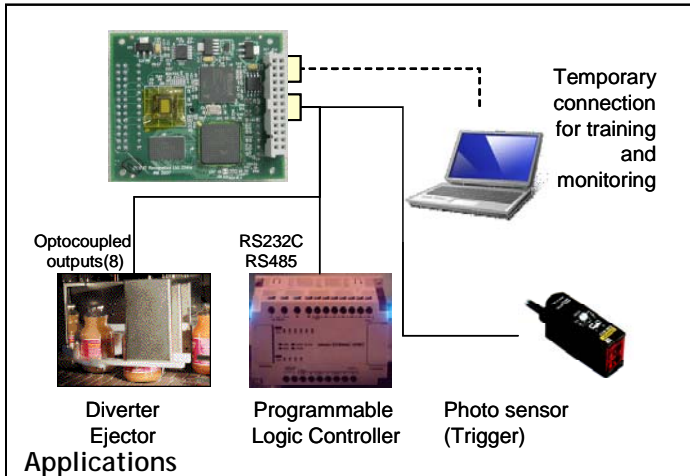


The CogniMem Image Recognition board (CM-IR) offers developers and OEMs a comprehensive platform to evaluate the CogniMem neural network for real-time video recognition applications. The board features a Aptina CMOS sensor, 2 CogniMem chips, each with 1024 neurons, an Actel FPGA accessible to programmers and a Flash memory to save the application settings and knowledge. User I/Os are implemented on the board in a flexible variety of configurations, including an I2C serial bus, an RS232 bus and 8 general purpose I/Os brought to header pins.

The Aptina CMOS sensor MT9V022 feeds its video data directly to the CogniMem recognition engine which extracts a signature vector from a region in the video frame and returns the response of the neuron recognizing the vector with the best confidence (if any) in 11 microseconds after the end of the video frame. The region of interest defines the area where objects or patterns are expected. Programmers can choose to implement their own video signature extraction in the FPGA, move the region of interest, condition the results of the recognition prior to transmission to the user I/Os and more. The neurons can be trained in real-time or a knowledge can be loaded from file and saved to a Flash memory so the board resumes recognition autonomously at the next power up.



Industrial automation

- Presence/Absence
- Pass/Fail, Sorting
- Object identification
- Anomaly detection

Video surveillance

- Selective recording based on image content
- Smart motion detection
- Target tracking
- Face detection

Toys & appliances

- Face recognition
- Image to speech
- Target tracking

CM-IR can address many recognition applications in industrial automation, video surveillance, robotics, and more. It can behave as a smart photocell detecting a part passing on a conveyor is acceptable or should be ejected. If installed in a hallway, it can be trained to detect incoming persons and turn a light on, but to discard a pet or a bird passing by the window. If mounted on a robot, CM-IR can be trained to recognize a target at different distances and angles and thus report if it is moving left or right.



Specifications

Aptina MT9V022 video sensor

- ✓ Monochrome, Progressive scan
- ✓ 752x480 pixels
- ✓ 60 frames per second
- ✓ Global shutter
- ✓ External trigger input

High-speed Recognition engine

- ✓ Internal feature extraction from a region of interest
- ✓ Single region per frame as small as 16x16 pixels and as large as a full frame
- ✓ Output category with the best match in 11 us after receipt of the last vector data
- ✓ I/O buses
- ✓ Miniature USB Hi Speed (480 Mbps)
- ✓ I2C serial interface (100-400 kbit)
- ✓ Serial output (115,200 baud)
- ✓ 8 parallel outputs (LVTTTL 16mA)
- ✓ Save project to Flash memory

Neural network

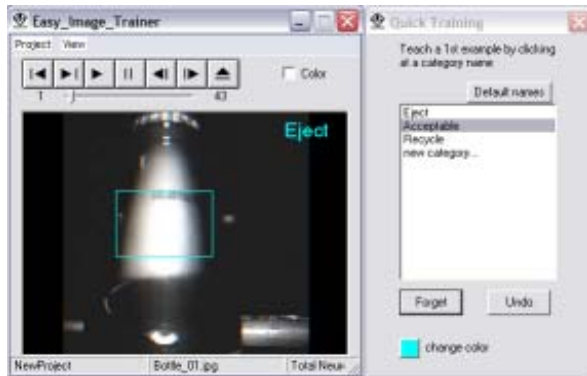
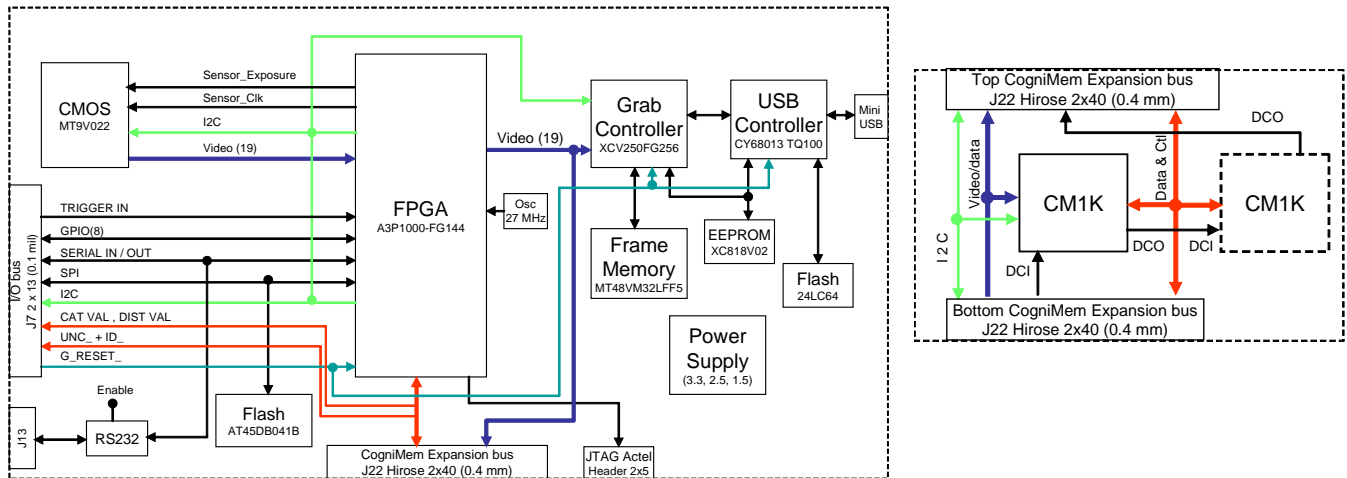
- ✓ Classify pattern vectors of up to 256 bytes
- ✓ Up to 32768 categories
- ✓ Classification status in 1 clock cycle (status= identified, uncertain or unknown)
- ✓ Category readout cycle in 36 clock cycle per firing neuron from smallest distance and up (equiv to 3 microseconds at 27 Mhz)
- ✓ Built-in model generator
- ✓ 2048 neurons working in parallel
- ✓ Expandable through neuron expansion modules

FPGA

- ✓ Optional core modules (input and output data conditioning, signature extraction, decision logic, etc.

Mechanical and Electrical

- ✓ 3.3v @ <250 mA
- ✓ 55 x 65 mm



Easy Trainer for quick training of the neurons. The board can later resume recognition at power up without any PC.

Ordering information

- CM-IR, includes
 - one CM-EMB2K module,
 - CogniMem development library
 - Easy Video Trainer software
- Optional stackable CM-EMB module with 1024 or 2048 neurons

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