Abstract

PictoBar is a portable and rugged Alternative and Augmentative Communication (AAC) device with image (pictures and pictograms) and barcode recognition capabilities. Once an image or barcode is recognized, PictoBar plays a pre-recorded sound message, associated to the recognized image or barcode. The recognition algorithm is implemented on a DaVinci DM6446 SoC using the Codec Engine (CE) framework.

Device description

- Micro-camera block with a CCD-module, fixed-focus optics and basic image processing (lighting, contrast, and white balance).
- DaVinci DM6446 SoC with fixed point DSP (C64+) and ARM9 core
- Audio I/O interface
- USB Interface
- Memory (DDR2, Flash NAND, SD card)

Image recognition Algorithm

- Large database (~5000 images). Recognition time should be less than 1 second. JPEG compressed format.
- Input query image is acquired with the camera
- The enclosing border of the image is detected based on modified Hough transform. The query image is then aligned and cropped. Image pre-processing such as histogram stretching is applied.

To decrease the complexity while keeping a good performance, image recognition is done in two stages.

- ‘Color Density Circular Crop’ searches the database and preselects 50 images closest to query image based on color proportions within specific zones.
- ‘DCT phase match’ searches the closest match to the query within the reduced database of the 50 preselected images from CDCC.

S/W Framework and DSP implementation

DM6446 contains ARM9 and a C64+ DSP core
- ARM9 core is used for barcode recognition algorithm, peripheral control and overall system management.
- C64+ DSP core is used to run the image recognition algorithm.

Algorithm Implementation

- Using Codec Engine Framework
- Each block of the algorithm as a separate Code Engine “codec”
- BRRP, CDCC and DCTPM codecs implemented using the IUNIVERSAL xDM interface
- The JPEG decoder from TI as IIIMGDEC1 xDM codec