

### **HARDWARE**

#### **Which board should I get for video recognition?**

If you do not have a particular sensor in mind or available to you, the CM-IR board features a high quality monochrome CMOS sensor from Micron delivering up to 60 frames per second at a resolution of 752x480.

If you want to use a specific sensor, the CM-EB board features a digital video input bus with one pixel clock line, the line valid and frame valid synchronization lines and a 16-bit data bus. We recommend that you refer to the CM-EB datasheet to verify that your sensor is fully compatible with the board. Also if you want to take advantage of the recognition logic built into the CogniMem chip, the pixel clock must be less than or equal to 27 Mhz and the pixel data must be 8-bit. If otherwise, you may have to customize the firmware loaded in the FPGA of CM-EB to condition your video signal prior to broadcasting it to the CogniMem neurons.

#### **Which board should I get to work with images saved to disk?**

If you have no intend to work with live video images, CM-EB will allow you to transmit the feature vector extracted from your images to the CogniMem neurons. The learning and recognition of the vectors will occur on the board. The Easy\_Image\_Trainer application supplied with the board can extract monochrome and color sub samples from images (bmp or jpg). The CogniMem SDK allows developers to interface with the CM-EB and CogniMem chip from their applications.

#### **Can I use a color sensor?**

Yes, a color sensor may be interfaced with CM-EB. However please note that the recognition engine built into the CogniMem chip extracts a monochrome feature from the video image. This means that the display may appear in color but the recognition will be based on the luminosity only. If the color information is critical to your application, the extraction of a color signature can be programmed in the FPGA of the CM\_EB board and send to the neurons in “Bypass” mode instead of “Video” mode.

#### **Can I use a sensor with a pixel resolution greater than 8-bit?**

Yes, a 10, 12 or 16-bit sensor may be interfaced with CM-EB. However please note that the recognition engine built into the CogniMem chip only receives the 8-bit data mapped from line [9-2] of the CM-EB input bus . If the higher resolution is critical to your application, the extraction of a custom signature can be programmed in the FPGA of the CM\_EB board and send to the neurons in “Bypass” mode instead of “Video” mode.

#### **Can I use CM-IR if I am not a programmer?**

Definitely. CM-IR is delivered with a ready-to-use application called Easy\_Video\_Trainer. You can teach what you want to recognize, monitor the results of the recognition on screen and when satisfied with the results save the knowledge to the Flash memory of the CM-IR board. You can then disconnect the board from your PC and connect it to an external power supply so it resumes recognition autonomously. Note that the default configuration of the board monitors a fixed single region of interest. If your application requires scanning, tracking or more, contact Recognetics to obtain a list of partners whom can help you with the programming of the board.

### **What is the difference between Easy\_Video\_Trainer and Easy\_Image\_Trainer?**

Easy\_Video\_Trainer is intended for use with CM-IR or CM\_EB connected to a compatible video sensor. This application lets you send teaching commands to the board and read the results of the recognition. It only acts as a user interface and all operations are actually executed on the board, including the extraction of the signature vectors from the video and their transmission in real-time to the neurons.

Easy\_Image\_Trainer is intended to simulate the behavior of the CogniMem chip on a PC. The interface looks very similar to Easy\_Video\_Trainer and knowledge file (\*.ckf) can be exchanged between the two applications. Easy\_Image\_Trainer can be convenient if you have collected many images with Easy\_Video\_Trainer and want to teach and validate your training at a different time or location on your PC.

### **Does the CogniMem chip learn the entire image?**

No, due to their memory size the neurons of the CogniMem chip can only learn a pattern which is 256 bytes long. As a result the information present in the image has to be reduced to fit in a vector of 256 values prior to being sent to the neurons. Compressing a full image into such vector is possible but will lose too much information. CogniMem can extract a signature from a region of interest and the smaller the region the less loss of information. The signature itself is called a subsample and described in the datasheet of the chip and board. Custom signature extractions can also be programmed in the FPGA.

### **Can I do target tracking with CM-IR?**

Yes. A simple demonstration of target tracking can be made with Easy\_Video\_Tracker by learning a known target at 3 different positions within a region of interest centered in the field of view: (1) target is centered, (2) shifted to the right, (3) shifted to the left. When the recognition logic of the CogniMem chip is active, the recognized category is transmitted to the GPIO lines at frame rate. This means that a motion controller properly interfaced with CM\_IR (both mechanically and electronically) could always re-center the target to be in the middle of the field of view.