Product Testing
- ***IMAQ™***
- ***LabVIEW™***

EMC Test Automation Using Motion and Vision

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The Challenge: Changing EMC testing from a supervised inspection system, which requires the constant presence of a test engineer, to an automated inspection system.
The Solution: Developing a moving camera system controlled by a LabVIEW application using IEEE 1394 (FireWire) technology for video transmission and control signals to detect test object failures by means of image processing.

Introduction

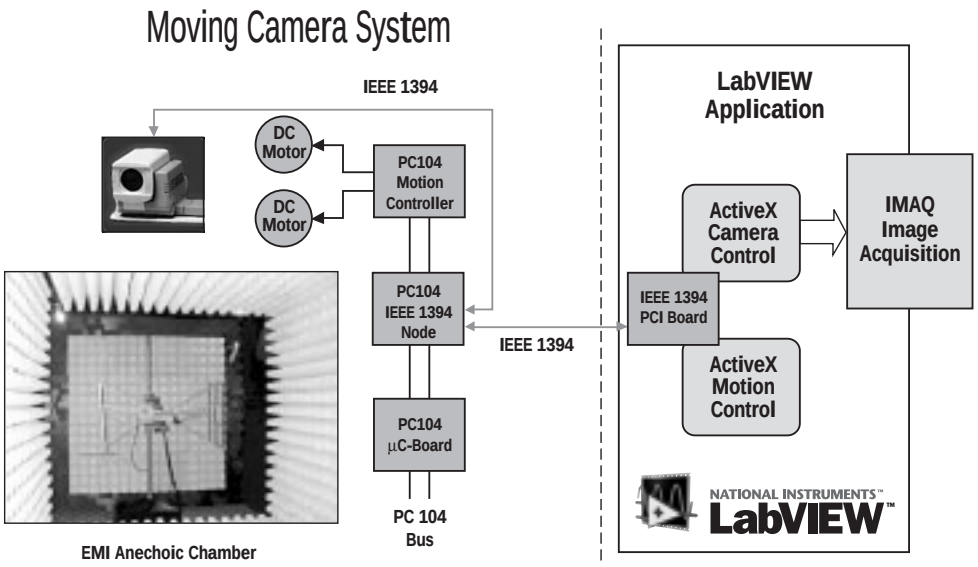
CTI (Carinthia Tech Institute, or Technikum Kärnten) is an educational institute with several research projects sponsored by the Austrian government. Serial bus systems (with a focus on IEEE 1394 technology) and EMC are two main projects. We combined these two topics to develop a moving camera system.

Typically, a camera is installed inside an EMI anechoic chamber to monitor the test object during the test period. Current solutions use a video monitor in combination with a VCR, but a digital video camera coupled with an IEEE 1394 bus also displays the video on a PC.

IEEE 1394 (FireWire)

IEEE 1394 is a high-speed system capable of replacing all existing interfaces in PC or multimedia environments. In 1995, the bus was standardized under the name IEEE 1394-1995.

The primary features of FireWire are:
- Transfer rates of 100 Mbits/s, 200 Mbits/s, and 400 Mbits/s (up to 3.2 Gbits/s planned)
- Isynchronous application (guaranteed bandwidth) and asynchronous application (guaranteed delivery) handling
- Hot-plugging – attaching or removing devices from the bus dynamically



Block Diagram of the Moving Camera System

- Cable power – either source or sink power available from the bus with a given node
- Daisy-chaining – extending the serial bus by connecting new serial devices to ports provided by serial bus nodes

FireWire is commonly used for high-end multimedia applications, such as digital camcorders or VCRs. It is also becoming a standard for industrial automation applications.

The Moving Camera System

The left-hand part of the above block diagram represents the moving camera unit, which is located inside the EMI chamber and connected via one single serial IEEE 1394 cable to a PC equipped with an IEEE 1394 PCI interface board. The IEEE 1394 cable provides the digital video signal as well as the motor control signals and the power supply for both the camera and DC motors. Two ActiveX controls regulate the hardware – one displays the video data on the PC screen and the other positions the digital camera using the motor controller and DC motors.

Moving Camera Hardware

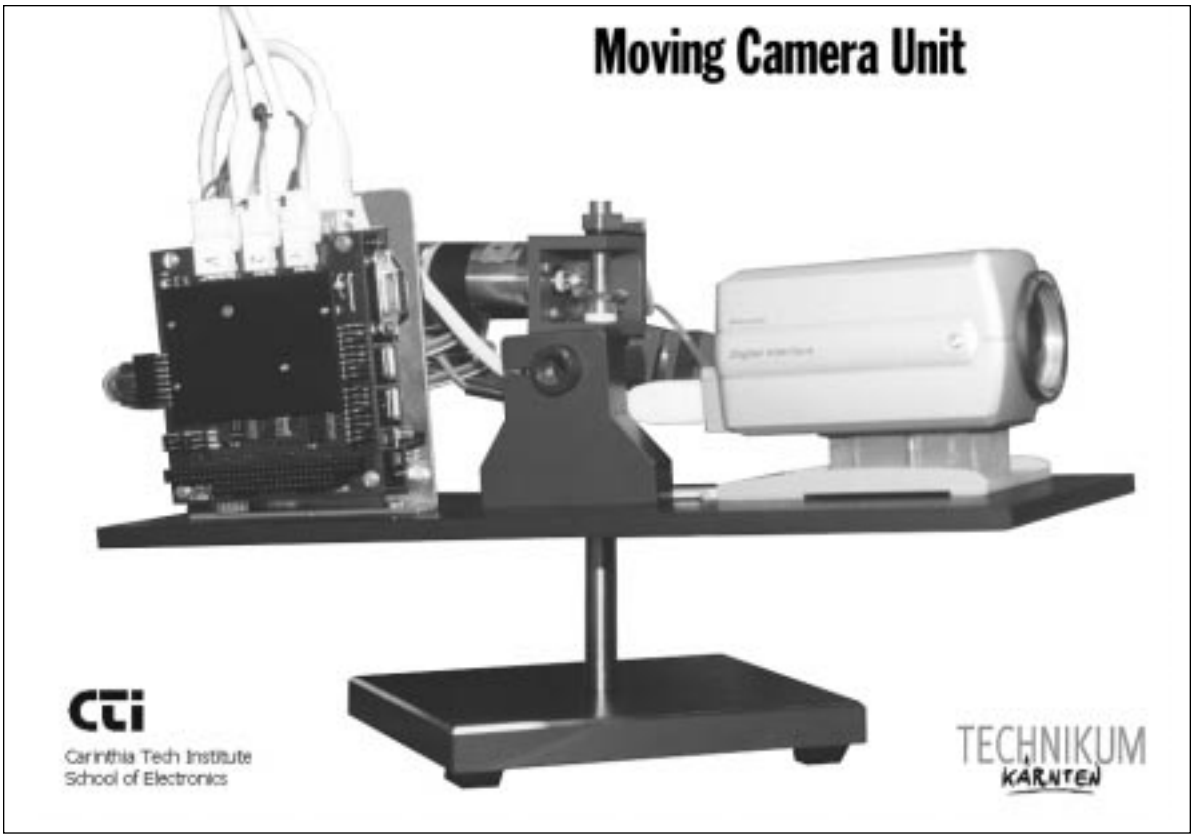
The Moving Camera unit (inside the anechoic chamber) consists of:
- A digital IEEE 1394 video camera (Sony) with a resolution of 640x480 pixels
- A PC104 microcontroller board (386SX microprocessor, 24 MHz clock, 1 MB DRAM)
- A PC104 IEEE 1394 node for asynchronous transfers at 200 Mbits/s
- A PC104 motion controller board driving two DC motors for horizontal and vertical movement
- An aluminum ground plate and DC motor support with gear units

With the PC104 bus, we can develop a modular design of the system. For further upgrading, it is possible to add other components, such as ADC boards.

Because of ActiveX capabilities, it is easy to enhance the functionality of LabVIEW with custom-made functions.

Moving Camera Software

The moving camera software base consists of two ActiveX controls, layered above the driver for the IEEE 1394 PCI board. The camera control software provides the



The Moving Camera Unit (inside the anechoic chamber)

functionality to control the camera properties and display the video stream. The motion control software provides the functionality to control the movement unit. Both controls are embedded within a LabVIEW application.

A typical LabVIEW graphical user interface (GUI) displays live video on the left, and an IMAQ window is used for further image processing. The GUI also contains the control elements for the moving camera, position and zoom elements for the IMAQ window, and application-specific controls. One of our sample applications detects the change of brightness in a previously specified region. For example, with this feature you can detect LED failure.

Conclusion

Because of ActiveX capabilities, it is easy to enhance the functionality of LabVIEW with custom-made functions. As a result, it is possible to include digital video functions, DC motor control, IEEE 1394 bus handling, and image processing in a single application.

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