TELEDYNE WEBB RESEARCH AUV

TRAINING COURSE NOTES 2010 – STUART HALEWOOD

Periodically check on the website: https://dmz.webbresearch.com/ for updates to software and other updates or service bulletins. Contact Stuart Halewood for password and access to this area.

Also check the FTP site: ftp:glider.webbresearch.com for manual updates.

DOCKSERVER System:

- Contains the following applications:
  GliderTerminal
  Glmpcviewer
  Dataserver
  Data Visualizer
  GMC FTP Client (Any LINUX experience useful in this Application)
  All Files transferred by any of the above Applications
- Contains factory scripts. The script takes the place of a person and sends commands/responses to a glider communication.
  For example the script may start the Dockserver then when the glider is seen the script issues a Z modem command to send the SBD &TBD files and tells the glider to wait for transfer.

GLIDER TERMINAL:

- Some factory scripts are provided with the glider written by TWR. Language can be adjusted as you learn. These allow you to automate jobs i.e. file transfers when the Glider surfaces.
- GLIDER TERMINAL can run on ANY machine networked to the Dockserver machine

MISSION FILES:

- Mission files (.mi) define Glider specific variables. Contains behaviors and variables can be edited e.g. you can enter all various variables that cause the glider to Abort. Be aware it is possible to program a loop that can keep going,

always allow it to be interrupted. In the file comments are preceded by the character #.

- It is possible to comment out part of a mission and then un-comment and therefore add it back in at a later date.
- Glider needs to have an action to do after the last Waypoint is reached. Ensure that the mission contains a command for the Glider mission to quit properly.
- To abort after no comms for a certain time ensure that the abort after no comms time is set for long enough that all other arguments occur before it times out.
- To change a mission you should edit add comments and save the mission. Then stop the active Glider mission at the next surface time and reload the new mission. Save all missions locally and to the glider as well as backing up old missions, e.g. rename as old.
- If a variable in an Argument isn't specified in a mission file then it resets back to its default value given in the master.txt file (details below).
- In the mission script loadsim.mi you can reset your local coordinates to your own geographical area, mission is supplied with the TWR standard location in MA.
- The mission script lastgasp.mi is an old supplied mission that remembers the last good GPS hit and will return to that location if the glider hears nothing from you for a certain time period. For example if you drifted away it will swim back to the last known 'good' fix.
- Another provided mission is GLMPC.mi, which is the training mission run in Ashumet pond in Falmouth MA. This mission script can be altered and turned into your own local training mission.
- After an Abort for any reason the glider may try and resume the present mission. You can program it to run a altered GLMPC.mi of your own after an abort that tests the glider then continues on with the mission after a certain time. You may also want to tell the glider to call home after an abort if you are able to control the Glider live. Basically you MUST have a Rescue Mission of some type written.
- Autoexec.mi file sets all user changeable variables. Typing Autoexec.mi will display the whole file and all sensor serial numbers and other details such as the calibration coefficients and mechanical calibration coefficients for the mechanics e.g. pumps. The beginning of the file shows the latest updates with date and author. We should continue this trend and comment any changes to this file.
  A # before words in this file indicates a 'Command' not an 'action'.
  Autoexec files are individual to each Glider and must be reloaded after any code update to the glider.
- Be aware that a lot of old MS-DOS commands will work in Glider Terminal, when you are in Glider perspective. Glider perspective (Glider Icon) shows the split window allowing you to type commands to the glider in the lower window whilst seeing the glider status or response to the commands in the upper window

- Serial perspective (Comm Port Icon) has one single terminal window like Hyperterminal or Procomm Plus where you can type commands directly to the glider and the glider will return data or results directly to the same screen. Note if you use thus type fast incase it spits back a response in the middle of you typing the next command!
- Server Icon

.MA FILES:

- .ma files are small parts of files with arguments from the masterdata.txt adjusted by the user. They are written into and called from masterdata.txt.
- For .ma files you must have written in a 'start' and 'end'
- Examples of .ma files that get changed often are yo.ma and goto.ma
- For yo.ma you can chose the dive and climb limits as well as te number of yo's to do and if you want this to continue as a loop.

SUPERSCI.APP:

- Supersci.app runs from the Science Persistor computer. It contains science sensor proglets.dat for each science sensor and contains all info for the science bay.
- The proglet tell the science bay when to apply power and retrieve data. Also is decides where to send data and fill in the correct fileds.
  e.g. the CTD proglet grabs the values for the Cond, Temp & depth and puts them in the correct CTD fields.
- We can also setup power to a Generic data logger. This only applies power to a sensor, no data captured.

SBDLIST.DAT:

- Sbdlist.dat has the min engineering units so you can see and plot the Glider data. Values are given out in binary.
- In the Glider Dockserver locate the files in the following directory:
  Glider folder/Logs/Dir (this area contains files with and without the headers.
- The files are sent from the glider to the Dockserver and into the 'from glider' file (still in binary), these are basically the raw files.
- These Raw files can later be converted by the Dataserver and displayed.
- Files with the extension .ebd = Full sci data
- Files with the extension .nlg = log of sci data
- Transfer ONLY files with extension .sbd or .tbd over RUDICS Iridium as these are the small version of the data files.

GLMPCviewer: (Glider Mission planning and control application)

- Provides a graphical interface for a user to interact with gliders monitored by the Dockserver.
- User can graphically click on a series of waypoints on a displayed area and this application will generate a Waypoint list for the glider to follow.
- Displays Glider's position live on any uploaded .jpeg of the geographical area as long as the correct coordinates have been uploaded detailing the positions of the lower left and upper right corners of the Jpeg.
- Every time the glider surfaces and communicates, the Icon on the viewer updates and indicates the next position the glider will head for on a current mission.
- GLMPC terminal can run on ANY machine networked to the Dockserver machine.

DATA SERVER:

- Provides an integrated mechanism for storing glider data and making it available to client applications.
- Dataserver is intended to run in the background with little human intervention, like the Dockserver application.
- Stored data is updated in real-time as more glider data becomes available on the Dock server.
- Cleans-up stored data by (for example) interpolating missing glider positions based on standard algorithms.
- Data is made available for viewing by network connected clients.

DATA VIZUALIZER:

- Allows data to be plot on graphs. Any Sensor data can be displayed in a continuous plot from the beginning of its operation.
- To isolate a particular mission or dive you zoom in on the particular data area of the plot.
- Data vizualizer must first always be connected to the correct Data server for the appropriate glider

GMC FTP Client Application:

- This application allows a user to transfer files between the Dockserver machine and any other machine on the network.
- GMC FTP can run on any Dock server machine that has Java JRE 1.4.2 or l;ater and Java Webstart loaded on it. See webbresearch FTP site for these downloads.

- GMC FTP is a basic FTP client that is preconfigured to connect to the dock server machine. However any other file transfer protocol can also be used to transfer to and from the dock server machine.
- Upgrades are available from www.webbResearch.com

SOFTWARE HEIRARCHY:

PICODOS: Persistor operating System

- Persistor computer software details at www.persistor.com
- PICODOS can be run on both the main Glider Persistor and a separate Science Persisitor in the Sci bay.
- Glider can be set to be booted up in PICODOS to perform software updates
- Within Picodos are the following folders:
  CONFIG
  BIN
  LOG
  MISSION
  SENTLOGS
  STATE
  AUTOEXEC.BAT

GLIDER DOS: Glider Operating System

- GLIDER DOS can be entered into from PICODOS and is a superset of PICODOS
- Used for checking hardware, using command TALK you can communicate with Ports directly. Used for troubleshooting.
- From GLIDER DOS you can exit back into PICODOS
- Configured correctly Gliderdos will boot up and call an autoexec.mi file that has all the glider's calibration coefficiants.
- There is also a HELP mode in GLIDERDOS which will list all available functions.
- Within Gliderdos also are the following folders:
  CONFIG
  BIN
  LOG
  MISSION
  SENTLOGS
  STATE
  AUTOEXEC.BAT

MASTERDATA.TXT:

- This very large Text file contains the default values for the Glider
- This is an un-editable document. You can change behavior parameters but not the code.
- Arguments each have a value to identify them (enum #) in the text file.
- For sample sensor arguments look in the master.txt file e.g.

  b_arg: args_from_file (enum) -1   # >=0 enable reading from .ma files/sample num.ma

  b_arg: sensor_type (enum) 0 #All 0 c_science_all_on

- If you do not change a parameter elsewhere e.g. a Mission file then the glider will default back to values set in this file. Periodically check on the website (https://dmz.webbresearch.com/) for updates to this file and other updates. Contact Stuart Halewood for password and access to this area.
- The Text version of masterdata can be found at:
  https://ftp.glider.webbresearch.com/glider/windoze/production/src/code

LAB MODE:

- Turns off any current Mission if you turn Lab Mode On
- Note this is ONLY for use in lab and NEVER at sea
- Longterm.dat records values from one power cycle to the next e.g. # of inflections
  Type 'Longterm_dat' and glider will return all values that have been recorded e.g. horizontal distance travelled, the file Longterm.sta shows where these values are written to
  Note: after any code update to the Glider you must reinstall the Longterm.dat file and ensure Lngterm.sta is present
- Report command allows you to have a chosen sensor report its value to the screen e.g. report++m_depth, this reports the depth data to the screen, the m indicates this is a measured value
  To turn off and remove from screen use report clearall

GLIDER SIMULATION – USING GLIDER ON BENCH:

- Under the glider config directory you must have a file named 'simul.sim'

- In the simul.sim file there will be text stating 'on bench' for the glider to be used in simulation mode. Delete this text and the glider will be out of simulation mode. Then hit Cntl-C to save if you want to exit Simulation mode and use glider as normal.
- Make a backup of both files with and without On Bench to switch in and out of Simulation mode easily.
- Within Glider lab prompt type load mission loadsim.mi to check your specific setup for simulation. Type 'Where' and you should see your starting position. Establishes the geographic location for your sim and the fact that you are simulating.

MISSION LIMITATIONS:

- Simulate all missions before using live.
- For a 200m glider the top of any 'Yo' must be between 0-30m depth or the ballast motor will over-pressure.
- Between the Shallow (200m) Glider and the deep (1000m) glider the difference is the front ballast pump assembly, what pressure rating can the pump actuate at and how quickly can it respond. The pump gearboxes are difference therefore the shallower pump moves the piston faster and responds quickly enough in shallower waters to allow a turn without hitting the bottom. The deeper pump will not respond quickly enough below approx 30m. Otherwise both hulls are rated to 1000m and are basically the same.
- GPS – Whilst underway a Glider 'dead reckons' after it takes a last good position at the surface. When it next surfaces it calculates the difference in position from where it came up and where it is supposed to be according to its waypoint list. It then uses this Vx and Vy as an offset value and calls it 'current correction'.
  You can turn this current correction off if you decide to plan this yourself. NOT usually advisable unless you know what the surface and underwater currents and wind driven drift of the glider would be!
- Deployments, Glider is tested first and then deployed using the Freewave system and then as it heads out further from shore it switches over to the Iridium(RUDICS).
  If the Freewave antenna is mounted high enough then we are told you can get approx 10-15miles comms range.

GLIDER SIMULATIONS:

- The simulators are useful to test glider missions before actual deployments as well as for training users on the glider system. The Glider itself can be turned into a Simulator on dry land.
- NEVER deploy a glider in simulation mode
- When using an actual glider and not a simulator box the Glider must always be set to "On_bench"

- NOTE: Major damage will be caused to the glider if the Simulation file contains {no_electronics or just_electronics} when using a full Glider.
- The level of simulation is set when the Glider boots by the contents of the simul.sim file in the config directory of the glider flash memory card. A single line of text controls the level of simulation:

no_electronics	Persistor alone-no glider-pocket simulator.
Just_electronics	No hardware, no motor, etc just electronics board and persistor –shoebox simulator.
on_bench	This is a complete glider on the bench I.e. not deployed in water. (WE WILL USE THIS OPTION AT ALL TIMES)

If the file simul.sim is missing or does not have the required text line, the no simulation is done. A glider should NEVER be deployed at sea with a simul.sim file in the directory.

HRDWARE:

- Glider body hull now made of Carbon Fiber except nose cone which is hard plastic and the tail removable section which is yellow plastic
- The wings are now also Carbon Fiber
- Amber Strobe now fitted fwd of the Tailfin
- Ballast pump should be serviced after approx 10,000 inflections
- Weight in air 52kg
- Weight in water = neutrally buoyant
- AUV Length = 1.5m
- AUV Hull diameter 21.3cm/8 3/8inch
- Projected speed 0.4m/sec horizontal