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7 *TargetLink was used to generate production code for the 2005 Jeep Grand Cherokee and proved to be a very versatile tool. There was no need to modify the code manually.*

EDITORIAL

Hardware-in-the-loop simulators are a special success story, for both our customers and ourselves. Just how vital this technology has become was underlined by Dr. Eckhard Cordes, CEO of the Mercedes Car Group, in an interview for Automotive News Europe. To paraphrase, he says that Mercedes is now using computer simulation to run tests, and this makes it possible to solve practically all electronics problems in good time. He doesn't explicitly mention hardware-in-the-loop (HIL), but that is obviously what he means. There were reports that Mercedes had problems with electronics and software – as did other manufacturers, to a greater or lesser degree. The press often play up the error-proneness of electronics and software, even though the situation has changed enormously. Great progress has been made, especially in electronics architectures and development processes. Mercedes, for example, tested the electronic system of the new A-Class almost completely by HIL. dSPACE helped to construct the HIL platform for the tests (see ATZ/MTZ, special edition, October 2004, pp. 116-125). The positive results of systematic maturity management based on HIL can be clearly seen in the new A-Class project. Future vehicles will also benefit from this technology.

HIL has come a long way. Exactly 10 years ago, as I recall, an Audi A8 was delivered to dSPACE's back yard.

We were tasked with developing a vehicle dynamics HIL system for it. We had been supplying HIL simulator platforms for years, but this was our first turn-key HIL simulator. Cables hung from a window on the second floor of our office building, connecting the desktop HIL simulator with the vehicle hydraulics. To this day, Audi remains one of our lead customers for HIL simulators, and by all accounts Audi has profited from this as much as we have. Today, we know of no major vehicle manufacturer who does not use dSPACE HIL simulators. There was just one missing from our customer base until recently, and now that too relies on dSPACE HIL. Automotive suppliers are also increasingly using HIL technology. At any rate, we certainly have to work hard to meet the constantly increasing demand. Though fortunately, having so much experience is making us increasingly efficient. Our engineers know what has to be done and how to do it.

Without wishing to appear immodest, I think I can say that dSPACE did pioneering work on HIL simulators and has in many respects become a standard for HIL technology. Consultants Frost & Sullivan agree: Their analysts just recognized dSPACE as the Leading Manufacturing Test Company of the Year 2005, because of our leading position in hardware-in-the-loop simulators.

Dr. Herbert Hanselmann
President
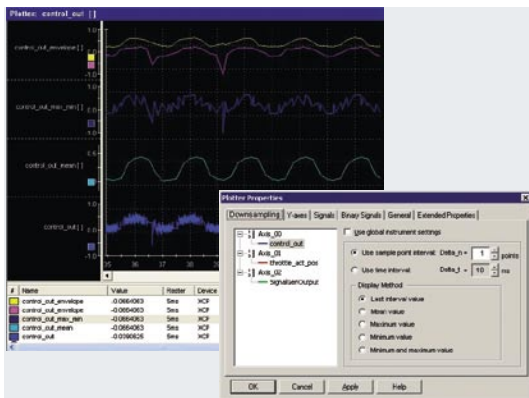
12 *CalDesk 1.2, dSPACE's calibration software, has greatly extended functionality for interfaces, instrumentation, and data analysis, plus optimized handling features.*

17 *Global growth consultants Frost & Sullivan named dSPACE Leading Manufacturing Test Company of the Year 2005 for our market position in hardware-in-the-loop systems.*

Renault F1 Team Wins With Step 11

- **Renault F1 Team uses new Magneti Marelli ECU**

- **Controller and dSPACE Simulator Full-Size designed in parallel**

- **Simultaneous testing at different places**

The Renault F1 Team got off to a highly successful start in the current Formula One season, using a new electronic control system. Wanting a more powerful platform for the engine and chassis control, but also to simplify the electrical and electronic installations, the team had decided on a combined chassis and engine controller. Called "Step 11", the new racing controller was developed in partnership with Magneti Marelli according to the team's requirements. Simultaneously, dSPACE designed a Simulator Full-Size, two identical setups of which were produced for the Renault F1 Team technical centers in the United Kingdom and France.
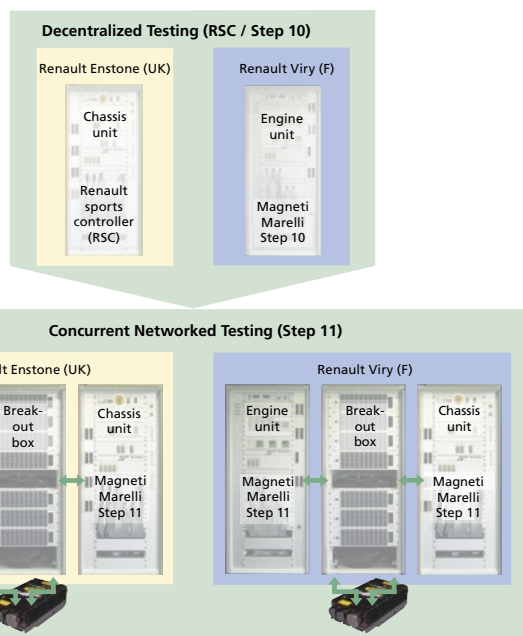
Renault is one of the few Formula One manufacturers to produce both the chassis and engine in-house. The team in Enstone is responsible for chassis development and so far we have tested the chassis electronic control unit (ECU) with the corresponding simulator, while the engine team in Viry-Châtillon also tested the Magneti Marelli Step 10 controller on two dSPACE engine simulators. Last year, the Renault F1 Team decided to develop the all-new electronic control system, Step 11. Step 11 is physically lighter, representing a quarter of the total weight saving in the new car, and gives us more scope for further development.

It has four times the processing power, and ten times the data acquisition capacity, all of which will help to improve control systems compared with 2004. On that score, the new R25 is certainly the best-integrated racing car the team has ever produced.

HIL Testing of the New Racing Controller

The requirement was to create an overall hardware-in-the-loop (HIL) system that integrated the chassis and engine HIL test systems in the United Kingdom and France to test the Step 11 controller. dSPACE was the company that offered everything we needed. The dSPACE Simulator Full-Size consists of three racks: engine rack, chassis rack, and break-out box (BOB) rack. The optional BOB rack makes all the ECU pins directly accessible, enabling every signal to be measured with great precision. The dSPACE Simulator Full-Size can be run either with the BOB rack attached or with Step 11 directly connected to the engine or chassis rack. The simulator is hosted by a PC with dSPACE standard software: the ControlDesk experiment software to control the real-time hardware and failure insertion capabilities, and a Simulink model as the basis for the real-time application. The real-time hardware comprises four DS1006 Processor Boards with several dSPACE I/O boards connected to them. Interprocessor communication is via high-speed Gigalink modules, which are connected by fiber-optic cables. Various signal conditioning, load, and failure insertion modules are connected to interface the I/O hardware to signals to and from the ECU.

▶ *Completely networked testing instead of decentralized testing: Magneti Marelli Step 11 on identical setups in Enstone and Viry-Châtillon.*

Decentralized Testing (RSC / Step 10)

Renault Enstone (UK) — Chassis unit — Renault sports controller (RSC)

Renault Viry (F) — Engine unit — Magneti Marelli Step 10

Concurrent Networked Testing (Step 11)

Renault Enstone (UK) — Engine unit / Magneti Marelli Step 11 — Break-out box — Chassis unit / Magneti Marelli Step 11

Renault Viry (F) — Engine unit / Magneti Marelli Step 11 — Break-out box — Chassis unit / Magneti Marelli Step 11
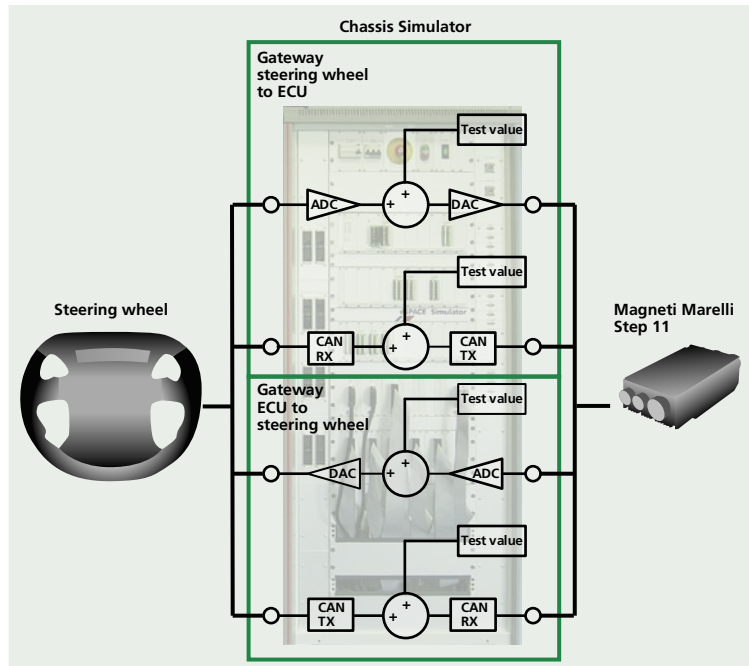
The simulator also has all the relevant car components connected, such as:

- Magneti Marelli Step 11
- Two lambda modules
- Four upright boxes
- Voltage regulator box
- Lap trigger
- A real steering wheel and pedals can be connected, too.

The dSPACE Simulator Setup

The engine and chassis racks are networked for testing networked functions. They have extremely fast model components, each running at different sample rates to handle model dynamics. Computing specific components requires only 50 µs (20 kHz) to achieve sufficient stability and accuracy. Renault F1 and dSPACE jointly defined the entire topology and signal routing on the individual CPUs. The simulator has a failure insertion unit (FIU) for feeding forward electrical faults for all ECU outputs and inputs: open wire, short to GND, and short to V_{BAT}, which can be set manually or automatically by the host PC. Another FIU is used to feed forward faults on the ignition channel and to keep permanent short-circuit currents. In addition, the simulator features a special sensor simulation. With the appropriate sensor scaling, any sensor value can be set and monitored in engineering units in the ControlDesk experiment software. Signal conditioning modules are available for simulating highly specialized sensors, such as thermocouples, linear lambda probes, and LVDT sensors (Linear Variable Differential Transformer). The simulator comprises a complete steering wheel gateway for all discrete and CAN signals. The steering wheel generates signals. The simulator picks the signals up, falsifies them if

necessary and forwards them to the ECU for failure simulation, and vice versa. The simulator also includes a noise generator for generating an explicitly bad environment. Any sensor signal in the ControlDesk layout can be chosen for "noising", for example, with a loose sensor connector, even during run time. The tough requirements on the HIL D/A channels in terms of high precision and marginal noising have been met. The noise on signal channels was reduced to a minimum by several measures such as signal topology and shielding.

▲ *The F1 steering wheel as an example of gateway operation.*

▲ *The ControlDesk screen shows the validation of the ignition and injection timing.*
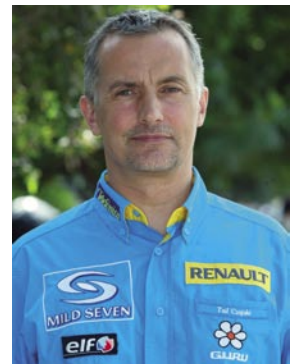
Simultaneous Testing at Different Locations

The ECU software is constantly undergoing further developments – there are new software releases every few days – and the interaction of all the ECU functions has to be tested again and again before the software is released for use on the race track. dSPACE Simulator is used to run the ECU function tests both in the software development phase and between races. HIL tests on engine functionality implemented with the simulator in France can now be verified and reproduced with our simulator here in the United Kingdom. If the team in France modifies the ECU code in terms of ignition and injection strategy, the ECU will also be flashed with the new code in the United Kingdom, so that we can simultaneously test that it is correctly implemented in terms of chassis functionality. Constant data exchange between the United Kingdom and France allows us to produce the same test results at both sites, with automated testing 24/7.

Excellent Cooperation with dSPACE

We started the simulator project with dSPACE in early June 2004. Only 4 months later, in September, the first simulator was supplied to us here in the United Kingdom, followed by the second system in October, which was delivered to the Renault F1 Team in Viry-Châtillon, France. Formula One is a very fast-moving business, so flexibility was vital. dSPACE was always quick to respond to any new specifications for the Step 11 racing controller, which was being developed in parallel – at the start of simulator design, there was not even a prototype of the Step 11 controller available. dSPACE was always closely integrated into the Renault F1 Team development process and proved to be a very competent development partner with regard to project management and engineering support.

Tad Czapski
Vehicle Technology Director
Renault F1 Team
United Kingdom

▲ *Twin dSPACE Simulators: Renault F1 tests new functions on the new Magneti Marelli Step 11 controller simultaneously in the United Kingdom and France.*

TargetLink Goes Off-Road

The Chrysler group of DaimlerChrysler used TargetLink to generate production code for the 2005 Jeep® Grand Cherokee. 100% of the application code for the Electronic Transfer Case and the Electronic Limited Slipped Differentials (ELSDs) was autocoded by TargetLink. During implementation, the developers found that "TargetLink is a very versatile tool" and they were "continuously impressed with the readability of the generated code". There was no need to modify the code manually.

- Autocode in production vehicle

- Chrysler group uses TargetLink for Jeep Grand Cherokee

- Large model fits on a standard controller

New Active 4x4 Drive

For the 2005 Jeep Grand Cherokee, we designed a new four-wheel drive system. The system can actively shift torque to all four wheels to provide maximum available traction in off-road driving. The electronic limited slip differentials (ELSD) help provide the ultimate in active traction management for every off-road challenge. Expected wheel speeds are compared with the actual speeds to detect wheel slip at the earliest possible moment. When slip is detected, the appropriate differentials are electronically activated to redirect engine torque to the wheels with the most traction. Known as Quadra-Drive II®, this system helped the Jeep Grand Cherokee win the 2005 4x4 of the year award from Petersen's 4-Wheel & Off-Road magazine.

Introducing Automatic Production Code Generation

To develop the application software for the Jeep Grand Cherokee, we implemented a model-based autocode integration process for the first time. After reviewing available options, TargetLink was chosen as the production code generator. Our group had experience using model-based function development for rapid control prototyping using a dSPACE AutoBox and ControlDesk for another program. For this application, a dSPACE bypass POD was used to allow the dSPACE MicroAutoBox to interface directly to our target hardware for rapid prototyping. TargetLink is also used to create the ECU description file in the standardized ASAM-MCD 2MC file format (formerly ASAP2) to make the variables and parameters available for ECU measurement and calibration.

◄ *The Jeep Grand Cherokee is the perfect combination of Jeep's legendary off-road capabilities with the ultimate in technical equipment and interior features.*

Autocode Integration Process

To support autocode generation with TargetLink, we have developed our own internal process as follows:

Step 1
Model conversion

After function design, simulation, and verification with MATLAB®/Simulink®/Stateflow®, we convert the Simulink model to TargetLink. The first time we did this, functional equivalents had to be found for any Simulink blocks which were not supported. The result was a 4-page modeling guideline called the "Model Autocode Readiness Review Checklist".
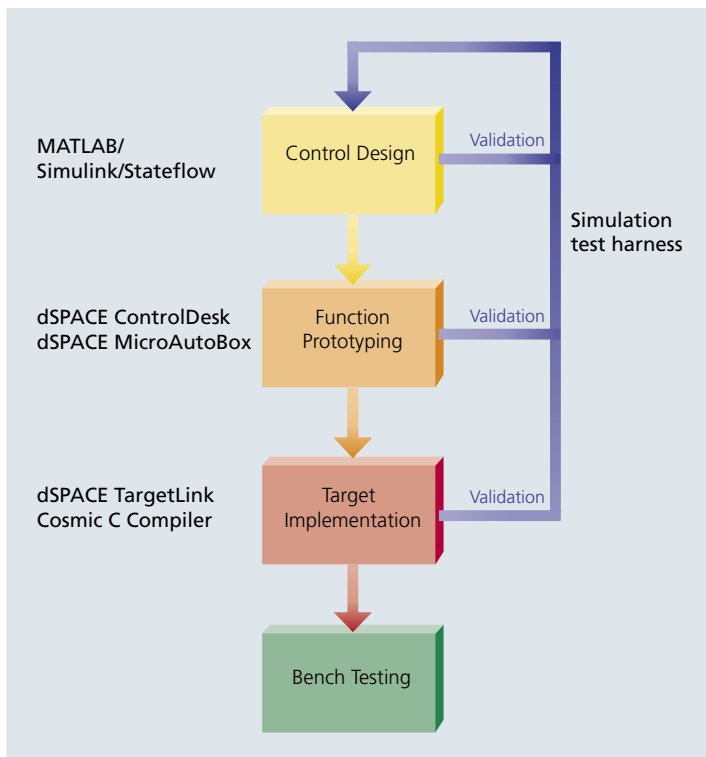
▲ *Workflow from control design to target implementation.*

Step 2
Simulation test harness

We created a simulation test harness which allows the execution of an integration test suite containing over 110 test cases. These tests are executed under simulation while the minimum and maximum values of every node in the model are recorded. We used custom written M-scripts to compare the model outputs with a baseline output file.

Step 3
Simulation-based autoscaling

Using the data collected in step 2, the fixed-point model can be autoscaled with TargetLink.

Step 4
Floating-point versus fixed-point simulation

The integration test suite is run again, only this time in fixed-point mode, recording the data at every node in the model.

Step 5
Error resolution (loss of resolution/word width)

Using the data collected in step 4, the fixed-point model output can be compared against the floating-point model output. Where there are significant errors, we have to trace back from the output to the source of the error, which is usually loss of resolution due to a too narrow integer data type.

Step 6
Target mode simulation on target processor

Initially, we did not use processor-in-the-loop simulation (PIL) on an evaluation board. We thought it was better to test the software after it was integrated with the other software components. But we have found PIL simulation with TargetLink to be a valuable tool in that it allows us to run our integration test suite and log stack usage and execution time for each test case.
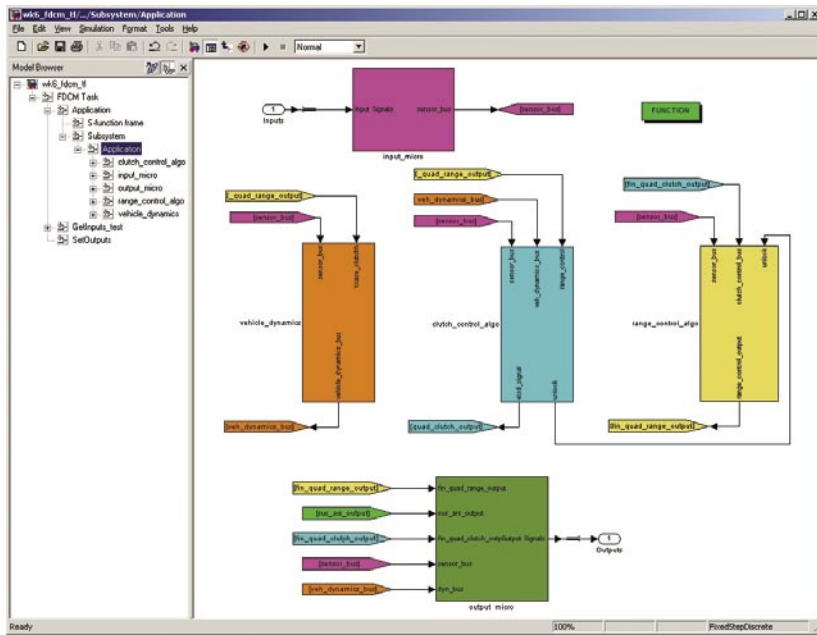
Step 7
Export C code and integrate with other components (integration layer)

The model is then exported as C code, and integrated with the low-level drivers, the OSEK operating system, and CAN drivers. This integration involves writing a small function to call the low-level functions, pass the inputs to the model functions, and update the outputs via the low-level functions with the values returned by the model.

Step 8
Verification

The integration test suite is repeated on the target hardware using an HIL simulator, and the results verified.

Astronomical Research in Chile

- ◢ **Ruhr University at Bochum researches in Chile**

- ◢ **DS1103 PPC Controller Board controls a telescope**

- ◢ **Studying the development of young stars and quasars**

Telescopes in the Atacama Desert in Chile are jointly maintained by the Astronomisches Institut at the Ruhr University in Bochum, Germany (AIRUB), and the University of Antofagasta. Research there mainly concentrates on the development of young stars and energy bursts in quasars. Soon there will be three more telescopes, including an innovative hexapod telescope, turning the complex into a sizable observatory. A DS1103 PPC Controller Board is used to control the hexapod telescope's movable legs.

Building an Observatory

AIRUB's telescopes are an impressive observatory. One of the new additions currently being erected in Chile is a hexapod telescope (HPT), funded by the Economics Ministry of Northrhine-Westphalia in Germany and built by Krupp Industrietechnik. It will be joined by a 40-cm robotic telescope that was completed in Bochum in March 2005. A 90-cm robotic telescope will be completed in 2006. The purpose of the observatory is to detect changes in young stars and quasars in the visible and infrared ranges.

Secondary mirror

6 adjustable legs

Primary mirror

Rod structure

6 height-adjustable legs

▶ *The hexapod telescope (HPT) – seen here still in the Botanical Gardens in Bochum – is being constructed in the Atacama Desert in Chile to study young stars and quasars.*
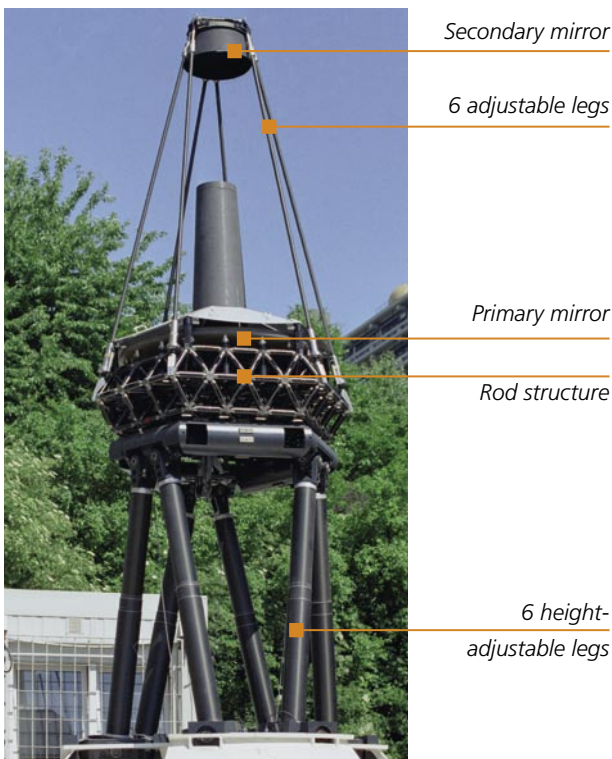
The Hexapod: A New Kind of Telescope

The HPT has 6 height-adjustable legs (hence the name hexapod) with high-precision spindles that keep the telescope trained on a target object, adjusting for the motion of the stars mainly caused by the Earth's rotation.

The HTP is a prototype with the following technical innovations:

- ◢ Mounted on 6 height-adjustable legs
- ◢ An actively controlled primary mirror consisting of a thin ZERODUR® meniscus mounted on a rod structure. The mirror is vaporized with aluminum for maximum reflectivity.
- ◢ A secondary mirror with 6 adjustable legs to compensate for gravitational deformations due to varying elevations

The primary mirror is 1.5 m in diameter, yet only 50 mm thick – so thin that it would be unable to keep its shape without its 36 computer-controlled mounting points. These bend the mirror to ensure it always has the optimum shape in any telescope position. The optimization process is constantly controlled by an electronic optical system that AIRUB developed with the help of the European Southern Observatory (ESO). The HPT's receivers are a CCD camera and a spectrograph. We planned the spectrograph in cooperation with the Landessternwarte observatory in Heidelberg-Königstuhl, Germany. It enables the HPT to capture and study all starlight across the entire optical spectrum (370 to 1000 nm) in a single exposure.

Advantages of a Hexapod Telescope

The special structure using adjustable legs made it possible to considerably reduce the weight of the telescope. The primary mirror is the first of its kind, with numerous mounting points that allow it to respond to both pressure and tension. This guarantees a constant ideal optical surface. Another computer-controlled support optimizes the position of the secondary mirror. So in a suitable location such as the Cerro Armazones in Chile, and with stable atmospheric conditions, the HPT provides a sharpness of image that is otherwise only possible in space.

▲ The Observatorium Cerro Armazones (O.C.A.) is a joint project of the Ruhr University at Bochum, Germany, and the University of Antofagasta in Chile. Research is currently being performed on two telescopes.

Term	Explanation
Azimuth	The horizontal angle from true north of a star or of a point on the Earth's surface
CCD camera (CCD = charge-coupled device)	Electronic camera that collects and reads the electrons that strike each individual pixel. This provides the distribution of light intensity over the surface. Filters are fitted in front of the camera to measure light of specific wavelengths.
Elevation	Angular distance of a point in the sky from the horizontal plane
Quasar (quasi-stellar object)	Highly luminous and usually very distant active galaxy
Spectrograph	An instrument that breaks down the light entering it into its spectral components. This provides the distribution of light intensity as a function of wavelength.

Controlling the Telescope

A DS1103 PPC Controller Board controls the telescope's position. The board is used to read out and control the encoders and servo amplifiers of the 6 adjustable legs, and to compare the telescope's actual position with the desired position. It also controls the HPT's speed. The desired position in terms of azimuth, elevation, and rotation is computed in real time via a CAN bus. The system is loaded from an experiment software environment, which also provides it with parameters.

Research Opportunity

At the Ruhr University in Bochum, we can carry out astronomy research programs that the big international observatories do not have time for. This gives our students the unique opportunity to work on telescopes at an early stage of their university courses – either on site in Chile or using the robotic telescopes on the Internet. The HPT is being installed on site and will be ready in August 2005. The first phase after that will be to test the HPT before it is put to work making astronomy observations.

Dr. Roland Lemke
Astronomisches Institut
Ruhr University, Bochum
Germany

More information on this project: *www.astro. ruhr-uni-bochum.de*

New: CalDesk 1.2

- ◤ **Downsampling, hardware polling, virtual variables**

- ◤ **Extended interface options**

- ◤ **Enhanced handling**

Version 1.1 of the CalDesk calibration software aimed primarily to provide all the major calibration and measurement interfaces, plus connection to dSPACE prototyping systems. The new version, CalDesk 1.2, greatly extends interface functionality and supports additional calibration concepts. It also has far greater functionality for instrumentation, data analysis, and handling in general.

Measuring via On-Chip Debug Interfaces Without ECU Service

DCI-GSI is a generic serial interface for calibration, measurement, and bypassing. It can be connected to debug ports such as Nexus, AUD/NBD, and JTAG. An increasing number of developers are using DCI-GSI to record the internal data of electronic control units (ECUs) as part of function development and validation.
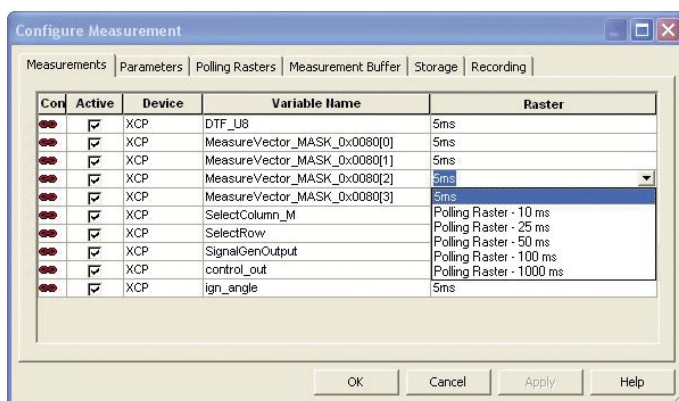
▲ *Configuring measurements by means of polling.*

DCI-GSI is ideal for such tasks, since it is enormously powerful in terms of measurement data through-put and provides a way of capturing internal ECU measurement variables, without the ECU software having to be specially adapted. In one application, for example, several thousand measurement variables in the ECU are recorded cyclically, and in another, the contents of a 40-KB RAM area on the microcontroller are logged on the ECU raster-synchronously. Version 1.2 boosts measurement data throughput even further, both on the DCI-GSI and in CalDesk itself. It also gives you an efficient means of processing the measurement files created during measurement runs – even ones larger than 1 GB.

◨ dSPACE Calibration System

Single-Page Concept, Flash Programming, Polling Measurement

ECUs for car body and comfort functions often have very limited RAM and ROM resources. This means it is not always possible to implement a two-page calibration concept, as this would require two sets of data: a write-protected set on a reference page (typically located in the flash memory) and a second, modifiable set of data on the working page in the ECU's RAM. CalDesk 1.2 now also fully supports single-page concepts, in addition to the two-page calibration concept usually applied in powertrain ECUs. It makes no difference whether the calibration data is stored in the RAM, on an EEPROM, or in flash memory, or whether calibration is performed offline or online. dSPACE's new ECU Flash Programming Tool lets you store a new set of data persistently in the ECU's flash memory. The limited resources in ECUs can also restrict the functional scope of a CCP or XCP on CAN implementation, for example, as regards the number of measurement lists that can be used to run raster-synchronous measurements. Variables can be captured on an ECU without measurement lists, at a clock rate defined via the PC timer (this is known as polling). This new CalDesk feature lets you increase the number of measurement variables to be recorded and work with ECUs without measurement lists.

Extended Interface Functionality

- Cold-start measurement supported for CCP, XCP on CAN, and DCI-GSI1

- Calibration results automatically saved to ECU's flash memory

- DCI-GSI: Supports Infineon TriCore Processors via JTAG/OCDS

- Easy updating of the variable description file – especially useful for users of rapid control prototyping (MicroAutoBox or DS1005).

In addition, ECU calibration variables and adaptive parameters can be measured easily.

No-Overlap Signal Display, Downsampling, Automatic Bookmarks

The Plotter in CalDesk 1.2 provides a lot of new functions for data analysis. A single click displays several signals and their y-axes simultaneously without overlapping, making them much easier to observe. The Plotter legend contains additional information for the selected time interval, such as mean value,
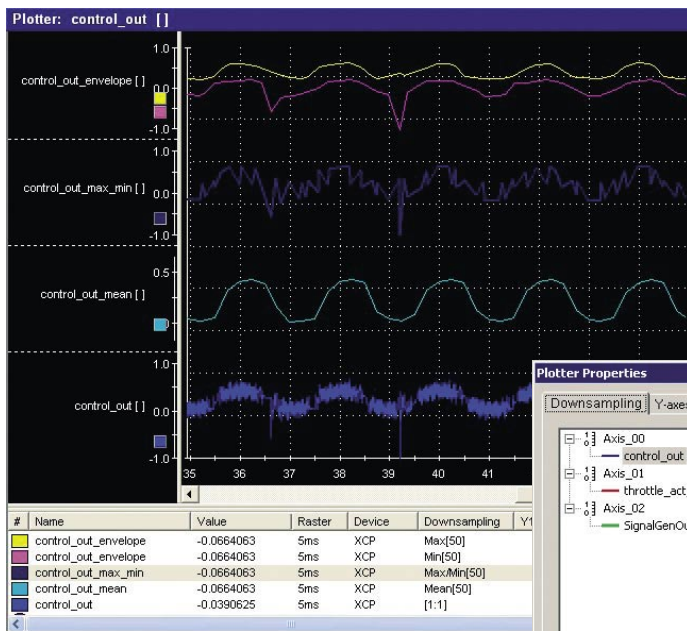
▲ *New Plotter features: signals stacked with no overlap, scroll bar, and downsampling (this example shows downsampling over 50 data points).*

standard deviation, and extreme values. The new scroll bar lets you navigate through the measurement buffer, and you can also define the interval for visualization and signal analysis. Several markers can be placed on different signals for data analysis purposes. The new downsampling option reduces the number of measurement values that are displayed, allowing signals with very high sampling rates to be visualized during measurement – virtually in real time. Typical applications include visualizing the envelope curve of a torsional vibration or the mean value of a noisy signal. Only the visualization is downsampled – the number of measurement values that are recorded is not affected. Bookmarks can be inserted in measurement files automatically using configurable trigger rules.

Virtual or Calculated Variables

With CalDesk 1.2, you can create new, calculated (virtual) variables whose values are calculated from other elements in the variable description and connect them to instruments in CalDesk and in measurement files just like "normal" measurement variables. Power calculation is a typical example.

Enhanced Handling

With CalDesk 1.2, you can edit folder structures in the Experiment Navigator and specify automatic naming of projects and experiments. This greatly speeds up experiment configuration, especially for rapid control prototyping tasks. You can display reference values in calibration instruments even while the working page is active, assign reference values to selected variables, and group variables by defining individual foreground and background colors.
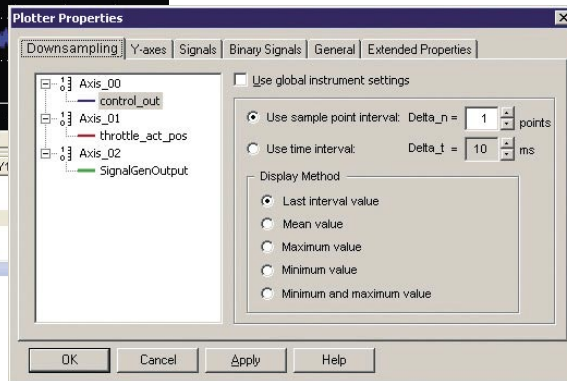

◀ *Several downsampling options for Plotter visualization.*

Improved Instrumentation

CalDesk 1.2 allows several 1-D or 2-D look-up tables to be assigned to a single table editor and organized on individual pages. The new Multistate LED instrument lets you visualize threshold and range violations, and display status information. Many ECUs contain state machines that represent individual states by bits in status variables. The Multistate LED instrument makes use of this, providing a method of evaluating selected bits or bit ranges of one variable.

▼ *Dialog for setting calculated variables.*
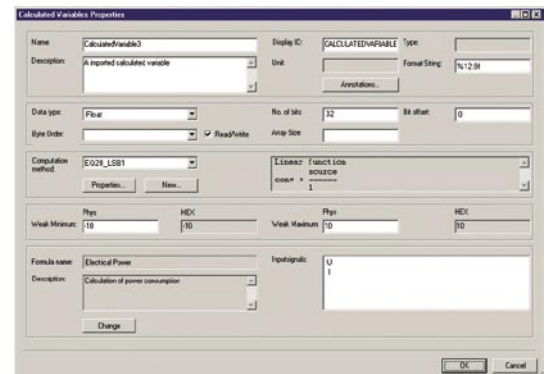
dSPACE Release 4.2: Numerous New Features

- Customized report creation with AutomationDesk

- Complex driving maneuvers with ControlDesk

- New analysis features for MotionDesk

For further details on dSPACE Release 4.2, see *www.dspace.de/goto?releases*

dSPACE Release 4.2 adds a whole range of new features to several dSPACE tools. AutomationDesk, the test automation software, provides new options for report configuration, plus access to calibration and measurement tools and to Softing's Diagnostic Tool Set DTS7. ControlDesk, the experiment environment, now allows complex driving maneuvers to be performed with a joystick or a steering wheel. And finally, MotionDesk, the 3-D animation software, has extended analysis features.

New Functions for AutomationDesk

Using AutomationDesk 1.2, the new version of the test automation software, developers can automate dSPACE's calibration software, CalDesk 1.1, and Softing's Diagnostic Tool Set DTS7. They can also customize the contents of automatically generated reports by integrating elements such as texts, tables, and images as required (see details on page 16).

Complex Driving Maneuvers with ControlDesk

Joysticks and steering wheels can be connected to the new Version 2.6 of the ControlDesk experiment environment as input devices. This is useful in HIL simulation, making it easy to simulate driving maneuvers that are difficult to implement via keyboard and mouse.
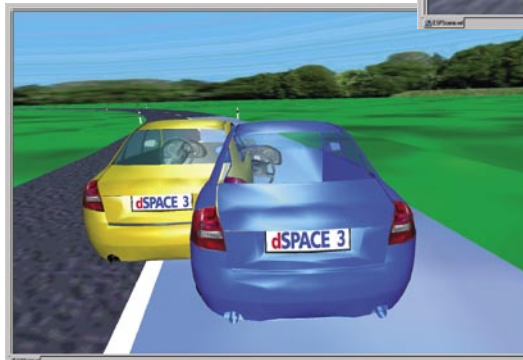
Simultaneous Animations with MotionDesk

MotionDesk 2.0, the 3-D animation software, now has a multitrack mode that visualizes several vehicles simultaneously, each vehicle based on a different simulation run. By overlaying the simulation runs, engineers can see the differences between them at a glance – for example, when comparing a simulated vehicle with and without ESP.

Several New Blocksets

The new RTI RapidPro Control Unit Blockset allows the new RapidPro hardware to be used as an intelligent I/O subsystem (for engine control, for example). Bypass interfaces can be configured with the new Version 2.0 of the RTI Bypass Blockset. RTI CAN MultiMessage Blockset 1.1 provides new functions for editing messages.

▲ *The new multitrack mode in MotionDesk, the 3-D animation software: Several simulation runs are overlaid for developers to see the differences at a glance.*

If you would like to receive release information by e-mail, send an e-mail to *release.news@dspace.de*

Hand in Hand

MTest is our test management software that automates systematic testing in conjunction with TargetLink, the production code generator, during function development. Its main use is in the left-hand branch of the V-cycle, running tests in parallel to the development process. It is an indispensable time-saver for back-to-back tests during function development. MTest not only manages tests, it also generates reports.

- ◤ TargetLink and MTest interact
- ◤ Regression tests during function development
- ◤ Automated, systematic testing

Developing Tests

While functions are being developed with TargetLink, MTest can perform a wide variety of tests systematically and automatically for early function design validation. It does this by first generating a test frame, into which a copy of the function model is inserted. MTest then provides two methods of obtaining test vectors: the integrated Classification Tree Editor (CTE) and a second method based on signal behaviors. The CTE is a graphical method of test data creation, while in the signal behavior method, MTest either generates stimulus signals or imports test data, for example, from MAT, XLS, or CSV files.

Running and Managing Tests

MTest supports all TargetLink's simulation modes – from model-in-the-loop to software-in-the-loop and right through to processor-in-the-loop simulation – so back-to-back tests can be run for all test phases throughout function development. MTest stores and manages all the tests belonging to one function model. The tests can be reused at any time, with an automatic plausibility check to ensure that the tests are suitable for the test object.

Documenting Tests

When tests have been run, MTest automatically compiles and displays the results. These can be used for automatic report generation in PDF or HTML format, for documentation and for further analysis of the test scenarios.

▲ MTest user interface, model of the controlled system, and test frame with function model.

▤ MTest
▤ TargetLink 2.0

Versions and Download

MTest is currently available as an add-on to AutomationDesk. MTest 1.3, due out in the second half of 2005, will be a stand-alone version for use without AutomationDesk. Users of MTest 1.0.1 and 1.1 can update their versions to MTest 1.2 now, via download from
www.dspace.de/goto?mtest12
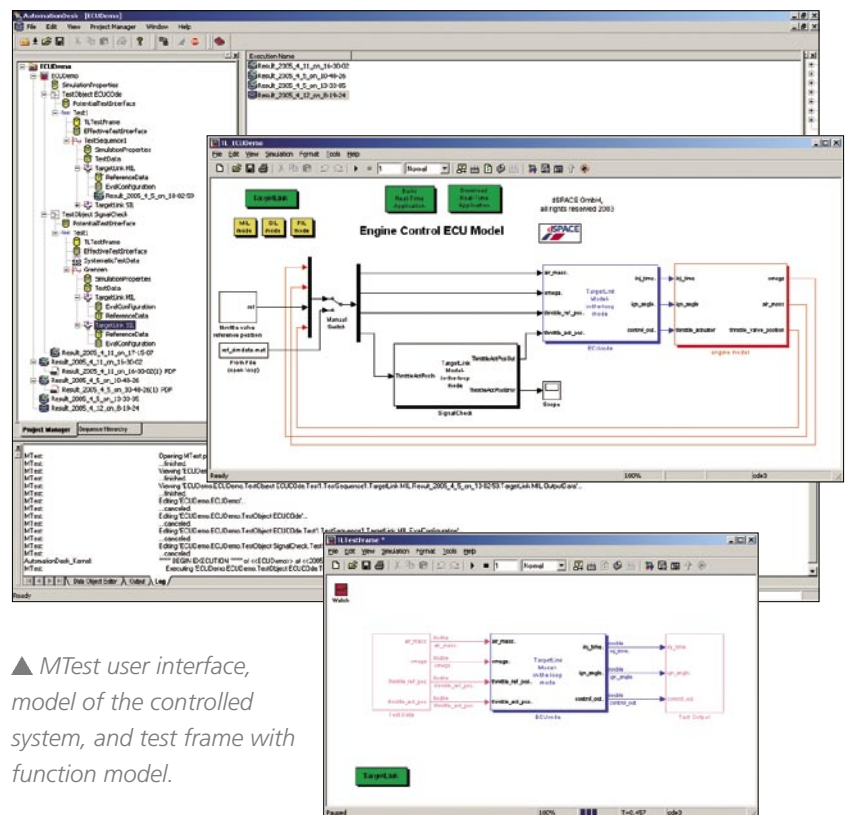
New Functions for AutomationDesk

- ◢ **AutomationDesk 1.2 out now**

- ◢ **New interfaces**

- ◢ **More configuration options**

A new version of AutomationDesk, the test automation and test management software, is available with dSPACE Release 4.2. AutomationDesk 1.2 provides enhanced report generation and supports the automation of Softing's Diagnostic Tool Set (DTS7) and the integration of calibration and measurement tools such as CalDesk 1.1, the calibration software.

New Report Generation
Report generation has been reworked for AutomationDesk 1.2. The enhanced report generation feature revolves around a report library. This provides special blocks that can be placed at any desired points in the test phase to generate report entries. There are now also comprehensive setting options for configuring the contents and appearance of the report output. Report generation is still based on XML, so custom formats can easily be generated by means of style sheets.

DTS7 Integration
The new version adds a DTS7 library to AutomationDesk's proven support for DTS6. This means you can integrate and automate Version 7 of Softing's

Diagnostic Tool Set (DTS). Integration is based on the new ASAM-MCD 3 standard. The DTS7 library provides high-level functions especially for hardware-in-the-loop applications, so you do not have to worry about the details of complex ASAM-MCD 3 functions and objects.

Remote Calibration via COM/DCOM
Previous versions of AutomationDesk already contained the Remote Calibration Library for connecting calibration and measurement systems via the serial interface and Ethernet, using the old ASAP3 standard. Now a new interface has been added. This is based on the current ASAM-MCD 3 standard and uses COM and DCOM. The advantages this brings include automation of CalDesk 1.1, the calibration software, in a HIL scenario, for read and write access to the internal variables of an electronic control unit. CalDesk can run on the same PC as AutomationDesk (via COM) or on a separate PC (via DCOM). The interface has also been tested successfully with other calibration and measurement tools, i.e., INCA from ETAS and CANape from Vector Informatik.

Further Innovations
There is a new data container for grouping data objects. This helps to design and organize large-scale projects more clearly in the Project Manager. The capture function in the Platform Access Library is now more flexible to handle. New tool properties mean that AutomationDesk's features can be adjusted even more closely to individual requirements.

▤ AutomationDesk 1.2
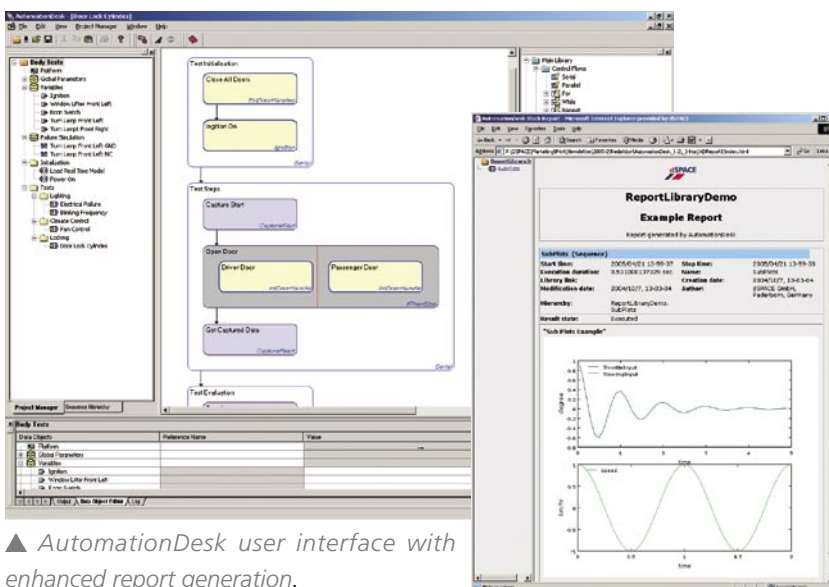
▲ AutomationDesk user interface with enhanced report generation.

Frost & Sullivan Award for dSPACE

Frost & Sullivan has granted the award 2005 Leading Manufacturing Test Company of the Year to dSPACE in recognition of its pioneering role and its market position in hardware-in-the-loop (HIL) systems. Frost & Sullivan is one of the premier strategic growth consulting companies in the world. The Company of the Year Award is presented each year to the company that has demonstrated unparalleled excellence within its industry.

◢ **Frost & Sullivan honors dSPACE**

◢ **dSPACE becomes Company of the Year**

◢ **Award presentation in Florida**

The Frost & Sullivan Awards are based on numerous factors including the company's business development, competitive strategy, and customer service leadership within a particular industry. Frost & Sullivan found dSPACE to have an outstanding position in the automotive HIL simulation systems market, way ahead of its competitors. There are currently more than 1,100 simulators with dSPACE technology in use worldwide. dSPACE has assisted numerous car manufacturers in adopting a wide variety of new technologies. Its customers include almost every company in the automotive industry. dSPACE is perceived to exhibit outstanding management and consistent growth, and to provide high-quality products and services. The Award will be formally presented to dSPACE during the Frost & Sullivan 2005 Excellence in Industrial Technologies Awards Banquet in the US on May 25 in Florida. At the event, Frost & Sullivan will honor companies and individuals that identified emerging trends before they became the standard in the marketplace, and that created strategic product implementations to further expand their market base.

About Frost & Sullivan

Frost & Sullivan, a global growth consulting company, has been partnering with clients to support the development of innovative strategies for more than 40 years. The company's industry expertise integrates growth consulting, growth partnership services and corporate management training to identify and develop opportunities. Frost & Sullivan serves an extensive clientele that includes Global 1000 companies, emerging companies, and the investment community, by providing comprehensive industry coverage that reflects a unique global perspective and combines ongoing analysis of markets, technologies, econometrics, and demographics. For more information, visit *www.frost.com*

Panel Discussion with the German Economics Minister

Germany's Economics Minister, Wolfgang Clement praised the city of Paderborn, Germany, as a business location when he came to attend a panel discussion on Innovation and Growth Through University Spin-Offs in the Technology Park on March 8. Clement was impressed by the growing spirit of enterprise at universities, especially at the University of Paderborn, which has the second highest number of university spin-offs in the state of North Rhine-Westphalia. The other panel members apart from Minister Clement

(on the right) included Dr. Herbert Hanselmann (on the left), dSPACE's CEO. dSPACE itself originated in the university in 1988, and now employs around 500 people in Paderborn alone.

More Power for dSPACE Hardware

We regularly upgrade the performance of our processor and controller boards, to ensure that they meet the toughest requirements in developing and testing electronic control units and other mechatronic control systems. Available from fall 2005 the powerful DS1006 Processor Board will have an AMD Opteron™ processor running at 2.6 GHz. The versatile DS1005 PPC Board and DS1103 PPC Controller Board now have an IBM PPC 750GX running at 1 GHz.

▤ DS1005 PPC Board
▤ DS1006 Processor Board
▤ DS1103 PPC Controller Board

US Journalists Visit dSPACE

Three American journalists were the guests of dSPACE management at our headquarters in Paderborn, Germany, on March 8. They came to learn more about current trends in developing and testing software for electronic control units, and held lengthy conversations with dSPACE employees. The information they gathered will be passed on to the readers of major American electronics and automobile publications. Our visitors were (from left to right): Tom Murphy, senior editor of Ward's AutoWorld, John Peter, editor-in-chief of Automotive Industries, and Gary Vasilash, editor of Automotive Design & Production.

Technical Sales Training in Paderborn

Employees from dSPACE's distributors and subsidiaries came to our headquarters in Paderborn, Germany, for training from February 28 to March 4, 2005. The aim of the international get-together was to learn about new and further developments in the dSPACE product range and gain hands-on workshop experience. This will ensure that dSPACE's proven services are available to customers all over the world.

Papers

"Hardware-in-the-Loop Testing
in Racing Applications"
Dr. P. Wältermann, T. Michalsky, J. Held

"Signal Conditioning and Power Stages"
R. Busche, R. Lieberwirth

„Test Methods and Tools in Model-Based
Function Development"
Dr. K. Lamberg, M. Beine

SAE World Congress 2005
dSPACE paper download:
www.dspace.de/goto?SAE_Papers

Job Opportunities

Are you an engineer who is just graduating?
Or are you looking for new professional
challenges? Then come and join our team in
Paderborn, Munich or Stuttgart, Germany; Paris,
France; Cambridgeshire, United Kingdom or Novi,
MI, USA!
Due to our continuous growth, dSPACE is looking
for engineers in

- Software development
- Hardware development
- Applications
- Technical sales
- Product management
- Technical writing

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- Send us an e-mail at
  dspace-news@dspace.de

Your opinion is important. Please send your
criticism, praise, or comments to
dspace-news@dspace.de – thank you!

Events

USA
AIAA/ASME/SAE/ASEE Joint Propulsion
Conference and Exhibit
July 10-13
Tuscon, AZ
Tuscon Convention Center

AIAA Guidance, Navigation, and
Control Conference and Exhibit
August 15-18
San Francisco
Hyatt Regency, Embarcadero Center

Engineering Propulsion Controls Symposium
September 6-9
Sterling Heights, MI
General Motors Heritage Center

Embedded Systems Conference ESC East
September 12-14
Boston, MA
Hynes Convention Center

Global Powertrain Conference
September 27-29
Ann Arbor, MI
Sheraton Inn

SAE 2005 AeroTech Congress & Exhibition
October 3-6
Grapevine, TX
Gaylord Texan Resort and Covention Center

For more events, visit *www.dspace.de*

Training

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- dSPACE Real-Time System
- ControlDesk
- RapidPro
- TargetLink
- HIL Simulation
- AutomationDesk
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