Video-Data Fusion Subsampling

Sensors; they are an integral part of control systems from opening your garage door to guiding missiles into space. They are used to monitor performance of equipment and measure the environment. The variety of sensors is infinite from cameras to a simple limit switch.

In control systems and critical monitoring systems situations, data must be read from sensors frequently. The frequency is guided by the bandwidth of control desired or the spectrum of relevant performance. Sampling rates can be in the millions per second.

The study of things in motion requires another dimension, images. How things deform, move, fracture, collect or morph is best studied using a movie to help visualize performance. Seeing that something deformed and how it deformed is very important. Equally important is to know the conditions of deformation, for example what are the forces that are applied to cause the deformations. This is information provided by sensors.

With a coordinated set of images and data, very detailed and thorough analyses of things in motion as well as predictive models of how such things would behave with a different set of stimulating condition can be accomplished.

A snapshot of the subject being evaluated with the conditions surrounding the object when the picture was taken is quite significant. Video cameras take pictures at rates to several thousand frames per second (FPS). HD-SDI cameras are generally taking pictures from 30 to 60 FPS. So how could an image and data relevant to the image be captured? Subsampling.

By subsampling a stream of sensor samples; one can capture a data set that matches the frame rate. An important step is to sample at the right time, or a consistent time. ITS metadata inserters, including the 6520 Fusion Video Recording Instrument (VRI), samples data on the arrival of a new frame (first sample of the first line of a new frame), every frame. This is a data subsampling set synchronized to the to the picture taking. While all of the parameters of a stimulus may not be captured this way, the current state of any stimulus is captured with the imagery. At each picture, deformations, movements, fracture travel, collection of particles or morphing and the instantaneous state of stimulus that caused them are captured in one instant.

The ITS 6520 Fusion (VRI) records uncompressed HD-SDI video. When studying the motion of things, every detail is important. The Fusion VRI captures the image that the camera delivered without compression, resolution loss, color shift or added blur. Playback comes from an uncompressed captured clip. The Fusion VRI plays back exactly what the camera delivered; no compromises. Each frame stands alone and is the collection of the original sample data, not a reproduction from an algorithm. More uniquely, the Fusion VRI can sample an incoming stream of data packets and place them into each video frame on their arrival. The result is synchronized subsampling of sensor data.

The data packets can be measurements from one sensor or a collection of coordinated samples taken from a number of sensors at once. ITS offers a tool, the DataConcentrator©, that lets you build complex data packets that are a collection of samples from any device that is connected via network or directly to the PC running the DataConcentrator© software. Drag and drop features let you map incoming data from this random set of sensors into data packets organized as you choose. ITS offers a tool for that too, the KeyTemplate© The DataConcentrator© collects the sensor data, organizes it into data packets wrapped in ITS metadata insertion commands. Packets can be sent to any of our HD-SDI products equipped with the KLV metadata features. This feature is standard with the 6520 Fusion VRI. Packets can be sent as frequently as 200 times per second, thus while recording 60 FPS video, packets no older than 5 milliseconds will be embedded in the metadata space of each frame. Our tools currently offer direct support of two sequential data packet streams having an aggregate of up to 128 different data sources for each image sample.

Once embedded in the VANC space (equivalent of vertical blanking space in the analog video days), the data and imagery are permanently fused together. Any ITS metadata inserter, including the playback channel of the Fusion VRI can extract this data and can be "told" the data packet organization and how to scale the data for presentation in human readable form. Our equipment can overlay the data frame by frame as it passes through, and output the data to a file for use with our KeyRead© or DownloadVideo© software. These software tools can also export the data to *.CSV records which can then be imported into Excel or other software for analysis.

Learn more about the 6520 Fusion VRI at http://www.itsamerica.com/assets/flyers/6520fly.pdf and more details about ITS inserter and recording products go to www.ITSamerica.com or contact one of our sales representatives.
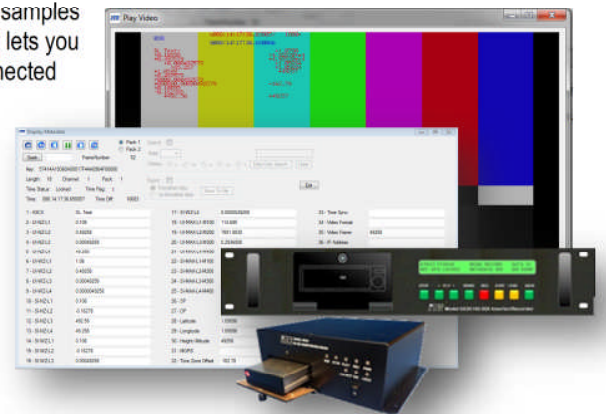
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