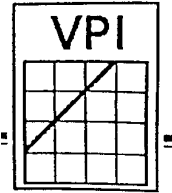


VIDEO PERCEPTION INCORPORATED WWW.VP-INC.COM



DEVELOPMENT AND APPLICATION
OF AN
IMAGE PRE-SCALAR
TO ADJUST FOR
LIGHTING VARIATIONS

IMAGE PRE-SCALAR (Operating between the A/D Converter and the IPP)

PURPOSE OF PRE-SCALAR

The Pre-Scalar will be placed between the A/D Converter and the Image Pre-Processor (IPP) of a visual monitoring system. It is used to improve the lighting environment. The brightness of a digitized image may vary greatly in various settings. During an outdoor-scene application, the brightness could vary from poor night lighting to intense sunlight. During the poor lighting extreme, the digitized image intensity, would tend to be concentrated at the very lower portion of the digitizer range. The dynamic range of the result would be very limited. During the intense light extreme, the high intensity value range could be "clipped"; variations of light intensity in this range would not be detected. It is the purpose of the pre-scalar to improve the dynamic operating range of the image without clipping.

BACKGROUND OF THE IPP OPERATIONAL REQUIREMENTS

During any image processing application, the brightness range problem (previously described) may be experienced unless the lighting is carefully controlled. This is normally corrected with the video camera aperture. Unless there is a very effective automatic aperture, manual correction would be required to solve the problem. The Pre-Scalar proposed still requires adjustment; however, it is easily adapted to automatic control. The IPP employs a differential-threshold-processing algorithm to obtain its results. This provides better results to the light variation problem than the results obtained from competitor systems. The IPP threshold must still be adjusted when large lighting changes occur without other system corrections. The Pre-Scalar provides this system correction.

IPP PERFORMANCE WHILE EMPLOYING THE PRE-SCALAR

The following improvement are expected when operated from the adjusted digitized image from the Pre-Scalar:

- The IPP will function within a large range of lighting change
- Passing clouds occurring in a scene with outdoor sunlight will cause little effect
- Closing the blinds controlling an indoor scene lighting will cause little effect

DESCRIPTION OF PRE-SCALAR OPERATION

Figure 1 is a block diagram of the Image Pre-Scalar. It receives g-bit digitized data from an A/D Converter. It provides a 6-bit output to the IPP. The scene average light intensity, (the DC level) is shifted to the midrange value from control of a 2-bit input (DC Offset). The dynamic range of the video is amplified from control of a 2-bit input (AC Gain). A Register Strobe signal latches the Read-Only-Memory (ROM) look-up table results at the timing interval required. The end result is output data with a dynamic range utilizing most of the 6-bit range. This is to be done without clipping the image at either the upper limit or the lower limit. Figure 2 illustrates the "before" and "after" results of this process.

A software algorithm can easily be generated to create the look-up table results stored in the ROM.

FIGURE 1

BLOCK DIAGRAM OF IMAGE PRE-SCALAR

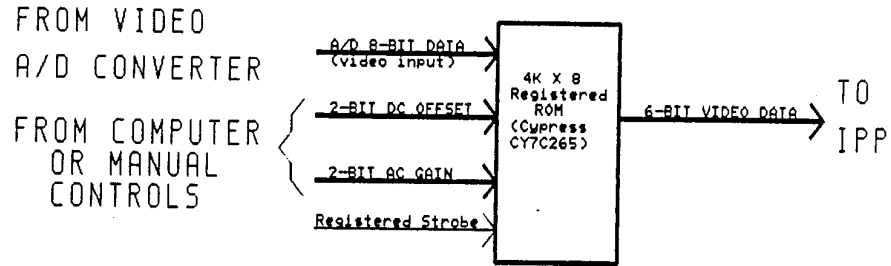


FIGURE 2

PRE-SCALAR CORRECTION EXAMPLES

