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PAMGUARD Maintenance and support Activities
June to December 2012

A significant number of bugs have been fixed in the PAMGuard software and new features added in the latter half of 2013. This report outlines the features and bug fixes funded through the monies receive both through IAGC and from other sources to St Andrews University.

An increasing number of developers are now contributing to PAMGuard and these developments are funded through a variety of sources including university research grants and contracts from other offshore industrial sectors. Many of the improvements (particularly in the realms of 3D tracking) are being made within St Andrews University using Scottish Government money. While the development itself is covered using these government funds, we use time funded through the IAGC maintenance fund to merge these developments into the release versions in order to make them available to other PAMGuard users.

The funding source is shown following each item listed below:
IAGC = funds received from the IAGC for PAMGuard maintenance.
SMRU = SMRU or SMRU Ltd research output using a variety of funding sources
OTH = Other

Bug Fixes

Bug fixes
(All bug fixing funded using IAGC funds)

Radar Display
A bug which stopped the radar display from correctly displaying bearings to whistles from arrays containing more than two hydrophone elements has been fixed.

Database Speed
A substantial rewriting of some of the indexing methods in the database module has led to a significant increase in the speed at which data are written to the database (orders of magnitude for large databases). This is having a significant impact on the overall reliability of the software. Other changes have increased the speed (again by orders of magnitude) at which data are read back into PAMGuard when using the viewer.

PAMGuard startup options

PAMGuard start-up options were confusing to many users and some of the messages given to the user were misleading. Code behind the start-up options has been rationalised and feedback to the user improved to make the process more intuitive:

- In either normal mode or viewer mode, pressing the Cancel button will cause PAMGuard to exit.
- In normal mode, if you enter the name of a configuration file which does not exist, a warning will be issued and you will be given the choice between creating a new blank configuration file and exiting.
- In viewer mode, if you enter the name of a database file which does not exist, a warning will be issued and you will be given the choice between creating a new blank database file and exiting. Code has also been added which allows the user to create a blank Access database without having to create using MS Access.

Click detector

- When the click detector is first created it would not connect to a source of audio data and this had to be done manually. Code has been modified so that a new instance of the click detector will automatically connect to the output of the sound acquisition module (assuming one is available).
- Display options have been both fixed and improved. A status bar at the top of the click detector display allows users to select which click types to show and also whether or not to only show clicks which are part of a track or event.

Filters and Filter dialogs

- The filters and the filter dialog which controls them are used by many different modules in PAMGuard. The dialog has been improved so that unavailable options for a filter type are disabled. This makes setting up filters easier for the user.
- A notch (band stop) filter option has also been added.
- Code has been added to prevent the user from entering illegal values for cut off frequencies (i.e. filter cut off frequencies must be below half the sample rate).

Colours

- When night time (darker) colours are selected, they were not correctly displaying at startup time and the user had to change to day colours and back again. This issue has been fixed.

Simulator

- Timing of signals in the simulator has been improved which makes it more reliable and more suitable for testing out different array configurations.

New Features

Storage options.

- New storage options have been implemented which give the user greater control of where data are stored. Many modules can write to both the binary store and to the

database, these options allow the user to select which one (or none) data should be written to. (Funding IAGC)

Database

- Support for open office databases has been added. These can be used both under Linux and Windows and offer an alternative to MySQL and MS Access. (Funding IAGC)
- Can create a new blank MS Access database. (Funding IAGC)
- Can open a MS Access database directly from within PAMGuard (requires MS Office). (Funding IAGC)
- General functionality has been added to the viewer to copy data from binary storage files to database tables for any module which uses both types of storage. (Funding IAGC)

Radar Display

- Functionality has been added to the radar display so that bearings can be shown relative to either the vessel or to true North. (Funding SMRU)
- Better control of data in viewer mode has been implemented, making is easy to scroll through and view data for short time periods. (Funding SMRU)

GPS

- Functionality has been added to import GPS data from other data sources for the PAMGuard viewer. This allows the importing of .nmea, .asc and .txt files containing NMEA strings. Functionality will be added soon to allow the importing of .kml, .gpx and other GPS file formats upon request. (Funding SMRU)

Sound Acquisition

- Code has been added to the National Instruments data acquisition interface to support the new x-series cards. This includes code for synchronising multiple x-series cards for operation with high numbers of channels. (Funding IAGC)
- We have added support for a new open source ASIO driver system (jasiohost). The old system has been left in place for now which we assess users response to the newer system. (Funding IAGC)

Ishmael Detectors

- Database storage has been setup for all three Ishmael detectors. This interface will also read the detections back into the PAMGuard viewer. (Funding IAGC)

AIS

- Support has been added to the AIS module to read data from Base stations, Aids to Navigation and Class B AIS stations. Class B AIS is carried by increasing numbers of smaller vessels. (Funding IAGC)

Spectrogram Display

- Can now scroll as well as wrap the data. (Funding IAGC)

Whistle Detector

- Adapted to stores amplitude and bearing information in the binary files. (Funding SMRU)

Click Detector

- Two additional displays have been added to the click detector
  - Concatenated Spectrogram which enables users to view spectra for multiple clicks within the same event. (Funding SMRU)
  - Inter Detection Interval Display which provides a visual interpretation of the inter-detection interval. (Funding OTHER)
- The target motion analysis module has been upgraded to handle 3-D data, using data from volumetric arrays to provide animal locations in three dimensions. This work includes visualisation of 3D bearings. Support has also been added for multiple array groups, e.g. being able to cross bearings from two different towed arrays. All 3D displays have been rationalised within the code. (Funding SMRU)
- An alarm has also been added to issue audible warning when certain click types are detected. (Funding OTHER)

Local time

- Local time from the host PC added to all database entries (The UTC field is still there too!) (Funding OTHER)

Module organisation
(Funding IAGC)

- The latest PAMGuard Beta release (1.12.00) contains 41 different modules.
- In order to make it easier for users to select the right module, the grouping of modules in the PAMGuard "Add Modules" menu has been re-organised so that the large "Detectors" group has now been split into "Detectors", "Classifiers" and "Localisers".
- Tool tips (little boxes of text that appear when the mouse hovers over a menu item) have also been added to provide additional information about each module.
- The help file contents have been reorganised to reflect these changes.

New Modules

Logger Forms.
(Funding OTHER)

- A substantial amount of work has been carried out on Logger forms, funded by the South West fisheries Science Center. Details in the PAMGuard help file

Clip Generator
(Funding SMRU)

- The clip generator module can be used to generate short sound clips (typically a second or so long) in response to either an automatic detection or to the user selecting an area on the spectrogram display.

- The module has a display which can be shown alongside the spectrogram and radar displays and each clip generator can be triggered by one or more detection modules.
- The Whistle and Moan detector, the Ishmael detectors and the Likelyhood detector have been modified so that they can trigger the detector. The click detector has not been setup to trigger the clip generator since it already generates clips of each detected click in a highly efficient file format.

Local Time display
(Funding OTHER)

- A new module has been developed which show local time on the PAMGuard display.

WILD ArcGIS interface.
(Funding OTHER)

- This module provides the user the ability to integrate Pamguard with the WILD ArcGIS-based marine mammal survey software package. The module takes positional data from the GPS module and couples that with user-inputted information regarding marine mammal location to create a NMEA string. The string is then output to the WILD package through a serial port.

As well as the new released modules, several other modules are currently under development. Ones that we know about include the following:

- Noise Band Monitor (Funding SMRU). An alternative method of measuring noise in octave and third octave bands which can work over a wider frequency range than the Noise Monitor module.
- Shaped noise monitor (Funding SMRU). Measures noise relative to an arbitrarily shaped filter band (e.g. the hearing response of a particular species).
- Long term spectral average (Funding SMRU). Measures and stores averaged FFT data over extended time periods (several minutes). Useful for generating a good overview of a dataset.
- Right Whale Edge Detector (Funding SMRU). Searches for right whale upsweep calls using methods described in Gillespie, D. (**2004**). "Detection and classification of right whale calls using an edge detector operating on a smoothed spectrogram," Canadian Acoustics **32**, 39–47
- Target Motion Analysis for the whistle detector (Funding SMRU).

These modules are at varying stages of development from ideas at the back of our heads to working modules which are currently undergoing final testing. Hopefully some of them will be released later in 2013 if we can find time to write documentation and merge them into the release branches.

Support

An important task we carry out in support of PAMGuard is supporting users. Over this six month period, we dealt with 46 support requests comprising a total of 103 separate emails.

Organisation of the PAMGuard Voluntary contribution

Work has continued on preparation of the proposed PAMGuard voluntary contribution system. Details are available on the PAMGuard website and we are working with the university business development team to implement the fine detail of the system.

Downloads

Between July and December 2012 there were 518 downloads of the latest PAMGuard software. There were also 209 downloads of the standard configuration files we made available via the new website and additional downloads of documents and classifier configurations.

Details of registration information from the download pages are:

Total Downloads		807					
Unique Email Addresses		2					
Industry Downloads		**Operation Downloads**		**Geographic Downloads**		**Location Downloads**	
Oil & Gas	188	Real time mitigation	240	US	159	Global	165
Civil Engineering	8	Abundance Estimation	86	Europe	343	US	115
Offshore Wind	24	Behavioural Research	163	Africa	20	Europe	245
Tidal and Wave Energy	7	Other	176	Australasia	25	Africa	20
Academic Research	301	Rather Not Say	30	Asia	25	Australasia	24
Other	141			Other	85	Asia	20
Rather Not Say	28			Rather Not Say	30	Other	65
						Rather Not Say	32