Technical Article

HUD 2.0 Brings a New Point of View

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Let's face it; being in the driver's seat comes with its share of distractions. Being able to keep your eyes on the road rather than the speedometer or radio or gas gauge is pretty helpful. Automotive Head-up display (HUD) systems have become an important tool for managing these distractions by providing information directly in front of a driver's field of vision.

With the addition of on-board sensors, cameras, and vehicle-to-vehicle/infrastructure communications, the amount of information a vehicle knows about its surroundings has increased exponentially. With all of this new data, the challenge becomes how to effectively communicate information to the driver.

Enter HUD 2.0.

Conventional HUDs offer a field of view (FOV) of around 5 degrees, a fraction of a single lane. HUD 2.0, with a larger FOV of up to 12 degrees and longer virtual image distance (VID), allows the driver to see beyond a single lane of traffic. Graduating from a small secondary display to a large primary display increases the importance of image quality and consistent readability in varying lighting conditions. And the increases in FOV and VID require higher luminance levels and power efficiency.

This is where TI DLP® technology comes in - by delivering award-winning image quality, outstanding brightness and flexible development options.

A large FOV and high luminance levels result in an easy-to-view image for the driver. To help ensure readability in varying sunlight conditions, the HUD should be capable of producing a virtual image between 15,000 and 30,000 cd/m^2 to provide a proper contrast ratio over a wide range of roads and sunlight illumination conditions. To achieve both a large FOV and high luminance while minimizing power, an efficient imager is required. The DLP 0.3-inch WVGA Type A100 digital micromirror device (DMD) is >66% efficient and uses direct RGB LEDs that enable images with rich color saturation.

As the FOV of a HUD system increases, so does the amount of sun energy collected by the HUD optics. Also, as the VID increases to allow the driver to view the image at the proper perspective, the energy from the sunlight becomes more focused onto the internal imager of the HUD. These two factors can be damaging to the imager due to the amount of heat collected in a small area. HUD systems based on DLP technology use a diffusing screen material to create the internal image of the HUD system. This provides two primary advantages: (1) it does not absorb the sun energy – it diffuses the light – and (2) it is not a source of heat itself. These attributes allow systems to scale to the large FOV and long VID needed for augmented-reality HUD systems.

HUDs are becoming an important part of vehicle human machine interface (HMI) strategies, especially as technology becomes more integrated into the driving experience. With HUDs transitioning from small secondary displays to large primary displays, the expectations for image quality, readability, and reliability increase. HUD designers face the challenge meeting new requirements as well as conventional automotive environmental conditions. DLP technology has built its reputation on reliability and flexibility, and it is positioned to be a powerful component of next-gen HUD systems development.

Additional Resources

Read the TI DLP® Technology for HUD product brief

Read about how TI DLP® Technology is solving design challenges for next-gen HUD systems

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