Objective test driving
## What are the five key benefits of using robots?

1: Accurate inputs

One requirement is common to all objective dynamics tests: good results and successful analysis are dependent upon accurate inputs. Expert drivers can achieve better accuracy than most, but even they are no match for a machine.

Steering: sine-sweep test

This is a classic example of a steering test used to analyse the vehicle's dynamic response across a frequency range. The resultant yaw and lateral acceleration levels in the test provide valuable information to the dynamics engineer about the vehicle. In this example, the requirement was for constant amplitude (54º) with frequency increasing from 0.2Hz to 3.5Hz.

The robot data exhibits much better control of amplitude, frequency sweep and the required sinusoid shape.
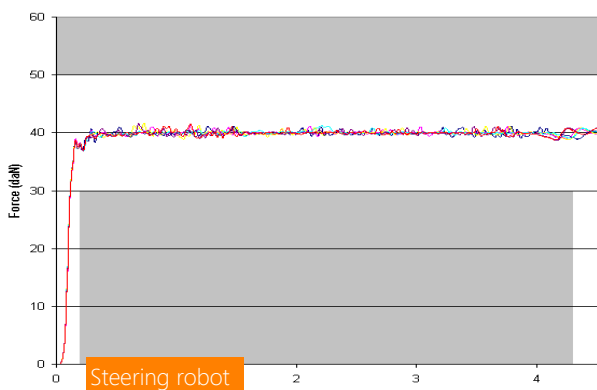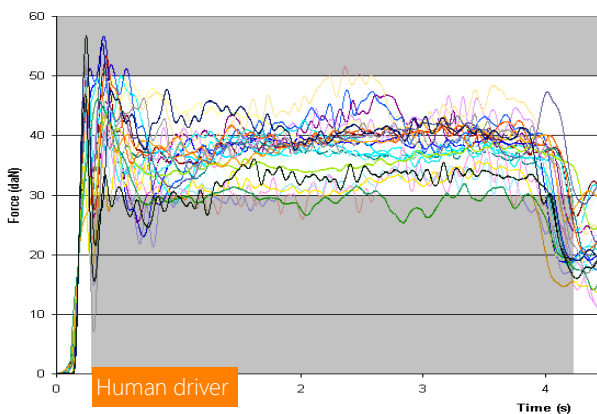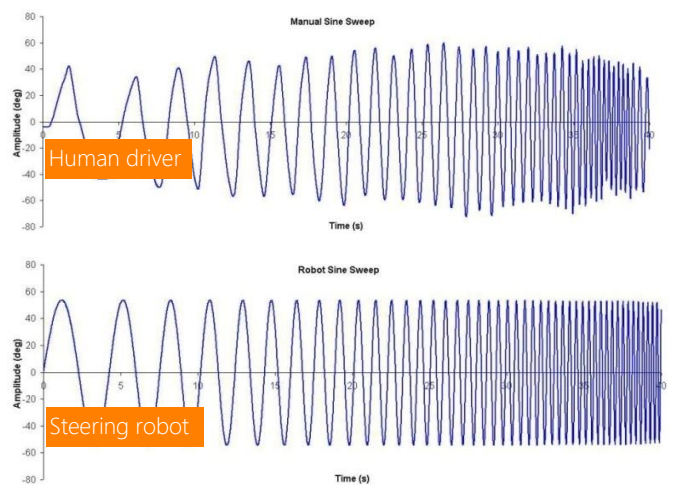
Braking: force step test

The brakes on modern cars are highly complex systems with mechanical, electronic, hydraulic and software elements. In order to develop and assess these systems there are many braking tests used today.

The force step test appears at first glance a simple one; to apply a step load of 400N to the brake pedal, causing the vehicle to decelerate from 130kph to zero. After the initial step, the force must neither exceed 500N nor fall below 300N during the braking period.

However, the violent deceleration (up to 1g) which results from the braking makes it difficult for the test driver to hold the force to within the limits required. The above data was recorded in a particularly difficult vehicle.

As can be seen, the brake force applied by the human driver regularly went outside the permitted boundaries, whereas the brake robot

2: High repeatability

Input repeatability is of paramount importance when making comparative tests. For the comparison to be meaningful the inputs must be the same, and the only way to guarantee the repeatability of your dynamics tests is to use a robot. In the example below, a double-lane change was driven 10 times by a human driver and then 10 times by an ABD steering robot with path-following. Statistical analysis showed the robot gave between 5- and 10-times better repeatability.

Human driver

Steering robot
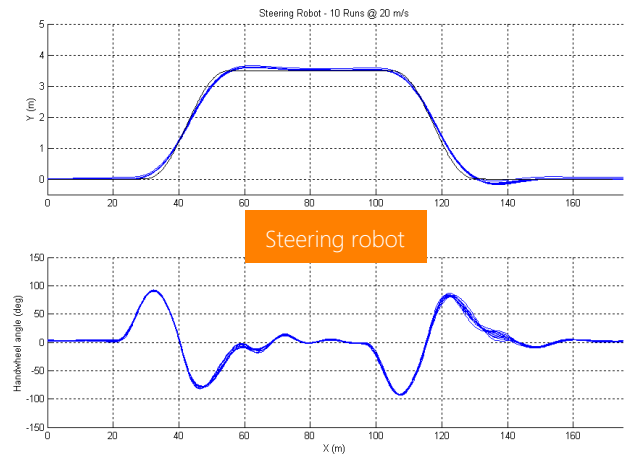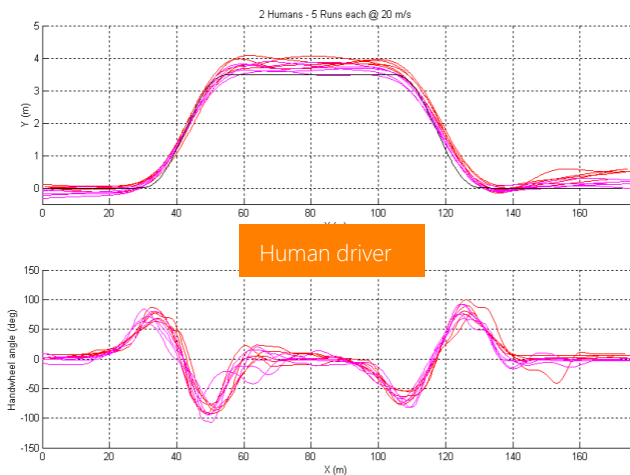
3: Time and cost saving

Without using robots, it is generally necessary to repeat a test 5, 10 or more times simply to obtain data of acceptable quality. Using a robot, this is no longer necessary. The brake force step test is a good example; the human driver spent a whole day trying to achieve the required braking profile, and from 27 attempts he only succeeded in performing 3 acceptable runs.

Using the brake robot it was possible to achieve five perfect runs in a matter of minutes! This represents a huge saving in testing time, which in turn translates to cost-savings in terms of labour, proving-ground time and equipment availability, while allowing you to get your vehicle to market faster.

4: Compliance with test standards

Increasing numbers of internationally-mandated tests specifically require the use of robots. Examples include the NHTSA fish-hook test and the UN Reg 13-H / FMVSS126 sine-dwell test, both of which specifically refer to the use of a steering robot. Future test standards will increasingly require the use of robots to ensure compliance.

5: Remove drivers from harm's way

Some types of vehicle testing can be unpleasant or dangerous for the test driver. Examples include:

- Roll-over testing can cause serious driver injury
- Durability testing can cause driver fatigue and possible long-term health problems
- Mis-use testing can cause back problems and other health conditions
- Testing of collision avoidance systems can put the driver at risk of a high-speed collision
- Aggressive brake testing can cause back, hip and other joint problems

AB Dynamics' driverless test systems (DTS) are in use around the world, performing essential tests including those listed above