_simple_1d_dd.h:794:44: required from 'void mjm_simple_1d_dd<Tr>::run(const StrTy&, const StrTy&) [with
  Tr = Tr; mjm_simple_1d_dd<Tr>::StrTy = std::__cxx11::basic_string<char>]'
mjm_simple_1d_dd.h:1326:37: required from here
mjm_simple_1d_dd.h:891:13: warning: unused variable 'cc' [-Wunused-variable]
  891 | const IdxTy cc=ComputeDn(dn,rv.dt,0);

```

4. RUNNING THE EXAMPLES

At this point, there should be a MJMDatascopeexecutable with a sample configuration file to begin listening on a default fifo. This is invoked with the command,

```
./datascope.out -source listenraw.txt 2>&1
```

```
cat listenraw.txt
# start the display although not needed right wawy
scope launch
# data client with no parameters
##dgram launch "ipv4s=192.168.4.1" 2
# server
#dgram launch "ipv4s=127.0.0.1" 3
rawfifo launch "ipv4s=127.0.0.1" 3
# client or data source a source is a source of course of course
#dgram launch "ipv4s=127.0.0.1" 2
# heart beat send no params
#send "chunks=sinewave"
#scope saver
#scope spr width=600;height=600;mpeg;mpeg_name=foodoo.mpeg;fps=30
#scope saver
displayfifo
```

At this point, a blank display window should appear along with a command prompt("mjm>") and a lot of informational messages. Failure to start could be due to inability to link and running ldd on the executable may be a good starting point. lsof should show the fifo is opened.

Obviously this needs to run to display the output of the below examples but all should run regardless of the state of MJMDatascope. Ideally they will stop packaging data for export if the send queue fills up but this is not implemented yet. Control facilities exist in the case of UDP that could stop sending absent a negotiated listener but that too is not implemented.

4.1. R

Probably the example of most widespread interest would be the R data source illustrated here. If the module was built and installed the following code should produce moving sine waves on the MJMDatascopegraphics screen. The current version has the copious informational messages suppressed but that can be restored by rebuilding the package with the global muting variable flipped.

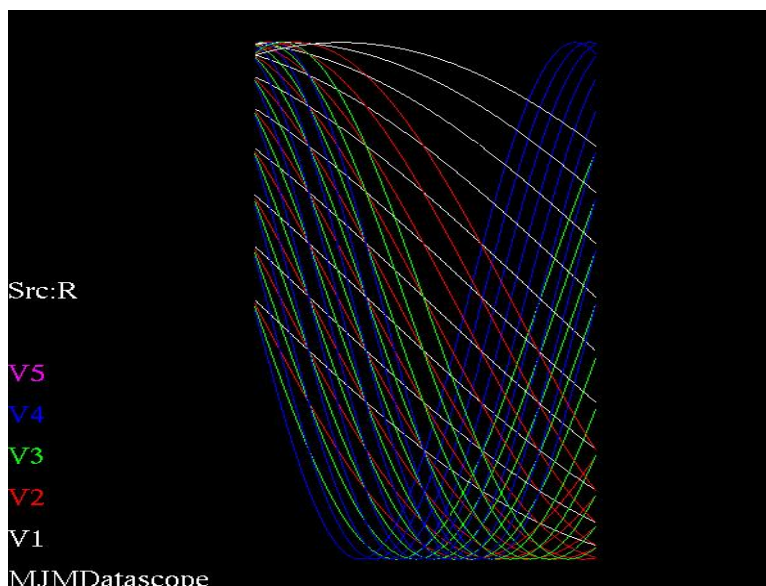


FIG. 1: Output to MJMDataScope using the R example

```
cat dscope.R

#Rcpp::compileAttributes("mjmdscope")
library("mjmdscope")
nr=100.0
nc=5
df<- as.data.frame(matrix(ncol=nc,nrow=nr,data=0.0))
#df<-data.frame(nrows=nr,cols=nc)
for(k in 1:10000)
{
  for(i in 1.0:nr)
  {

    for(j in 1.0:(nc-1))
    {
      df[i,j]=sin(.01*2.0*pi*j*i/nc+.0333*k*2*pi);
    } # j
    df[i,nc]=1.0*(i)/nr;
  } # i
  mjmdscope::mjmdscopesend(df)
  Sys.sleep(.2)
} # k
str(df)
```

4.2. Freefem++

This should demonstrate the simple time evolution of a diffusion problem with a central source region and a concentration dependent diffusivity. The problem is documented in crypted form in the configuration file for the following c++ code which solves a similar problem using finite difference.

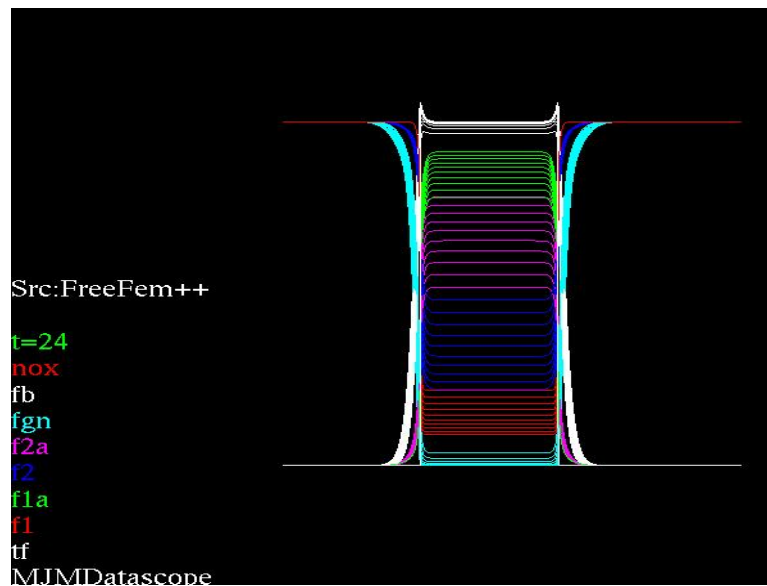


FIG. 2: Output to MJMDatascope using the Freefem++ example

```
2360 FreeFem++ -ne ddglue1d.edp -dt .1 -kdiff 20
```

4.3. A c++ app

The configuration file contains a terse description of a diffusion problem nominally identical to the above Freefem++ code.

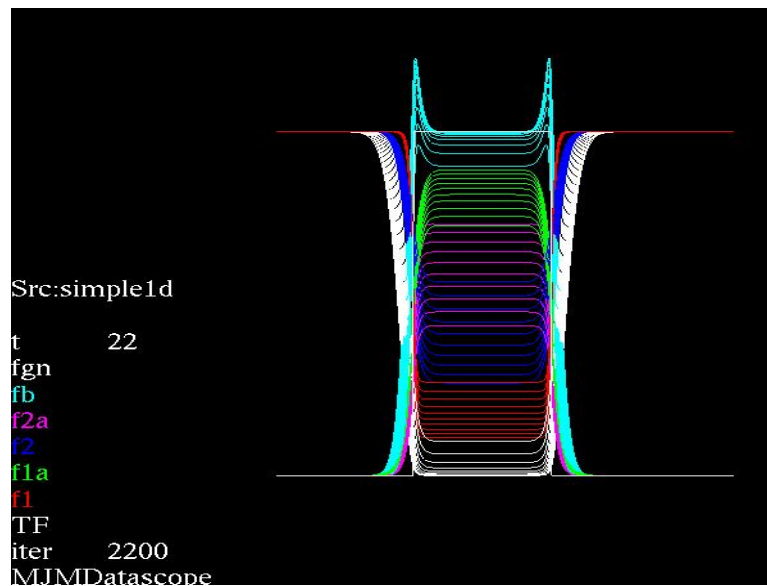


FIG. 3: Output to MJMDatascope using the simple c++ fd example

```
2330 ./mjm_simple_1d_dd.out "source sime1d.txt" quit 2>&1
```

```
cat sime1d.txt
# correct for factor of 2/d_sigma or avg pt distance ( 1000 lol)
```

```

add_point n=1000;d=.001
check
#kvp.get(m_nz,"nz"); kvp.get(m_ii,"nzed"); kvp.get(m_if,"nend");
#kvp.get(m_dz,"dz"); kvp.get(m_q,"q"); kvp.get(m_mu,"mu");
add_species TF nz=0;dz=0;q=0;mu=10;br0=.29999;bv0=0;br1=.3;bv1=1;br2=.6;bv2=1
add_species f1 nz=1;dz=.0000100;q=0;mu=0
add_species f1a nz=0;dz=.00005;q=0;mu=0
add_species f2 nz=1;dz=.00005;q=0;mu=0
add_species f2a nz=0;dz=.000001;q=0;mu=0
#add_species f3 nz=1;dz=.00005;q=0;mu=0
#add_species f3a nz=0;dz=.00001;q=0;mu=0
#add_species f4 nz=1;dz=.05;q=0;mu=0
#add_species f4a nz=0;dz=.01;q=0;mu=0
add_species fgn nz=1;dz=.0001;q=0;mu=0
add_species fb nz=0;dz=.0000001;q=0;mu=0
add_reaction f1a f1 ; TF , 1.0e-1 -> f1a
add_reaction f2a f2 ; f1a , 1.0e-1 -> f2a
#add_reaction f3a f3 ; f2a , 1.0e-1 -> f3a
#add_reaction f4a f4 ; f3a , 1.0e-1 -> f4a
#add_reaction fb fgn ; f1a , 1.0e-0 -> fb
add_reaction fb fgn ; f2a , 1.0e-0 -> fb
dscope "rawfif0 launch 2"
list
setup
# run n=0;dt=.01;sleep=0;itermod=100;geldof=fb;ef=20
run n=0;dt=.01;sleep=0;itermod=100;geldof=fb;ef=2

```

Thinking outloud

5. CONCLUSIONS

6. SUPPLEMENTAL INFORMATION

6.1. Computer Code

7. BIBLIOGRAPHY

Acknowledgments

1. Pubmed eutils facilities and the basic research it provides.
2. Free software including Linux, R, LaTeX etc.
3. Thanks everyone who contributed incidental support.

Appendix A: Statement of Conflicts

No specific funding was used in this effort and there are no relationships with others that could create a conflict of interest. I would like to develop these ideas further and have obvious bias towards making them appear successful. Barbara Cade, the dog owner, has worked in the pet food industry but this does not likely create a conflict. We have no interest in the makers of any of the products named in this work.

Appendix B: About the Authors and Facility

This work was performed at a dog rescue run by Barbara Cade and housed in rural Georgia. The author of this report ,Mike Marchywka, has a background in electrical engineering and has done extensive research using free online literature sources. I hope to find additional people interested in critically examining the results and verify that they can be reproduced effectively to treat other dogs.

Appendix C: Symbols, Abbreviations and Colloquialisms

TERM definition and meaning

Appendix D: General caveats and disclaimer

This document was created in the hope it will be interesting to someone including me by providing information about some topic that may include personal experience or a literature review or description of a speculative theory or idea. There is no assurance that the content of this work will be useful for any particular purpose.

All statements in this document were true to the best of my knowledge at the time they were made and every attempt is made to assure they are not misleading or confusing. However, information provided by others and observations that can be manipulated by unknown causes ("gaslighting") may be misleading. Any use of this information should be preceded by validation including replication where feasible. Errors may enter into the final work at every step from conception and research to final editing.

Documents labelled "NOTES" or "not public" contain substantial informal or speculative content that may be terse and poorly edited or even sarcastic or profane. Documents labelled as "public" have generally been edited to be more coherent but probably have not been reviewed or proof read.

Generally non-public documents are labelled as such to avoid confusion and embarrassment and should be read with that understanding.

Appendix E: Citing this as a tech report or white paper

Note: This is mostly manually entered and not assured to be error free.
This is tech report MJM-2023-007.

| Version | Date | Comments |
|---------|--------------------|---------------------------------|
| 0.01 | 2023-09-14 | Create from empty.tex template |
| - | September 14, 2023 | version 0.00 MJM-2023-007 |
| 1.0 | 20xx-xx-xx | First revision for distribution |

Released versions,
build script needs to include empty releases.tex

| Version | Date | URL |
|---------|------|-----|
| | | |

```

@techreport{marchywka-MJM-2023-007,
filename={dscoopedoc} ,
run-date={September 14, 2023} ,
title={MJMDatascope : A viewer for streamed numerical data} ,
author={Mike J Marchywka } ,
type={techreport} ,
abstract={ MJMDatascopeis designed to be a lightweight viewer or previewer for streaming numerical data from a
variety of sources such as "R", FEM codes such as FreeFem++, and custom or proprietary numerical code with a
current interface for c++. It is not designed to be particularly feature rich or generate publication quality output
but mostly to monitor and compare number streams from disparate sources while providing a uniform user interface.
The current form ( 2023-09-14) is proof of concept and not usable by most users except developers with an interest
in numerical codes. Note that with a simple interface, it could be used to plot streams of numbers from stdin making
it useful for a variety of monitoring tasks. } ,
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number={MJM-2023-007} ,
version={0.00} ,
institution={not institutionalized, independent } ,
address={ 44 Crosscreek Trail, Jasper GA 30143} ,
date={September 14, 2023} ,
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day={14} ,
month={9} ,
year={2023} ,
author1email={marchywka@hotmail.com} ,
contact={marchywka@hotmail.com} ,
author1id={orcid.org/0000-0001-9237-455X} ,
pages={ 10}
}

```

Supporting files. Note that some dates,sizes, and md5's will change as this is rebuilt.

This really needs to include the data analysis code but right now it is auto generated picking up things from prior build in many cases