Analyse This

By Hung Do

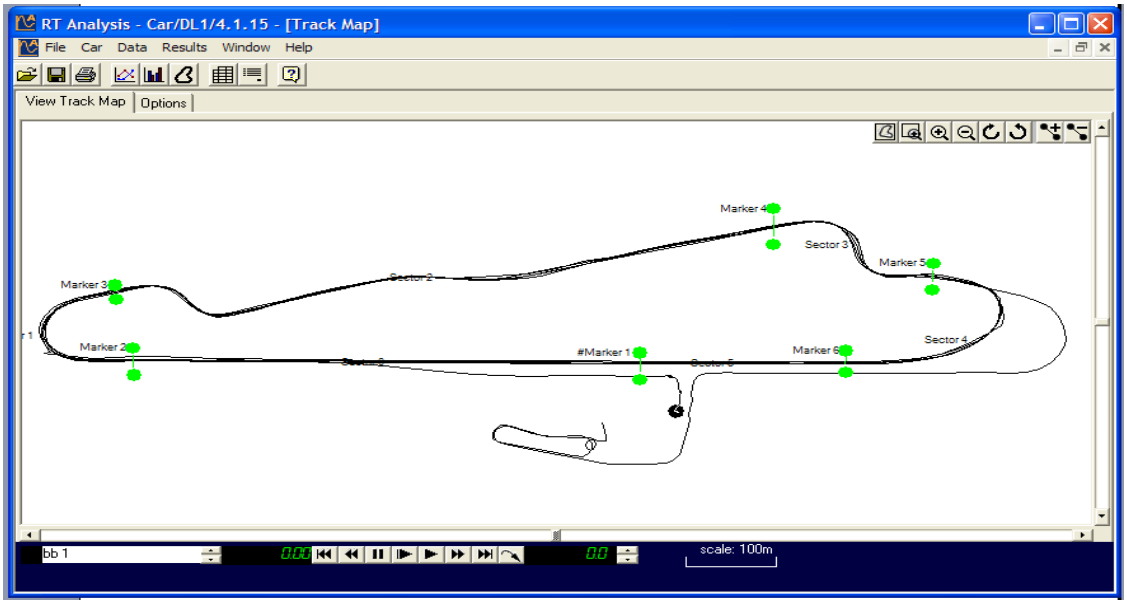
Have you ever wondered:

- Why at some sprint days you can't replicate the track times that you had previously obtained ?
- Why some people seem to be telling you that they can go through a corner at a speed that you would not even dream of ?
- If you should run with the rear sway bar on a harder or softer setting ?

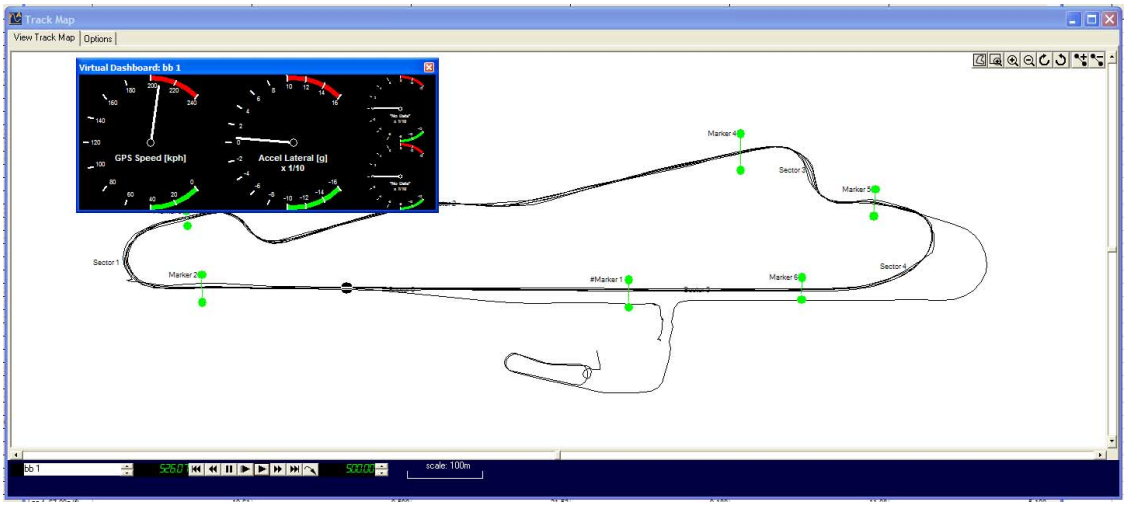
Well a lot of these questions can be answered if you have an on board data logger. Data acquisition and analysis has long been the domain of big budget race teams, but the decrease in cost of producing global positioning system receivers and accelerometers has put this technology within reach of club level competitors.

I have been using a DL1 data logger from Race Technology for several track sprints and it continues to amaze me how good a tool it is to measure and enhance both car and driver performance on each track. With its built in GPS, 2 accelerometers, 4 frequency inputs and 8 analogue inputs the unit can log a wide range of vehicle data for analysis. Useful inputs that can be logged are GPS speed, engine speed, individual wheel speed, temperatures, boost, throttle position and braking. A Windows software program can then be used to analyse the data with accurate track mapping and powerful graphing for comparison of different runs.

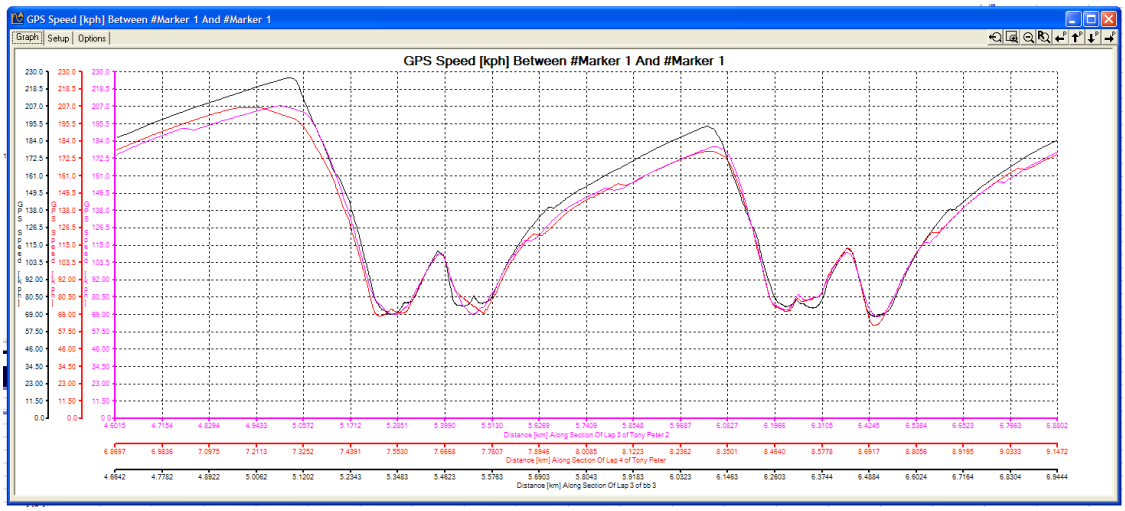
The simplest way of using the DL1 is to just plug the power adaptor into your cigarette lighter and with the built in sensors you can log and analyse GPS speed, longitudinal and lateral G forces. By simply analysing these you can get a wealth of information about the performance of both you and your car. Without delving too deep into data interpretation I have included some screen shots with a brief comment on each.



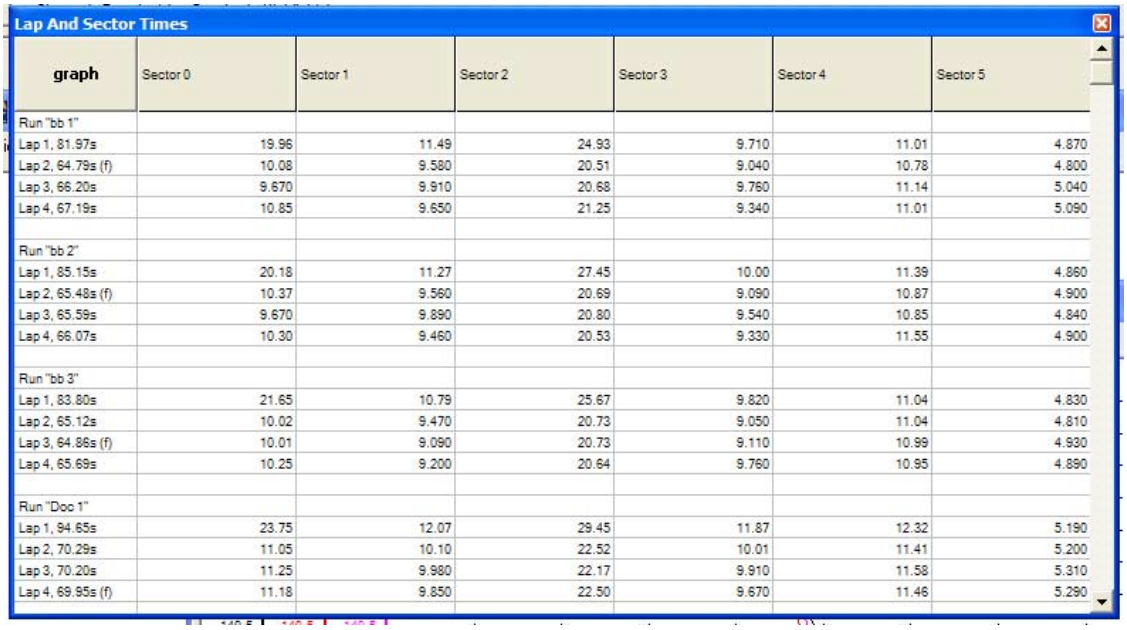
Very accurate track mapping showing pit entrance, exit and even the cool down area.



You can replay your lap with a virtual dash board and the next version of the analysis software will enable you to synchronise this with a video clip. This would no doubt be popular with those members who are using Budge's camera mount and video tape their sessions.



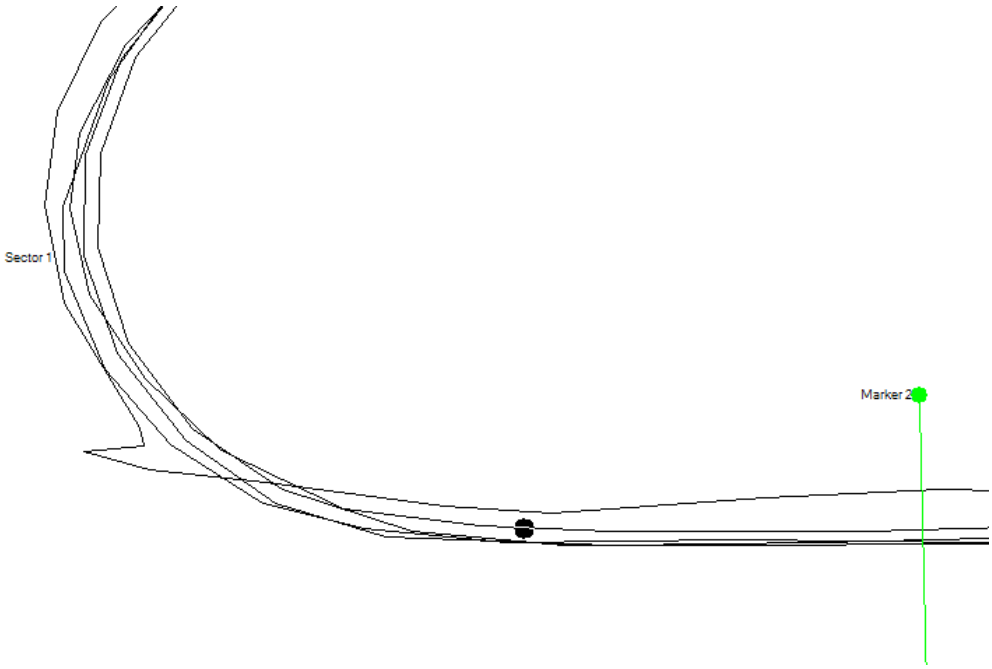
One of the simplest and most useful charts is to plot speed against distance for different laps. This of course will show you your braking points and corner speeds making it very useful to compare results with different cars/drivers. The above chart shows someone who is getting way too much power out of his car (as evidenced by the high speeds on the straights).



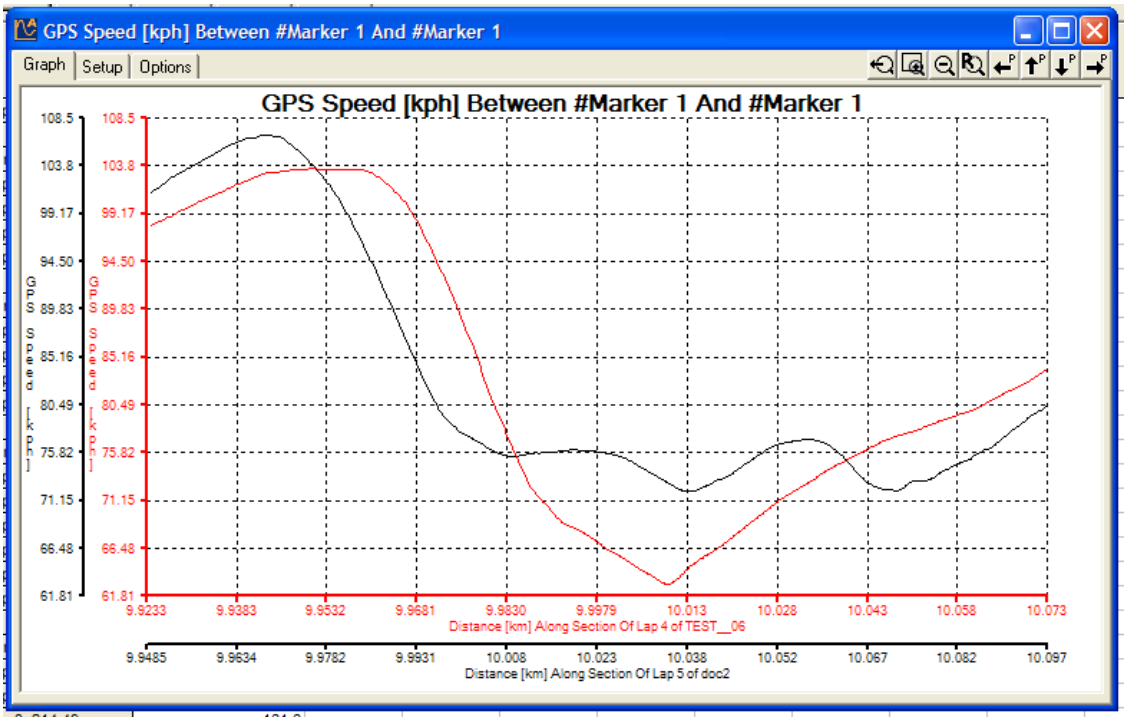
Lap And Sector Times

graph	Sector 0	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5
Run "bb 1"						
Lap 1, 81.97s	19.96	11.49	24.93	9.710	11.01	4.870
Lap 2, 64.79s (f)	10.08	9.580	20.51	9.040	10.78	4.800
Lap 3, 66.20s	9.670	9.910	20.68	9.760	11.14	5.040
Lap 4, 67.19s	10.85	9.650	21.25	9.340	11.01	5.090
Run "bb 2"						
Lap 1, 85.15s	20.18	11.27	27.45	10.00	11.39	4.860
Lap 2, 65.48s (f)	10.37	9.560	20.69	9.090	10.87	4.900
Lap 3, 65.59s	9.670	9.890	20.80	9.540	10.85	4.840
Lap 4, 66.07s	10.30	9.460	20.53	9.330	11.55	4.900
Run "bb 3"						
Lap 1, 83.80s	21.65	10.79	25.67	9.820	11.04	4.830
Lap 2, 65.12s	10.02	9.470	20.73	9.050	11.04	4.810
Lap 3, 64.86s (f)	10.01	9.090	20.73	9.110	10.99	4.930
Lap 4, 65.69s	10.25	9.200	20.64	9.760	10.95	4.890
Run "Doo 1"						
Lap 1, 94.65s	23.75	12.07	29.45	11.87	12.32	5.190
Lap 2, 70.29s	11.05	10.10	22.52	10.01	11.41	5.200
Lap 3, 70.20s	11.25	9.980	22.17	9.910	11.58	5.310
Lap 4, 69.95s (f)	11.18	9.850	22.50	9.670	11.46	5.290

This screenshot shows lap and sector times. From this you can work out what your theoretical best lap time would be if you managed to string together all of your best sector times into one lap.



This shot is of some GPS position plots showing different lines through turn one at Calder. It even shows the little off track excursion someone had after an optimistic late braking manoeuvre went wrong.



Speed graph through a corner showing the merit of the “slow in fast out” approach.

I have really only been using a very small part of this data acquisition and analysis system, but it has helped me to cut down my lap times everywhere. Some of the useful things that I have got out of the system are:

- Which corners I can make up some time at a particular track.
- Whether to go up a gear or remain in a lower gear. With my car I found that staying in 4^{th} gear all the way down the straight at Phillip Island was better than changing up to 5^{th} gear as I was losing some acceleration in 5^{th}.
- Trying different lines through a corner and seeing which one worked best, in terms of that sector's time.
- Having the data from a previous day at a particular track meant that when I hit the track in practice I already had some idea of what I wanted to do and achieve at each corner. This meant I was one step ahead of where I would usually have been.

At $1650 the unit doesn't come cheap but considering how much some people spend on modifications to their car, this is a worthwhile acquisition. Of course it can tell whether the mods you've performed on the car have the desired outcome and if you take the time to enter the vehicle weight, gear ratios, rolling resistance etc… you can obtain an estimate of your car's power and torque, a road dyno graph. Now that, would no doubt trigger a great deal of discussion between clients and tuning houses.

Hung Do
Member # 209