

measuring and analysis of vibration of outside mirrors of cars with ASAM CEA

“With the open and component based CEA products, I can provide customers better and cost saving solutions.”

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Project Engineer
AMS

i Summary

Challenge: Low vibration of outside mirrors of cars is essential for good backward visibility and therefore a safety relevant criterion.

Solution: Vibration is measured with small acceleration sensors at three different locations on the mirror – each in three directions. A mobile, laptop based data acquisition system with jBEAM is used for acquisition, first analysis and later reporting.

Key Benefits: The compact all-in-one system based on jBEAM was chosen only because one software solves the complete working process from data acquisition up to final reporting. Using open CEA based software guarantees an easy adoption to new situation by only adding new components as plug-ins.

ii Situation

End user is Magna Auteca one of the leading supplier of mirrors. Together with AMS engineers, a system was designed which reflects the complete working process. Requirements were:

- Fast data acquisition of 8 analogue acceleration channels
- Parallel with (slow) GPS positioning information
- Small and rigid hardware
- Easy in drive operation
- Intuitive and fast interactive data analysis
- Double integration of acceleration signals to achieve displacement
- Complete vibration specific analysis features

iii Challenges

The over all challenge was to develop a fast data acquisition CEA component in a generic way. For platform independence in data post processing, jBEAM is completely written in Java. Therefore, a way from Java to native Windows driver had to be developed. Even double integration seems an easy basic mathematical operation in practice, low frequency shifts of acceleration signals cause problems in generating displacement information.

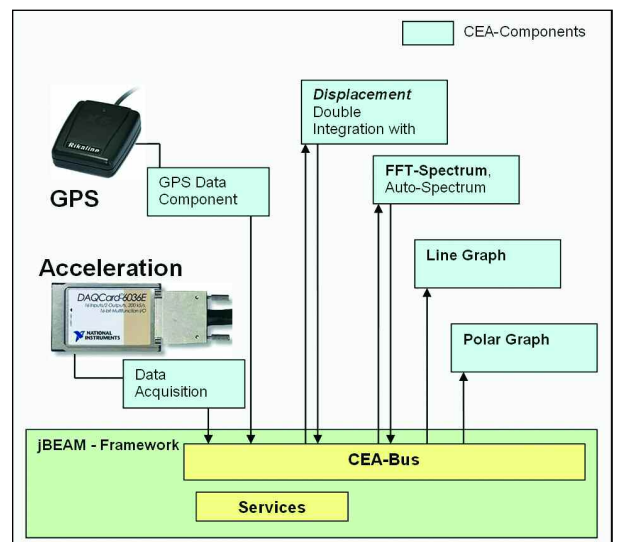


Figure 1: CEA component based architecture of multi-device data acquisition.

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iv Success strategy

National Instruments® DAQ hardware allows communicating using the NI DAQmx™ driver software. To access the Windows based DAQmx™ driver a Java/Windows wrapper had to be developed. This wrapper was designed as a separate tool, which can be used by third parties even without the AMS NI-DAQ CEA component.

The performance tests showed that the requested data acquisition rate of 5,000 samples per second per channel which yields in a sum rate of 40,000 samples per second can be achieved which includes online calculations and visualisation.

Target quantities are displacements. The easy usage of acceleration sensors lead to the problem of double integration. Even very small zero shifts of the signal yield to tremendous “wrong” displacement values. Therefore the acceleration signal has to be filtered to avoid these low frequency disturbances.

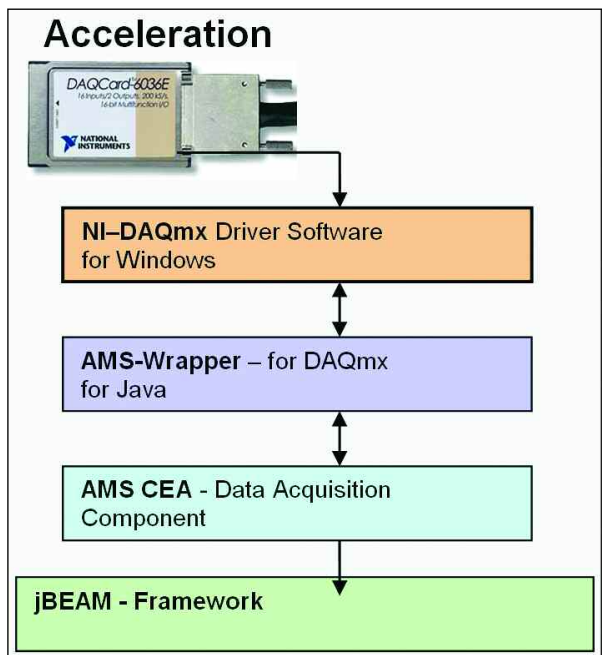


Figure 2: AMS Java wrapper for National Instruments DAQmx library.

v Challenges during the project

Specific requirements in analysis could be solved because a whole set of CEA based dedicated components are available to select the right ones solving the special needs of the application.

vi Business benefits

The described solution allows generating quality relevant information by a reliable easy to operate system. Together with the interactive analysis features testing could be optimized by time and redundancy. This increases the quality of products.

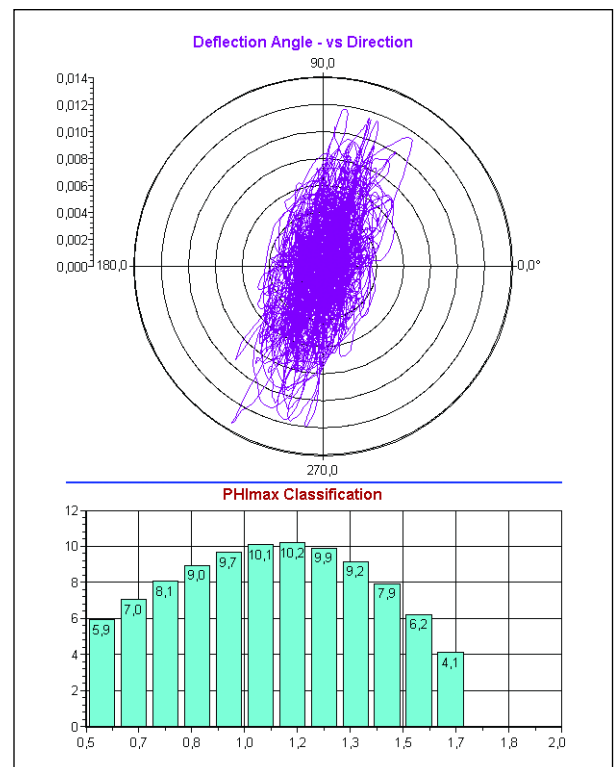


Figure 3: Results of vibration analysis: Displacement and direction of mirror in a polar plot, classification of vibration as bars.