Real-time Video Merge and Streaming for Training Purposes

Table of Contents

Introduction

The nature of certain industrial operations does not lend itself well to wide-scale demonstrative training efforts, whether due to security constraints, the physical realities of the facility itself or the types of operations which are underway. This can create challenges when attempting to gather real-world data with which to use as a training tool in either a one-on-one or a group setting.

StreamPix5 from NorPix offers the ability to not only gather but also consolidate and broadcast video training data so that it might be organized and displayed in an efficient manner. This white paper discusses the capabilities and design of the StreamPix5 Image Merge module and its video recording and consolidation functionality.

Multiple Input Video Capture

The StreamPix5 high speed digital video monitoring and recording system features an Image Merge module which accepts multiple video inputs (analog RGB data, in either HDMI, DVI or VGA format) from remote video outputs.

Hardware

The video is captured by one of three supported EMS VGA/RGB capture cards:

- XtremeRGB-II PCI-X Dual Channel
- XtremeRGB-Ex1 PCIe(x4) Single Channel
- XtremeRGB-Ex2 PCIe(x4) Dual Channel

Each EMS capture card is designed to capture the video output of multiple display screens. This allows for full resolution RGB capture without any remapping or image quality loss, maintaining the integrity of the information presented by the video output. All three supported EMS capture cards are capable of accepting up to two HDMI/DV/VGA inputs from external video sources.

While each card can accept two monitor inputs at a time, it is possible to install multiple EMS boards per workstation in order to capture a larger number of video feeds. A maximum of four cards can be used simultaneously, allowing for the capture of as many as eight simultaneous monitor inputs. The number of EMS capture cards that can be installed and used on a single machine is dependent on the configuration of that workstation's CPU and other system resources, as well as the number of PCIe slots available for card use. Average workstations can handle between four and six video channels without difficulty.

Should a larger array of monitor inputs require capture, it is possible to add additional digital video recording workstations – up to as many as are needed to accommodate the additional incoming video streams.

Software

StreamPix5 is used to manage all aspects of the video input and video merge process, including details such as video frame rate and image resolution. StreamPix5 provides a versatile set of controls over monitor inputs:

- Capture Rate: 60hz (standard monitor refresh rate) to 1 image per second
- Output Color Resolution: 16-bit RGB565, 24-bit RGB888
- Output Image Resolution: All resolutions up to 1920x1200.

Capture rate, color resolution and image resolution can be reduced by the user in order to accommodate low-bandwidth situations for video data transmission.

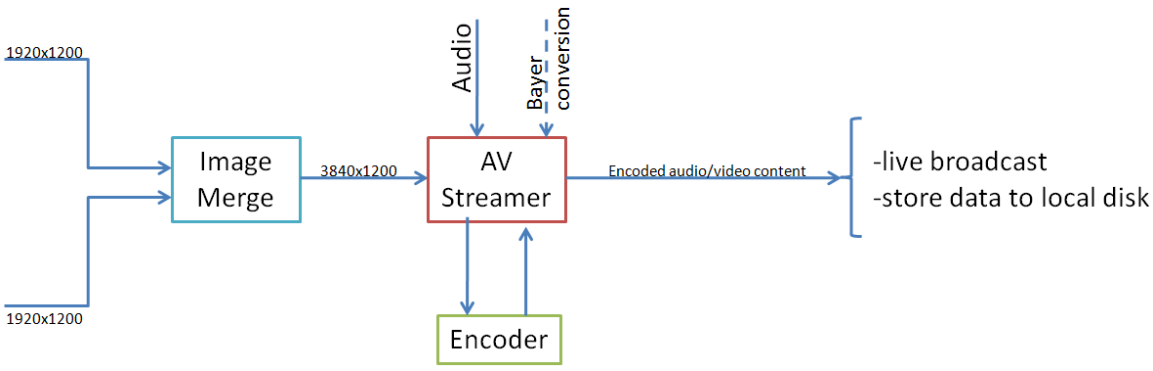
In cases where more than one digital video recording workstation is in use, StreamPix Remote can provide full real-time remote control over each individual StreamPix5 installation.

Combining Two Video Streams

The StreamPix5 Image Merge module combines each video input being fed into the EMS cards, creating a single merged video stream that displays all inputs simultaneously. Depending upon the input resolution and the number of sources, the merged video stream resolution can be as high as 3840x1080 (horizontal merge). It is also possible to select vertical merge in order to end up with a merged image resolution of 1920x2400.

Distributing the Video Image

From a training perspective, the role played by StreamPix5 once the digital video sources have been captured and merged is of the greatest interest. StreamPix5 uses the AV module in order to either broadcast or archive the merged video stream.



Broadcast can occur across the internet or within an intranet, and the archive feature can be used to store a digital video file either locally or at a remote storage location. The AV Streamer module also offers the ability to encode an audio stream along with the video image in order to provide a single audio/video data package that is compressed for maximum throughput. Video compression codec choice is completely configurable to allow users to select the option that best matches their bandwidth and image / sound quality requirements, as well as the nature of the action captured by the video images themselves.

Training Applications

The versatility of the StreamPix5 Image Merge module, combined with the AV Streamer broadcast module opens up a number of intriguing possibilities when considering the utility of this video capture software in a training situation.

The ability to remotely capture video feeds and combine them into a single training video means that it is possible to gather data from physically discrete yet operationally linked systems and examine them side-by-side. For facilities where interconnected processes are an important aspect of operations, this functionality is a crucial training tool.

After being encoded by the Image Merge module, the AV Streamer module allows for training to occur both within a corporation's intranet as well as worldwide through the use of internet video training sessions. The cost savings associated with consolidated training materials and instruction can be substantial, especially for repeatable processes that are similar from one geographical location to another.

The AV Streamer also offers the ability to add an audio component to the video stream, which can be useful for packaging in narration to further explain or enhance the training process. Black and white or grayscale video feeds can also be colorized using Bayer interpolation for added detail. In addition to offering network transmission or video feeds, the AV Streamer also provides the ability to store combined streams on a hard disk for later use or for archival purposes.

Conclusion

The ability to capture and compare multiple video streams at full resolution with no loss of quality is a useful tool in any industrial setting. Adding in the ability provided by StreamPix5 to add audio narration to these recorded streams creates a powerful tool that can eliminate the need for costly and time consuming hands-on training that could potentially interrupt operations or introduce a safety concern in a facility. Simultaneous video capture also provides a look at tightly coupled processes which might not be observable in real-time in the facility itself.

Taking into account the broadcast and archiving possibilities provided by the AV Streamer module, it becomes clear that the multiple video stream capture and consolidation capabilities found in StreamPix5 add an extra degree of versatility to any training program.