

## TargetLink – A Bright Idea

### CUSTOMERS

- TargetLink works straight from Simulink
- Excellent readability, overflow protection and library contents
- Generated code set to go into series production

Safety features of vehicles have been an important issue throughout recent years. Excellent visibility at night, for instance, is essential for the safety on our roads. With respect to visibility significant improvement was made by the introduction of xenon headlights. At MAN Nutzfahrzeuge AG we adapted this technology for trucks by means of the automatic code generation tool TargetLink. Soon trucks with a mixed leaf/air spring or sole air spring can be equipped with xenon headlights.

#### Xenon on Board

The luminosity of xenon lights is up to three times greater than the luminosity of conventional halogen lights. But on the other hand if the lights are not adjusted very accurately they lead to potential risks due to glare. Therefore, the law demands that discharge tubes must be controlled by adjustable headlight control. Currently this regulation applies only to a static case: The headlight must follow fixed guidelines during rest independent of the



MAN truck with headlight adjustment control.

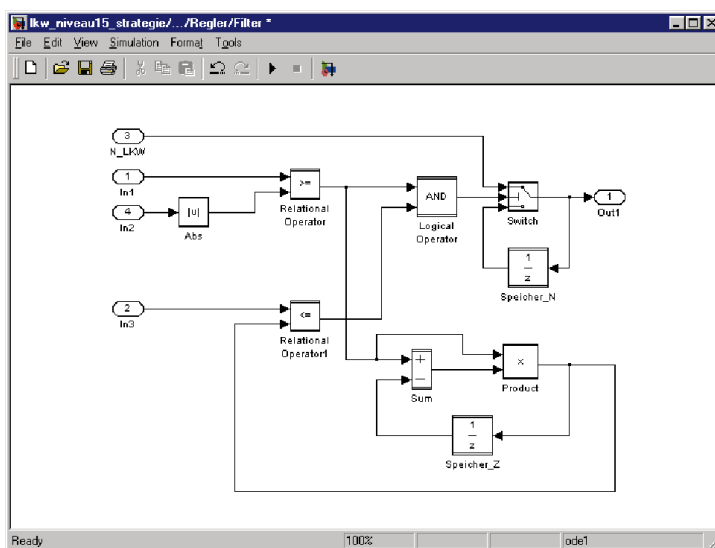


vehicle's load status. The situation slightly changes with trucks, compared to passenger cars. The driver's cabin swings much more than a normal car chassis. Massive body movements occur during start up or due to road bumps. Besides simply glaring other vehicles, a cut visual range includes a safety risk if you con-

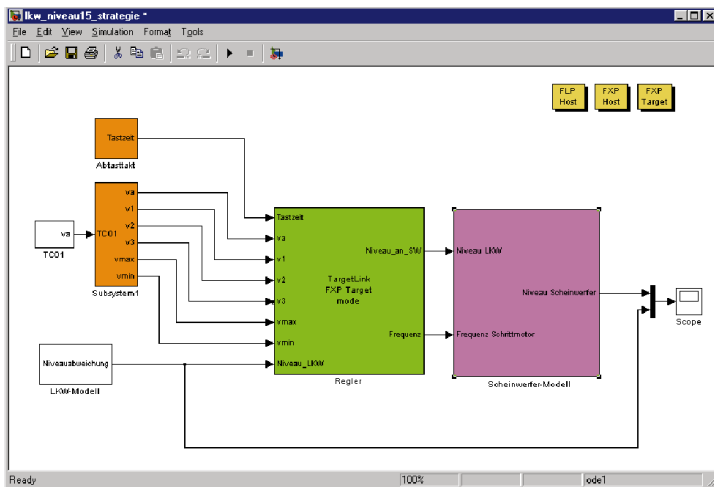
sider sudden braking. For this reason we want to apply a headlight control even for these dynamic cases.

#### System Setup

During this project, our goal was to bring the headlight adjustment control on board a truck with existing hardware. To measure the body movements we use dedicated sensors on the front and rear suspension linkage. This approach can be taken since there is a direct correlation between body and light housing movements. This data is transmitted via CAN to the corresponding electronic control unit (ECU). According to the applied control strategy, a step motor adjusts the headlight to eliminate the impact on the light distribution.



Excerpt from the headlight adjustment controller.



Simulink subsystems with integrated TargetLink subsystem (controller).

### Development Process

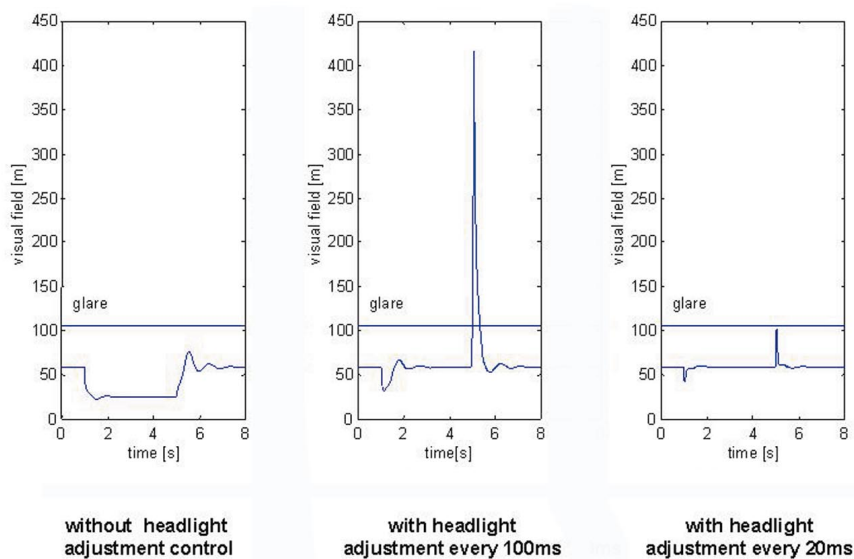
First, the headlight adjustment control was programmed graphically from MATLAB / Simulink. We therefore developed a model of the vehicle, applied the control function and monitored the impact on a model of the light. In correspondence with the required adjustment, the light's angle was altered every 20 ms. After we achieved satisfactory re-

sults on a purely simulated environment, we moved on to produce executable C code. Finally, this code was transferred to the production type ECU containing the Infineon C167 processor.

### No Handcoding Required

In the past we used to generate code solely by hand programming. To speed up this process,

TargetLink with its automatic code generation was the ideal solution. It perfectly corresponds to



Graph shows light distribution when braking from 60 to 0 km/h.

our development environment comprising MATLAB/Simulink and Stateflow. And what is equally important: The training time needed to get used to TargetLink is remarkably short. It took us only two weeks to familiarize ourselves with the tool. The complexity of the code wasn't too trivial, as the code size of 48 kB illustrates. Overall, we left

about 60% of the coding job to TargetLink. It was no problem to merge hand programmed parts with TargetLink produced sequences since the readability is excellent. The remaining bits were mainly interface and driver routines.

### Was It Worth It?

The control strategy worked out well. When the light was altered every 20 ms there is no glare under any circumstances whatsoever. Even the software implementation worked seamlessly, thanks to TargetLink. We carried out software-in-the-loop and tested the controller against the modeled

specifications. Overall, we reduced the development time by approximately 40%. We will certainly continue using TargetLink in our tool chain.

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