

Waterrower S4 monitor data logging

Mark E. Taylor

metphoto.net

Change log

Date	Version	Comment
23 rd January 2010	v1.0	Initial document.
31 st January 2010	v.1.1	Very small corrections. Added a section called 'Bugs and improvements'

Table of contents

- **Introduction..... 4**
- **Disclaimer and license..... 4**
- **Prerequisites..... 4**
- **Hardware description..... 5**
- **MySQL database..... 5**
- **Running the application..... 5**
- **Possible errors..... 7**
- **Code description..... 7**
- **Bugs and improvements..... 8**
- **Further thoughts..... 8**
- **Conclusion..... 8**
- **Internet links..... 9**

Waterrower S4 monitor data logging

Introduction

This is a simple application written in Perl to read and store the data output from a Waterrower S4 monitor. See http://waterrower.com/en/s4_monitor.htm for more information.

It stores the data in an MySQL database. It was written on an Apple Mac, and hence I cannot guarantee that it will work on other platforms. It was written for my own amusement as a way to learn Perl.

Mark E. Taylor
London, UK
January 2010

Contact: info@metphoto.net

Disclaimer and license

I cannot be held responsible for data loss or physical damage that may result from this document. **You** are responsible for your own safety and data security.

Always follow manufactures guidelines when installing electrical equipment.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 2.0 UK: England & Wales License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/2.0/uk/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

Prerequisites

I created this project with the following components:

- Waterrower rowing machine
- Waterrower S4 monitor
- Serial to USB convertor cable
- Cable from the S4 to the serial/USB convertor - I made my own
- Perl
- MySQL database

Hardware description

Clearly you need a Waterrower rowing machine and a S4 monitor. The application may well work with the earlier S3 monitor. Apparently the S3 monitor outputs more information than the S4. However I have not tested this configuration.

A cable is needed to connect the S4 monitor to your Mac or PC. I used a serial to USB convertor to connect the S4 to my Mac. There are instructions on the Waterrower web site showing how to make the cable that connects from the S4 to the serial to USB convertor.

MySQL database

You need a database and some tables to store the data in. I created a database called 'waterrower'. Within the database I created two tables, called 'rowdata' and 'session_summary'. To create these tables use the two included SQL scripts, 'rowdata table' and 'session_summary table'.

I also created a specific user within the MySQL server that was granted the rights to insert data to the tables. The server name, MySQL user name and password are all stored within the Perl code directly. This is hardly secure, but given the nature of the application it should be good enough for most people.

Running the application

Make sure that your MySQL server is running. Start the application from the command line, for example: ./water8.pl. When the application starts you are prompted with a series of questions.

1. The number of the session to be recorded.

This is session number : 102

Enter new session number or press return to accept the default :

This message is a relic of my testing of the code. It allows you to manually enter a session number. Just press return to accept the calculated session number.

2. A descriptive name of the session.

Last session name : "7km"

Enter new session name or press return to accept the previous name :

Any text can be used as a reminder of the exercise undertaken.

3. A prompt asking if the application should automatically stop recording.

Automatically stop after a certain Time or Distance? Enter T or D, press return to continue:

Either press T or D as necessary. If you press the return key the application will not automatically stop but continue recording until another key is pressed.

4. If you press T you will see this prompt.

Stop after how many minutes? Last session was = 0 minutes :20
The session will automatically stop after 20 minutes.

Here you may enter a number of minutes, after which the application will automatically stop recording data.

After you have entered a time you will be shown this message.

Recording will start automatically when you start to row.

5. If you press D you will see this prompt.

Stop after how many metres? Last session was = 7000 metres : 4000
The session will automatically stop after 4000 metres.

Here you may enter a number of metres, after which the application will automatically stop recording data.

After you have entered a distance you will be shown this message.

Recording will start automatically when you start to row.

As the session progresses a message is shown on screen to show that a sample of data has been saved.

Sample saved.....Sample saved...

Every sample of data is stored in the 'rowdata' table.

At the end of the session the application will display a summary of the data recorded.

Finished recording.

Updating summary table...

1. Time taken = 1 minutes 0 seconds.
 2. SPM average = 31.86 s.p.m.
 3. SPM max = 34 s.p.m.
 4. Total distance = 260.1 metres.
 5. Speed average = 3.81 m/s.
 6. Speed max = 4.5 m/s.
 7. Heart rate average = 154 b.p.m.
 8. Heart rate max = 148 b.p.m.
 9. Session number = 103
 10. Session name = "1min"
 11. Total strokes = 31 strokes.
 12. Time stamp of entry = Sat Jan 23 14:26:42 2010.
 13. The requested autostop time = 4 minutes.
 14. The requested number of autostop metres = 0 metres.
 15. Average number of seconds per km = 233.492641291811 seconds
- Quitting application.

It is this information that is stored in the 'session_summary' table.

Possible errors

The application performs no error checking and makes a number of assumptions. There are two major errors that could occur and no doubt a thousand others I have not thought of.

If the serial to USB cable is not connected you may get an error like this:

```
Can't call method "baudrate" on an undefined value at ./water8.pl line 40 (#1)
(F) You used the syntax of a method call, but the slot filled by the
object reference or package name contains an undefined value. Something
like this will reproduce the error:
```

```
$BADREF = undef;
process $BADREF 1,2,3;
$BADREF->process(1,2,3);
```

Uncaught exception from user code:

```
Can't call method "baudrate" on an undefined value at ./water8.pl line 40.
at ./water8.pl line 40
```

If the MySQL server is not running or is unreachable you may get a cable like this:

```
DBI connect('waterrower;host=SERVER_NAME','USER_NAME',...) failed: Can't connect to
MySQL server on 'SERVER_NAME' (61) at ./water8.pl line 197
Uncaught exception from user code:
connect failed: Can't connect to MySQL server on 'MBP' (61) at ./water8.pl line
198.
at ./water8.pl line 198
main::open_database() called at ./water8.pl line 54
```

Code description

The code is as well documented as I could make it. It should be fairly easy to understand. You will need to configure the application in one section so that works correctly on your own system.

In the sub routine 'open_database' you will need to define these values, at line 197 in current version of the code:

- Database server - this could be a local or remote server
- Database user name
- Database user name password

The application needs the following Perl modules:

- DBI - Database independent interface.
- Device::SerialPort qw(:PARAM :STAT 0.07) - Serial port driver.
- Term::ReadKey - Reads the keyboard.

- Number::Format qw(:subs :vars) - Allows numbers to be formatted.
- Time::HiRes qw(gettimeofday tv_interval) - Allows for time calculations in milliseconds.

Bugs and improvements

There is one small bug in the application. After you have started the application and answered the questions at the start the application does not wait for you to start before recording data. This means that some data is stored in the database before you start to row. This is an issue for a number of reasons. First a data sample will be stored that is mainly zeros, apart from the time of course. Second when you performing a timed session the application clock is running before you even start! If you have also set the S4 monitor up in timed mode, then the application could finish before your timed session is complete on the S4. Additionally the data produced at the end of the session will be distorted by this recorded lack of activity at the start of the run. Finally it is just simply frustrating to see the application record a sample before you have even started.

This “small bug” may seem in to be a large bug, but in reality it makes little real difference. First because it is easy to start within a few seconds of pressing return on the computer keyboard. Also as the data is being stored in the MySQL database for later analysis it is easy to remove any spurious data that may have been recorded at the start of the session. I may well revisit the code one day to correct this behaviour; in other words only record data after the first rowing stroke is made.

The other small improvement I would make is to tidy up the summary data displayed at the end of the session.

Further thoughts

A few further thoughts to take this project further.

You could...

- Write better code
- Add a smoothing algorithm to average out the data over the sample period
- Add a TK based graphical user interface
- Add some error trapping - I may well do this myself

Conclusion

This is clearly a very crude application; however it does what I need it to do. That is collect data from the Waterrower S4 for further analysis later.

I am sure that a beginner programmer could create an entire GUI based application in minutes. However I can't - I am simply not good enough. This was for me an exercise in learning a little about the language Perl. In my view the best way to learn something is to use it in a real life situation. In this case I could not find a suitable application that ran on a Mac that recorded information from a Waterrower. So I have created my own.

Internet links

Information	Link
Waterrower	http://www.waterrower.co.uk/
Waterrower S4 serial cable and output data description	http://www.waterrower.com/en/accessories_software_spec.htm

END OF DOCUMENT