



BoatCaptain Desktop Software Reference Manual

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This manual explains the features of the BoatCaptain desktop software for use with AMOS robots and AMOS-related data.

1. Recommended Hardware

- Windows PC computer with the following minimum specifications: (i) at least 20 Gbytes of available hard drive memory for program and data file storage, (ii) at least 8 Gbytes RAM, (iii) i3 or equivalent (or better) processor.
- Optional: For direct connection to the Raspberry Pi 3B+ processor on AMOS, a USB mouse, USB keyboard, and an HDMI video monitor with HDMI cable for connection to the Raspberry Pi 3B+.
- Optional: Ethernet cable for direct connection to the Ethernet port on the Raspberry Pi 3B+ processor board on AMOS.
- Optional: USB hotspot stick for enabling LTE communications on AMOS. For example see: <https://www.bell.ca/Mobility/Products/Huawei-E8372-Turbo-Stick> .

2. Recommended Software

- Windows 10 operating system.
- PuTTY terminal software for logging in remotely to the Raspberry Pi 3B+ processor on AMOS. (Free download available here: <https://putty.org/>).
- BoatCaptain desktop software (i.e. the software described in this reference manual). (Free download from In Nature Robotics available here: <https://www.innaturerobotics.com/support>).
- Optional: Esri ArcGIS (<https://www.esri.com/en-us/arcgis/about-arcgis/overview>). An Esri ArcGIS account can be used for saving web maps (see File | Save map).
- Optional: Easy View software, available from Teledyne Caris can be used for viewing XYZ files exported from depth data using the File | Export depth to XYZ file menu item.
- Twilio text service (if configuring text alarms), see <https://www.twilio.com/>.

3. Setup

The installer program for the BoatCaptain desktop software can be found on the In Nature Robotics website here: <https://www.innaturerobotics.com/support> (scroll to the bottom of the page for the “Software Downloads” section and click the “Download” button. This will download a file (ex: BoatCaptain_v094.zip) that will be saved to the Downloads folder of your computer. Find the downloaded file in the Downloads folder, and double-click it to open it, then double-click the .exe file found within it (ex: “Setup_BoatCaptain_v094.exe”) to install it on your computer.

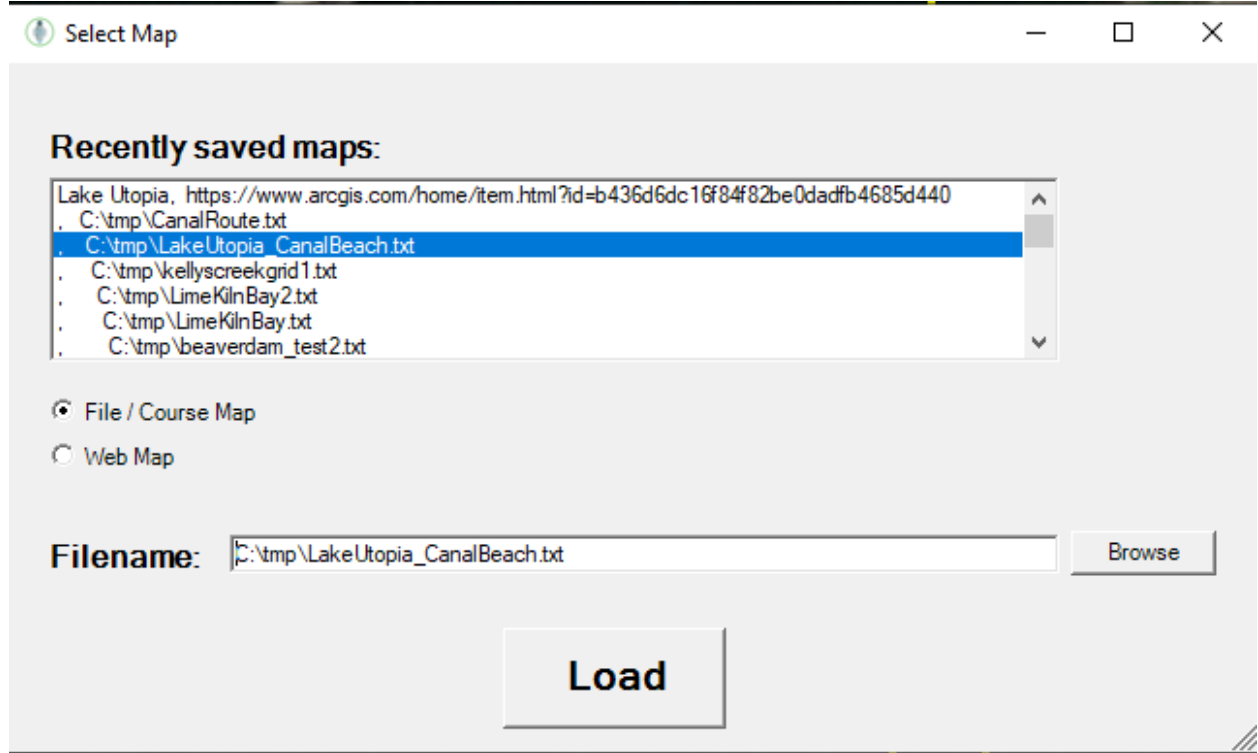
4. Menu Functions

The following summarizes each of the menu functions available within the BoatCaptain software .



4.1 File | Load map / course

This loads a previously saved map or course into the map viewing area of the program window. The file loaded can be a .txt file created using the 'Save Course' button in the top-right corner of the window, or it can be a web map created using the File | Save map menu item.



4.2 File | Save map

This saves the current map view as a web map. An Esri ArcGIS account is required to save this map (<https://www.esri.com/en-us/arcgis/about-arcgis/overview>).



Save Map

Name of Map
My Test Map

Description of Map
This is a description of my map

Tags (Optional - separate any tag words or phrases with commas)
WaterQuality, Depth, Temperature

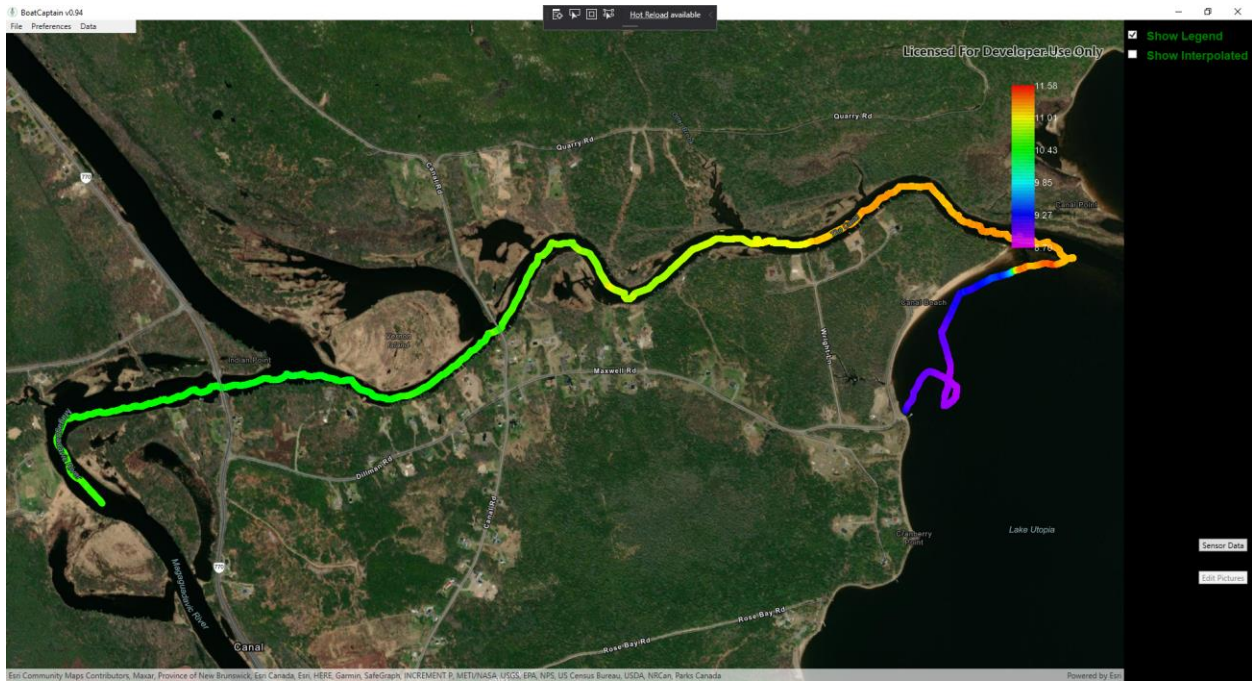
OK Cancel

4.3 File | Open data file

This opens a data file that was previously downloaded from an AMOS robot using the File | Download data file menu item. The default name of the data file will be “sensordatafile.txt”, and it is an ASCII text, comma-delimited file. After selecting a file, a choice of the type of data to view (similar to below) is presented:



After the data type radio button is selected, press the 'OK' button to view the data:



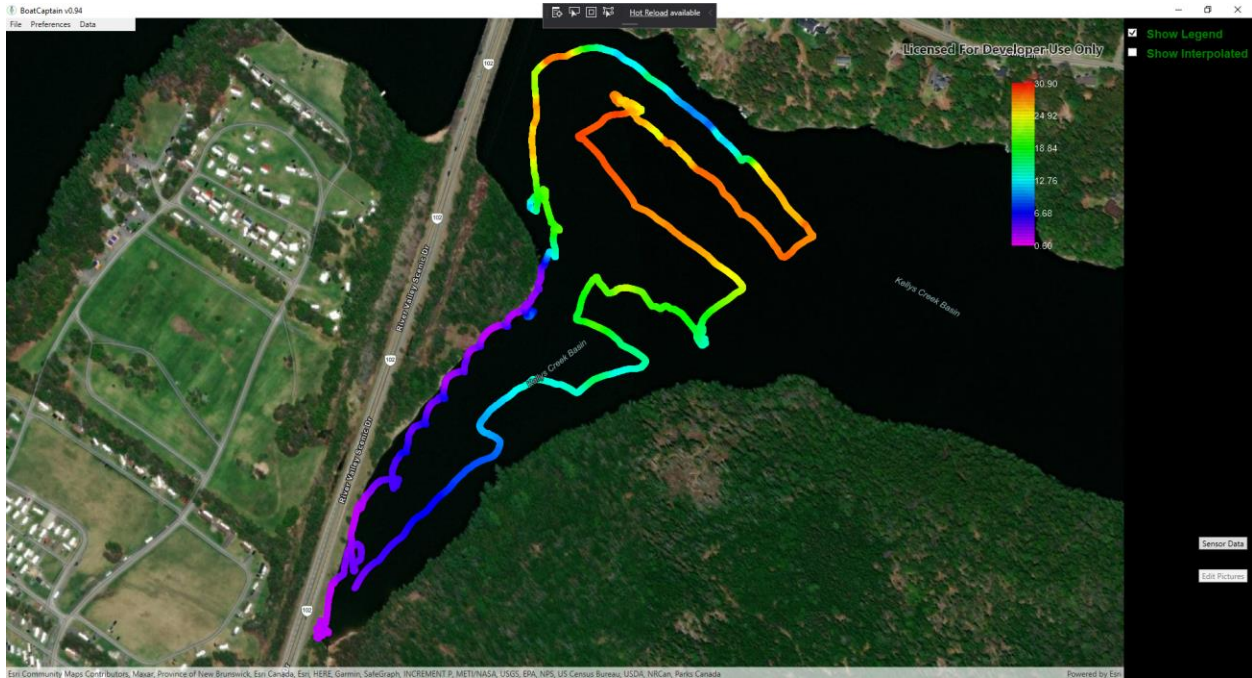
4.4 File | Open depth file

This opens a depth file that was previously downloaded from an AMOS robot using the File | Download data file menu item. The default name of the file will be “depthdata.txt”, and it is an ASCII text, comma-delimited file. After selecting a file, a choice of the type of data to view is presented:



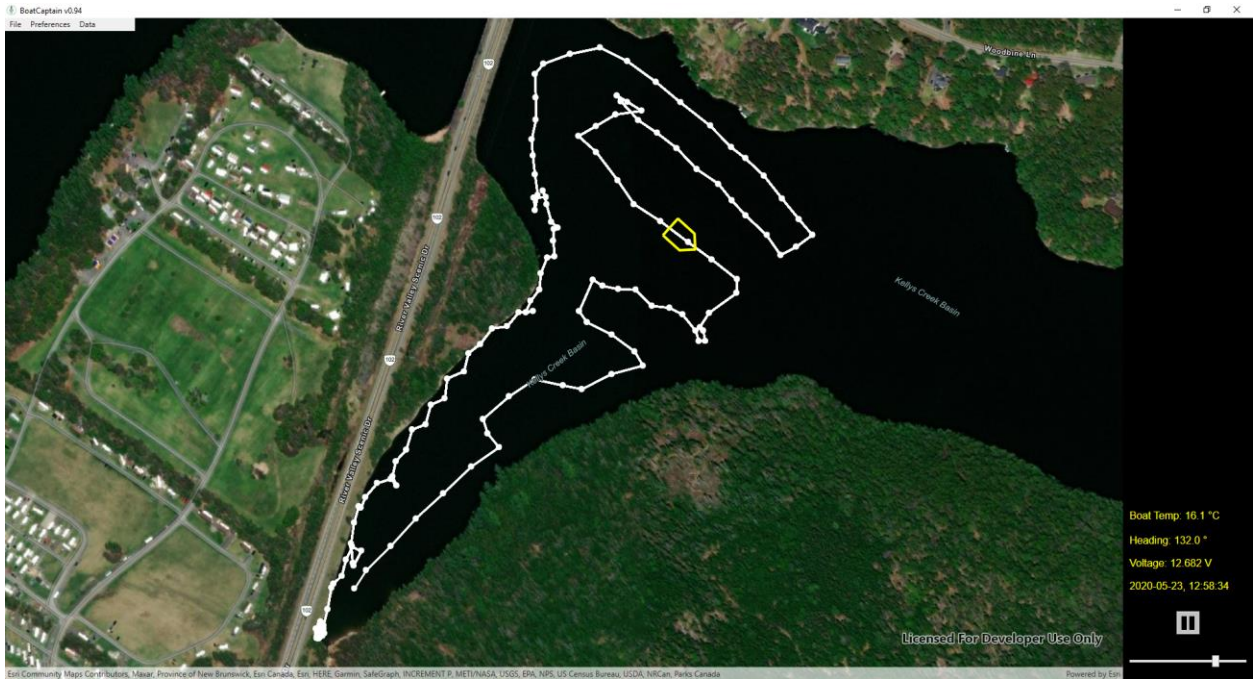
Select either the 'Water Temperature' or 'Depth' radio button and then click the 'OK' button.

An example of some depth data appears below:



4.5 File | Open log file

Every time that AMOS runs, it records a log file with a naming format of “shiplog_YYYY_MM_DD_HH_MM_SS.txt” which can be downloaded using the File | Download log file menu item. If this file is opened, it displays the path of the AMOS robot over time, along with the measured battery voltage. Playback controls appear in the bottom right corner of the program window for viewing where the boat was at different points in time, and what its battery voltage was at each time.



4.6 File | Export depth to XYZ file

This menu item exports a depth data file downloaded from AMOS using the File | Download data file menu item, and converts it to a text XYZ file that can be opened and viewed using the “Easy View” software from Teledyne Caris (<http://www.teledynecaris.com/en/products/easy-view/>).

4.7 File | Download data file

This requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software checks to see which data files are available for download on AMOS, and presents them in a dialog for selection. Choose the desired file(s) and select a folder on the PC for saving them. If there are many data files or they are very large (more than 1 Mbyte), a network connection is recommended for faster download speeds.

4.8 File | Download log file

This requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software checks to see which log files are available for download on AMOS, and presents them in a dialog for selection. Choose the desired file(s) and select a folder on the PC for saving them. If there are many data files or they are very large (more than 1 Mbyte), a network connection is recommended for faster download speeds.



4.9 File | Download image files

This requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software checks to see which image files are available for download on AMOS, and presents them in a dialog for selection. Choose the desired file(s) and select a folder on the PC for saving them. Image files tend to be relatively large in size, so a network connection is recommended for downloading them more quickly.

4.10 File | Delete AMOS files

This requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software lists all of the data, log, and image files available on AMOS in three separate list boxes. Below each list box is a 'Delete' button that is enabled when one or more files are selected. Highlighting one or more files and then clicking the corresponding 'Delete' button deletes them from AMOS instantly. Be sure that important data files have been downloaded using the File | Download data file menu item, prior to deleting them.

4.11 File | Update AMOS software

This requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software presents a dialog like the following:

The screenshot shows a window titled "Update AMOS Software" with standard window controls (minimize, maximize, close). The window contains the following fields and controls:

- AMOS IP Address:** Text box containing "192.168.5.1".
- Port Number (for SSH, default = 22):** Text box containing "22".
- Update Filename:** Text box containing "C:\Computer_Programs\AMOS\AMOS\Source\amos_update_2021_06_23.zip" and a "Browse" button to the right.
- AMOS Username:** Text box containing "pi".
- AMOS Password:** Text box containing "amos_robot" and a checked checkbox labeled "View Password".
- Do Update:** A button at the bottom center of the dialog.

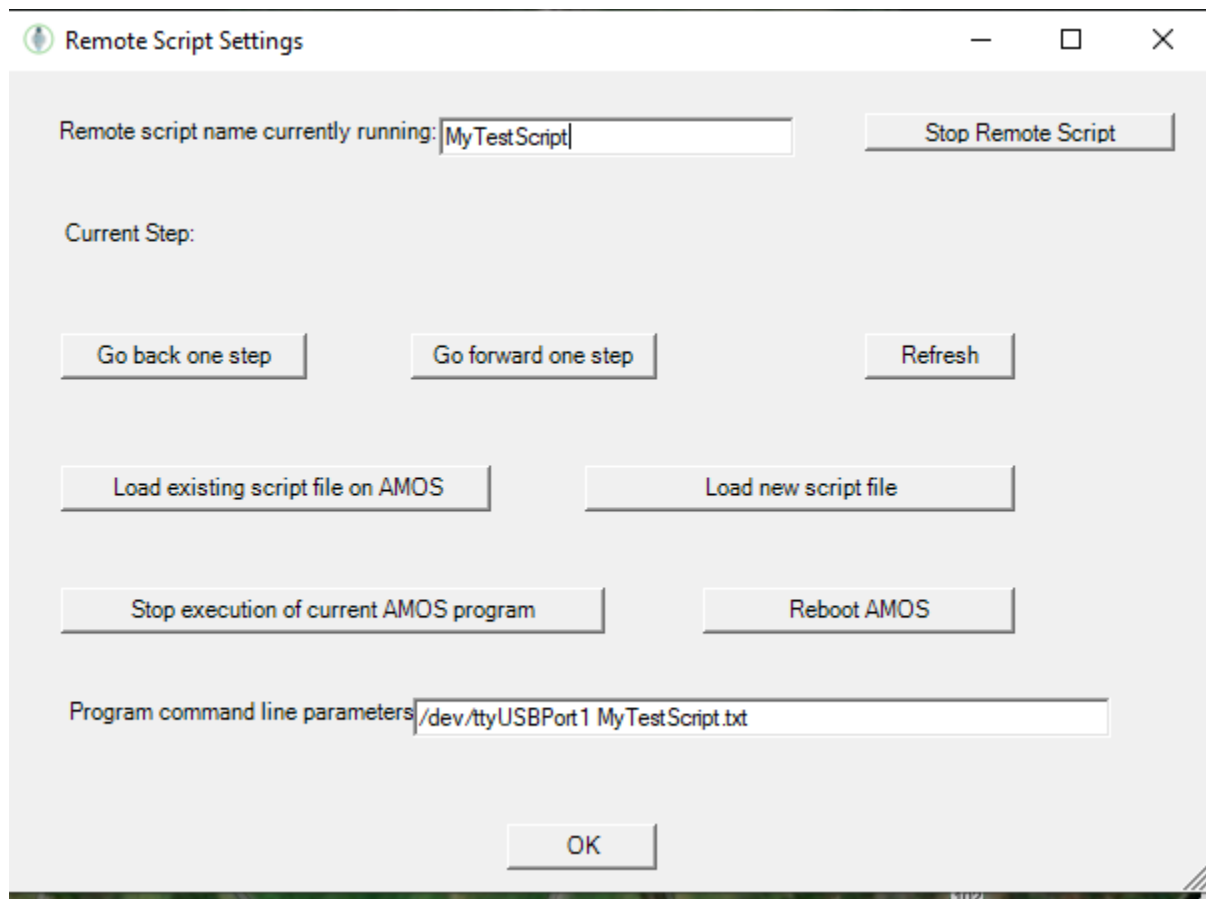
The "Update Filename" is a specially formatted .zip file supplied from In Nature Robotics. The update establishes a secure shell connection to AMOS to copy the necessary files and perform the necessary



remote build commands. The update generally requires a minute or two to complete. Once completed, AMOS will reboot itself, and it will be necessary to restart the BoatCaptain software.

4.12 File | Remote AMOS program info

This menu item requires a connection to the AMOS robot, using the Preferences | Connection menu item. The software checks the remote program settings, such as the name of the script that is currently running, what step of the script it is currently on, and can be used to advance or go back within a running script. It can also be used to stop a script and / or load a new script.

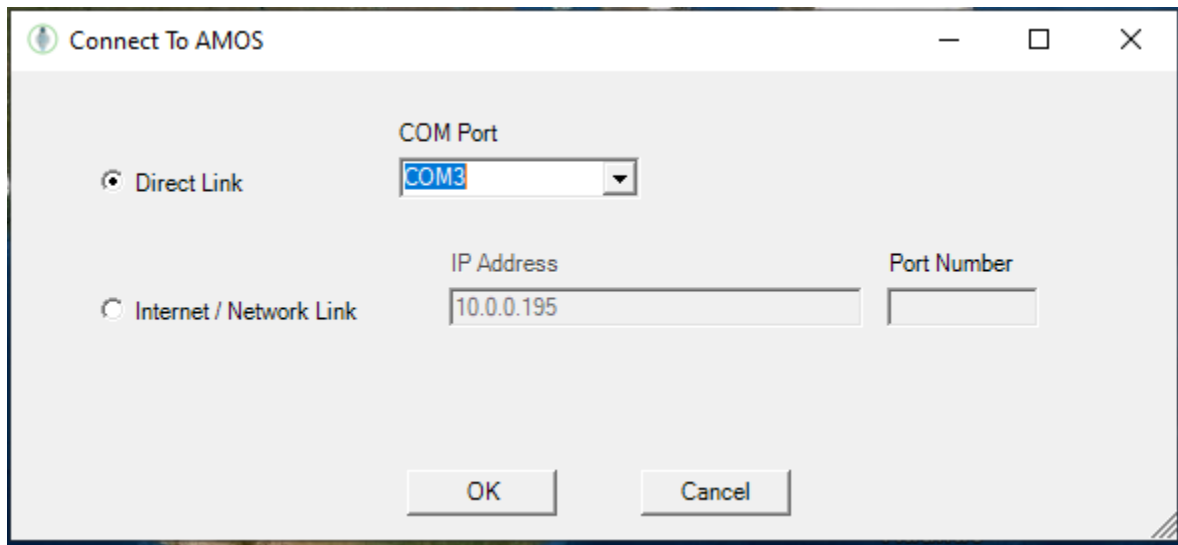


The program command line parameters are used to control how AMOS starts up. Typically, if a direct serial wireless link (i.e. the AMOSRemote) is being used, the program command line parameters should be `"/dev/ttyUSBPort1 <script name>"` where *script name* refers to the name of a sampling course defined by starting up a new BoatCaptain program session, left-clicking a series of one or more sample location points, and then clicking the Save Course button in the top-right corner of the program window. If a network connection is being used, the program command line parameters should be `"0.0.0.0 <script name>"`. The `"0.0.0.0"` portion can be replaced with the IP address of the AMOS computer.



4.13 Preferences | Connection

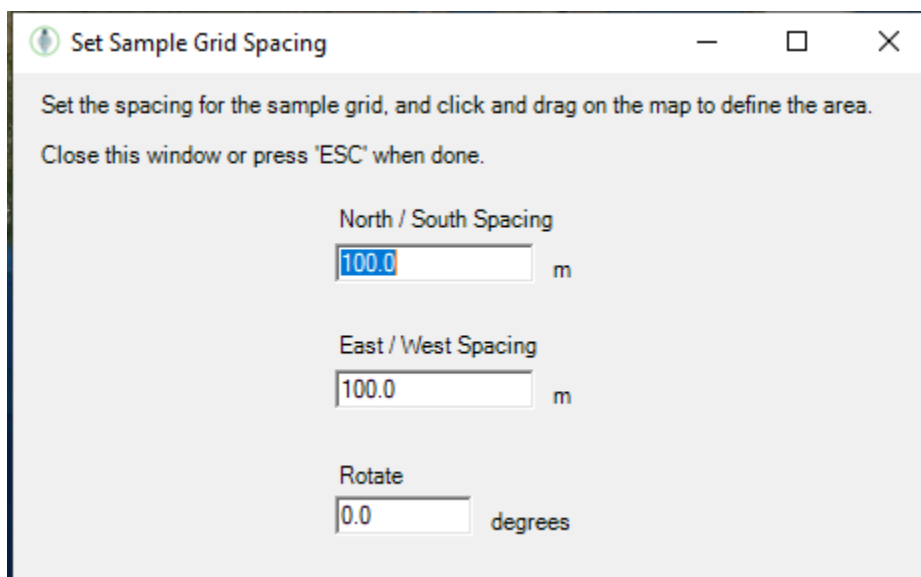
This opens a dialog that presents a choice between either a direct serial wireless link (using the AMOSRemote device) or some other network link between the AMOS computer and the PC running the BoatCaptain software.



If a network link is chosen, the default port number used by the AMOS software is 81.

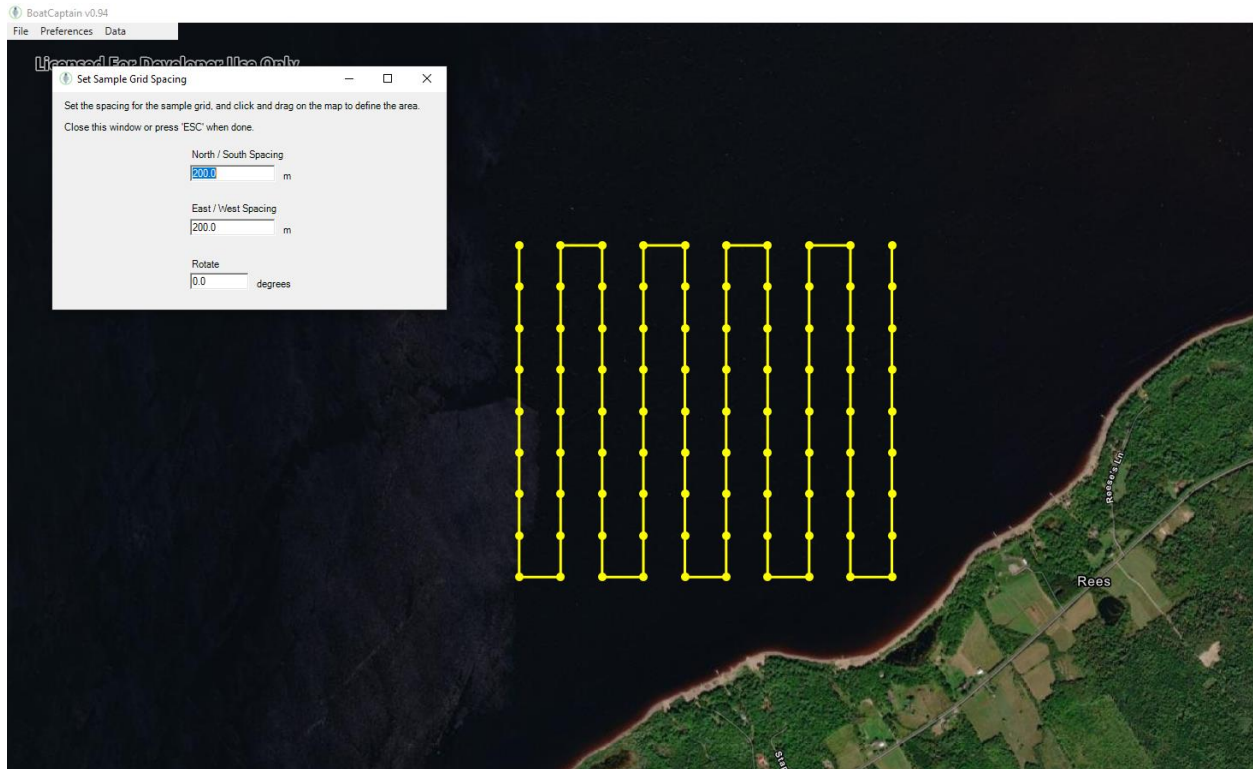
4.14 Preferences | Define sampling grid

This presents a dialog similar to the following:





That allows the user to quickly create a grid of sampling points on the map. Set the spacing in the north / south and east / west directions, and (if desired) set a rotation angle for the grid. Then left-click and drag the mouse on the map to define a sampling grid. When the grid is finished, close the “Set Sample Grid Spacing” dialog window. Individual grid points can then be removed if necessary, by right-clicking on them.



4.15 Preferences | Alarms

This menu item requires a connection to the AMOS robot, using the Preferences | Connection menu function. It brings up the following dialog:



Configure Alarms

Alarms can be issued for low battery or water intrusion. Either email or text (SMS) can be used for the notification.

Email Settings

Email Notification

From Address:

To Address(es):

Email Account Username:

Email Account Password:

Port Number:

Email Server Address:

Text Settings (requires a Twilio Account)

Text Notification

From Phone #:

To Phone #'s:

Twilio Account ID:

Twilio Authorization Token:

Status message text

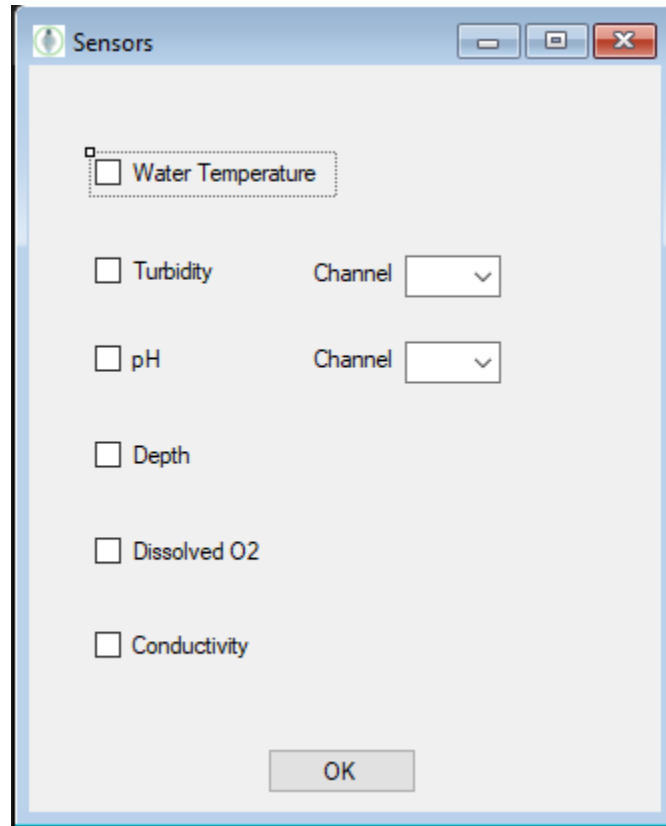
OK

AMOS can be configured to send out an email or text alarm if it encounters a low battery or detects a leak. Leak detection requires the installation of optional leak sensors (available from In Nature Robotics). Text alarms require a valid Twilio account ID and authorization token.



4.16 Preferences | Sensors

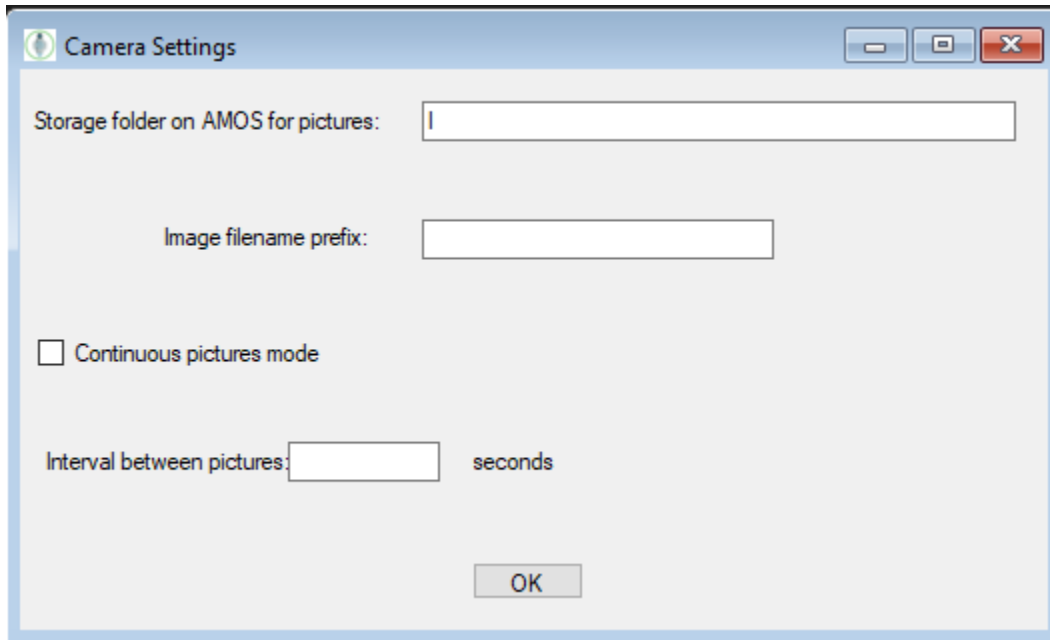
This menu item requires a connection to the AMOS robot, using the Preferences | Connection menu function. It brings up a dialog similar to the following:



Note: Sensors (except for included temperature sensors) are purchased separately or can be bundled with an AMOS package. Additional sensors are available upon request. Contact In Nature Robotics for details. Certain sensors (ex: turbidity and pH in the above dialog) are analog sensors, and are sampled by the onboard A to D converter on AMOS, so if they are being used, it is necessary to specify the number of the A to D channel (typically 1 to 4).

4.17 Preferences | Camera

This menu item requires a connection to the AMOS robot, using the Preferences | Connection menu function. It brings up a dialog similar to the following:



The above dialog is used to configure where and how visual pictures are taken on AMOS. Individual pictures can be planned at certain locations on the map by left-clicking a map point while holding down the 'P' key, or they can be taken continuously, by selecting the "Continuous pictures mode" checkbox above.

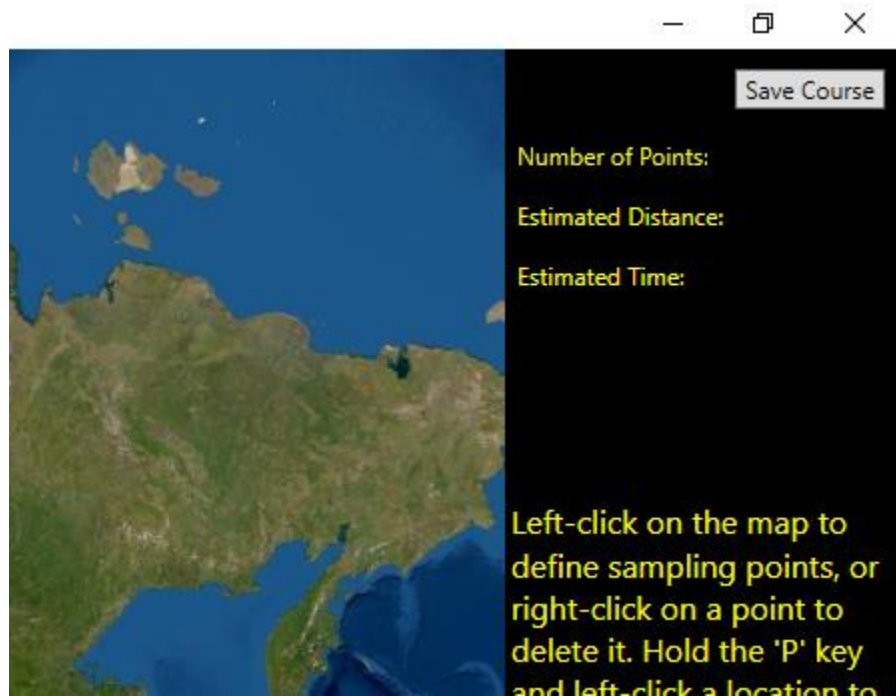
4.18 Preferences | LiDAR (object avoidance)

This option requires the optional LiDAR module from In Nature Robotics. It can be used to detect obstacles up to 20 m distant, and either stop the boat automatically or attempt to automatically steer around them. It can also be used to automatically take pictures if an obstacle is detected in the path of the boat.

5. Other Program Features

5.1. Defining sampling routes

Sampling points can be defined in a new program session by left-clicking the mouse at various points on a section of the map. It is possible at the same time to zoom in or out with the mouse wheel and pan the map around by left-clicking and moving the mouse around. To remove a sample point, right-click on it. Sample point grids can also be defined using the Preferences | Define sampling grid menu item. To save the sampling course, click the 'Save Course' button in the top-right corner of the program window:



5.2 Sensor Data button

If a data file was opened using the File | Open data file or File | Open depth file menu item, the 'Sensor Data' button in the bottom-right corner of the window can be clicked to change the type of data that is currently being viewed in the map.

5.3 Edit Pictures

If one or more picture points were defined by left-clicking on the map and holding down the 'P' key, the 'Edit Pictures' button can be used to define how many photos to take at each location, and what heading direction should be used for each photo.



Questions?

Please contact us if you have any questions about the software, hardware or anything else related to our products.

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