Sound Blocks
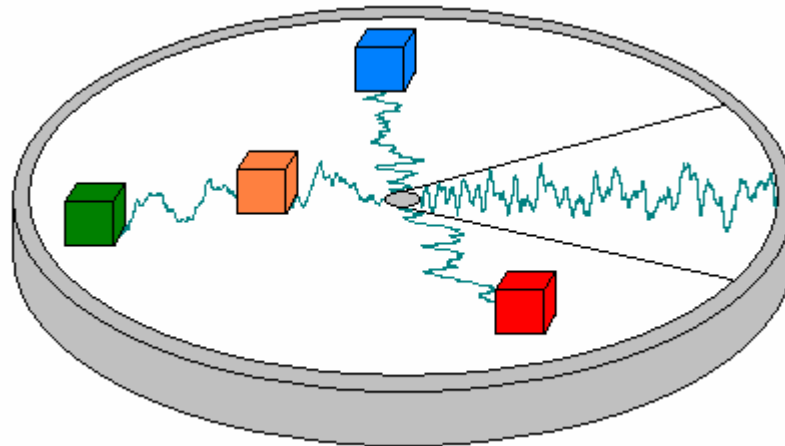
An interactive environment for real-time music creation

What does it do?

Global-effect block

Source block
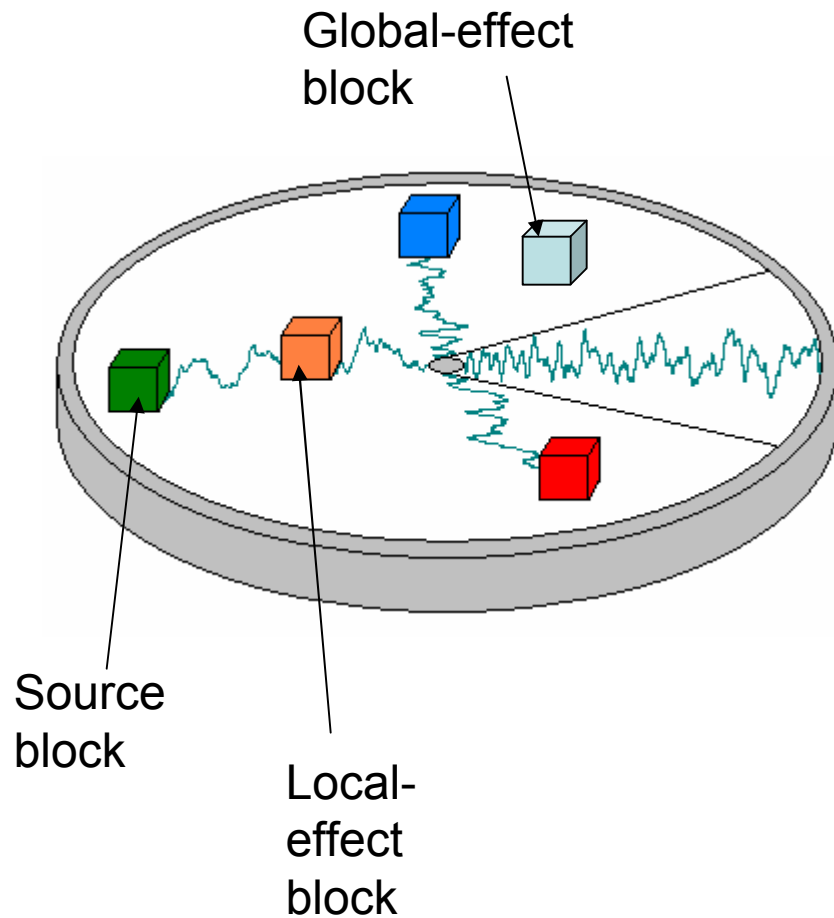
Local-effect block

- Users create and modify sounds by manipulating blocks on a specially-designed table.

- Three kinds of blocks: source, local-effect, global-effect.
    - Source: sound file stored in ram to be played out of speakers in loop
    - Local: modifies source block sound, ex. Add reverb, band-pass filter
    - Global: modifies entire system

- Rotating effect blocks changes magnitude of effect

- Audio waveforms displayed on table.
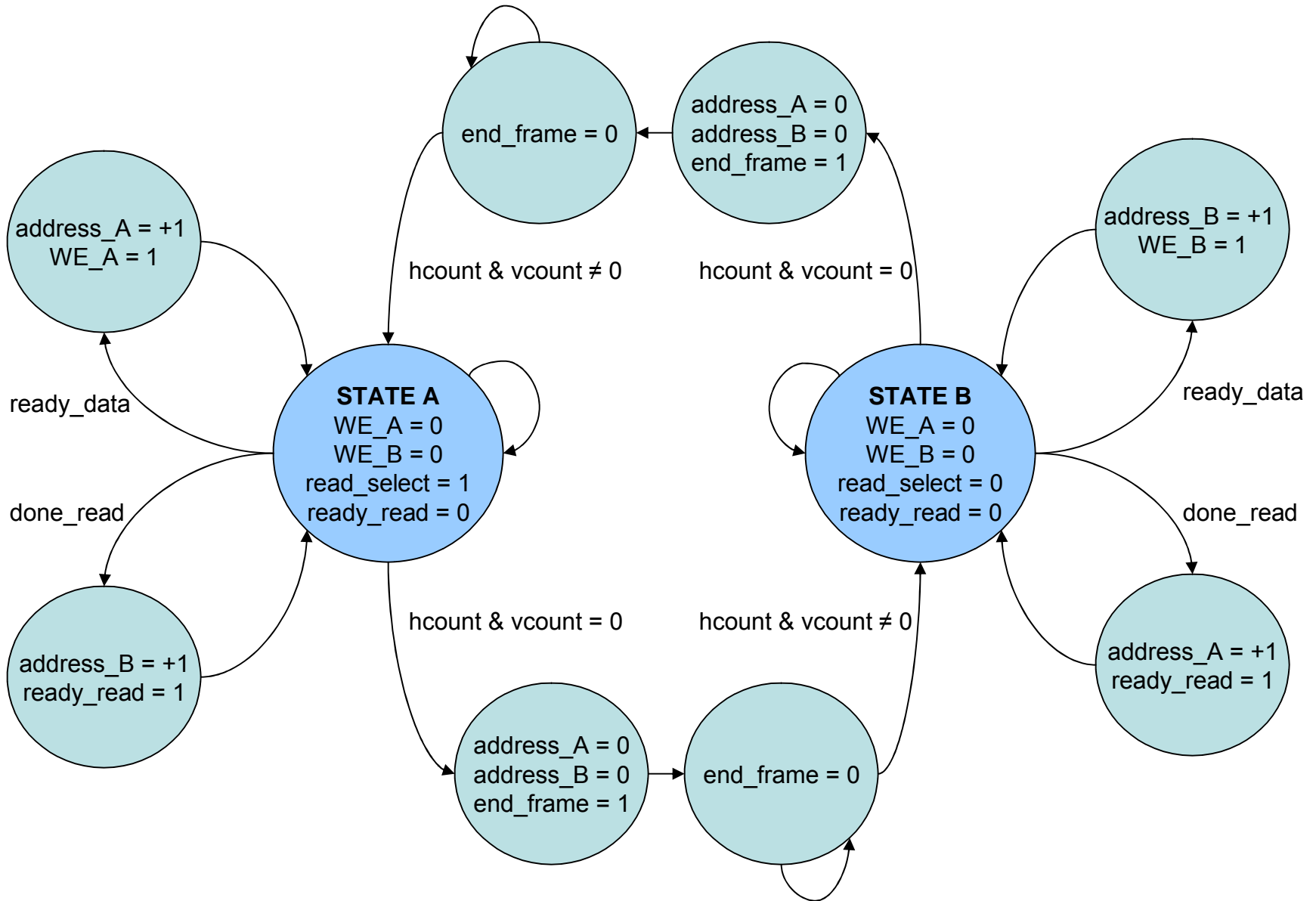
How does it do it?
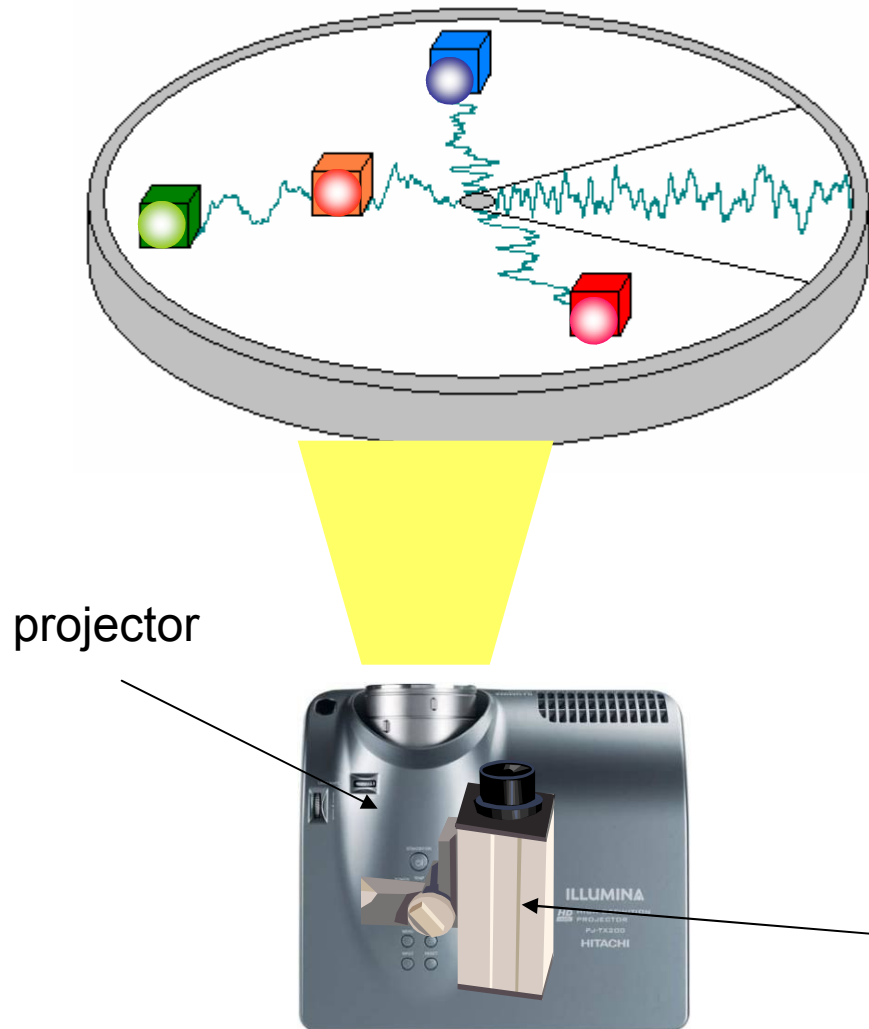
- The table surface is translucent.
- The bottom of each block has two different colored LEDs.
- A camera underneath the table looks for the LED colors.
- The audio and video is processed according to which colors the camera sees.
- The audio is played through speakers.
- A projector underneath the table displays the waveforms onto the table from below.
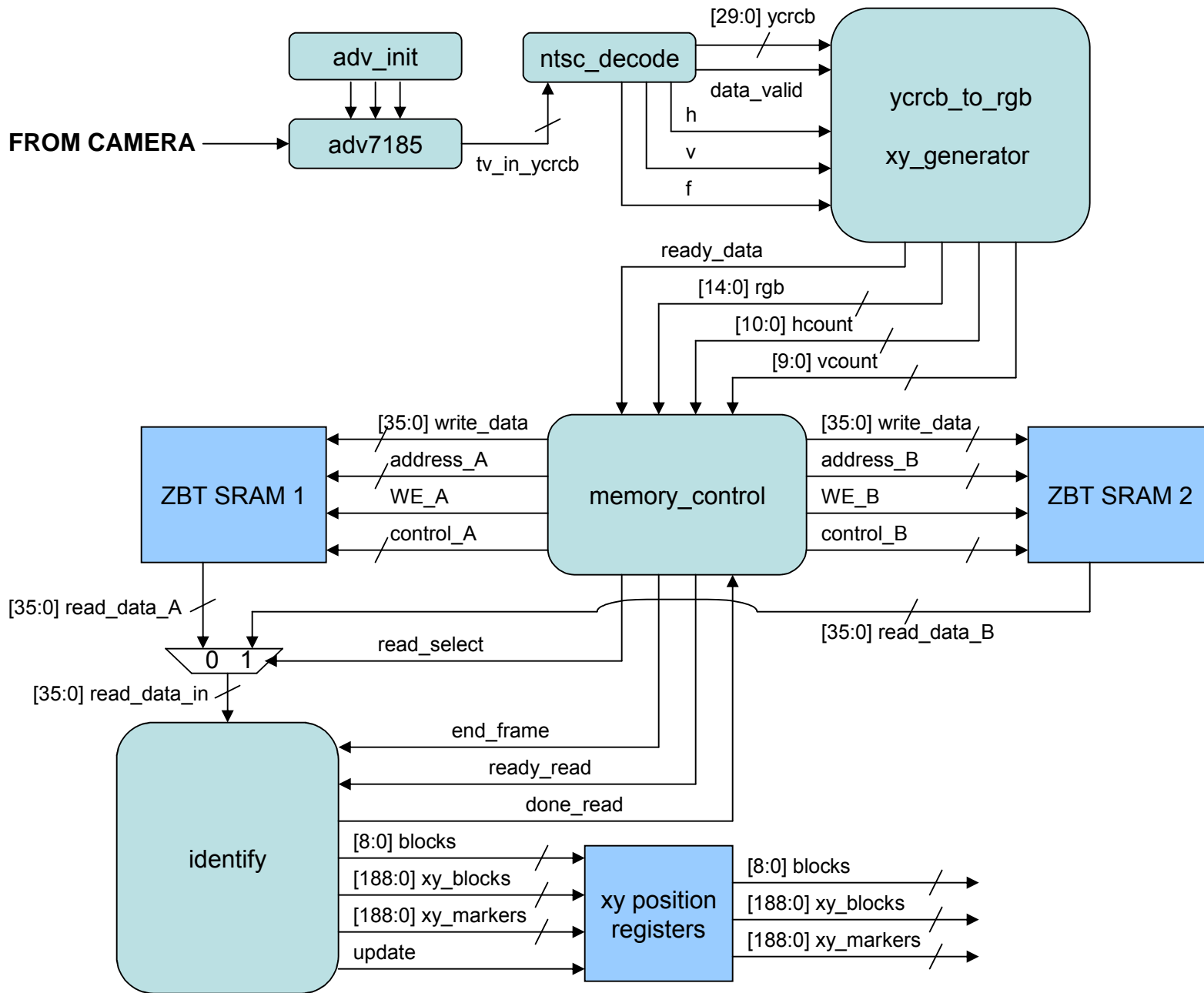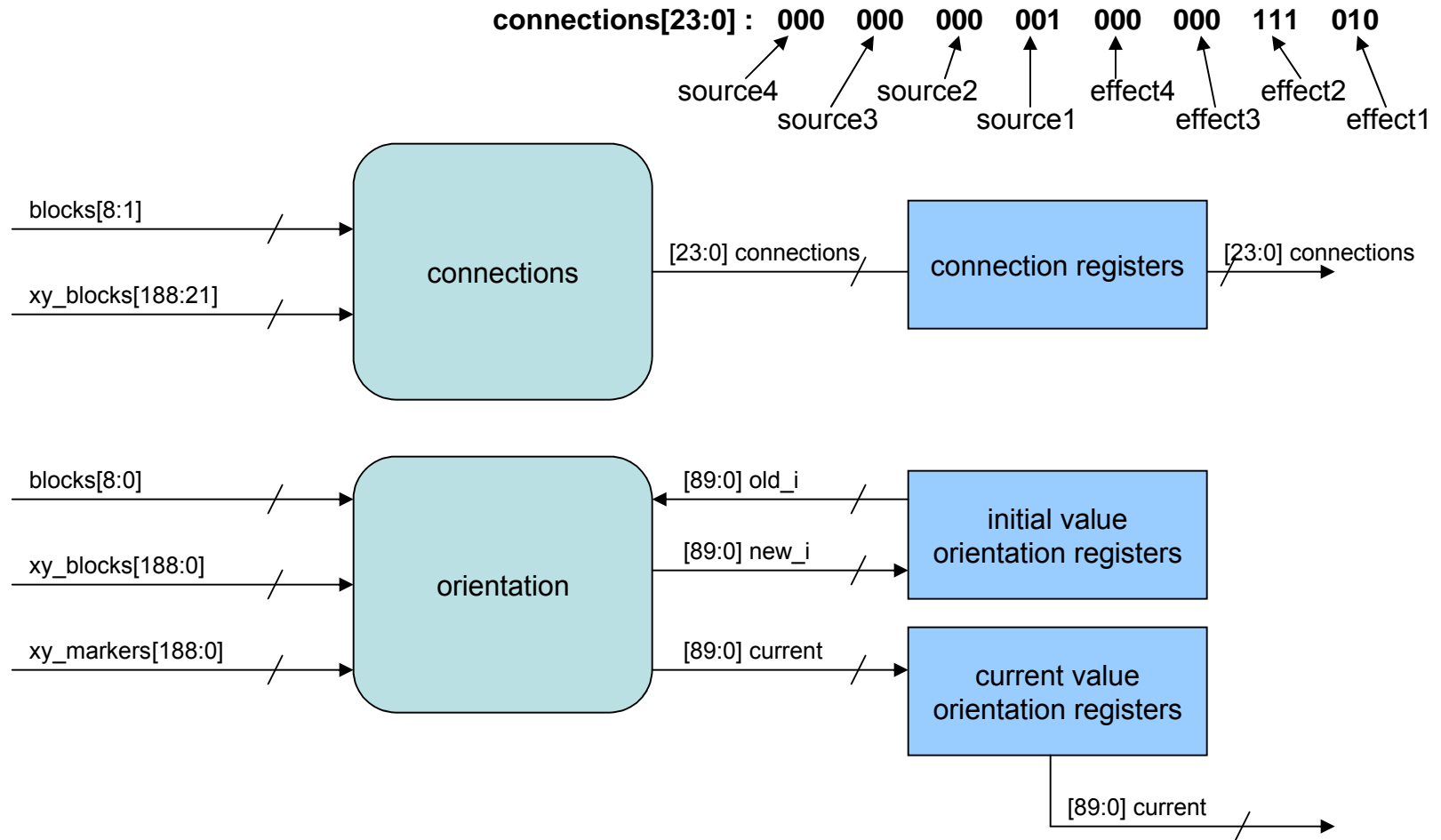
projector

camera
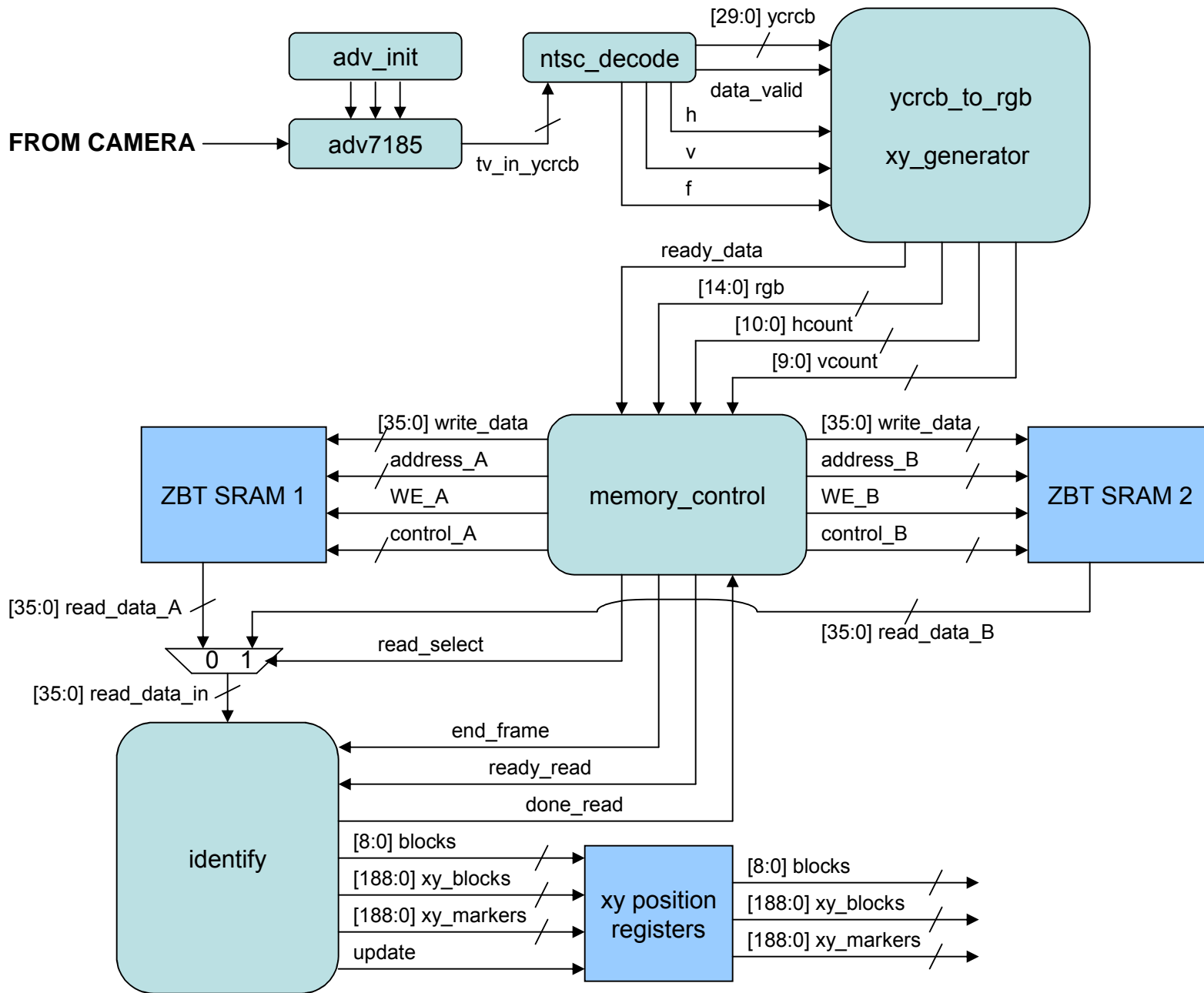
BLOCK DIAGRAM 1 – Identifying objects

MEMORY_CONTROL FSM

BLOCK DIAGRAM 1 – Identifying objects

ready_read   done_read   end_frame

[35:0] read_data_in

Identify Controller

[35:24] read_data_in = x coordinate

[23:12] read_data_in = y coordinate

X coordinate

Y coordinate

[9:0]x_block_red

[9:0]x_block_green

...

[9:0]x_marker_red

[9:0]x_marker_green

...

Running sum of y-coordinate (vcount)

Number of red pixels found

red_sel

end_frame

0

red_sel

end_frame

0

+1

÷

[9:0] y_block_red

IDENTIFY BLOCK

BLOCK DIAGRAM 2 – Interpreting the data

connections[23:0] : **000   000   000   001   000   000   111   010**

source4   source2   effect4   effect2

source3   source1   effect3   effect1

blocks[8:1]

xy_blocks[188:21]

connections

[23:0] connections

connection registers

[23:0] connections

blocks[8:0]

xy_blocks[188:0]

xy_markers[188:0]

orientation

[89:0] old_i

**initial value
orientation registers**

[89:0] new_i

[89:0] current

**current value
orientation registers**

[89:0] current

BLOCK DIAGRAM 3 – Generating the audio output

AUDIO FSM

Sample Register

from BRAM

0

source_sel
(from audio module)

effect_sel (from audio module)

Effect 1

Effect 2

Effect 3

Effect 4
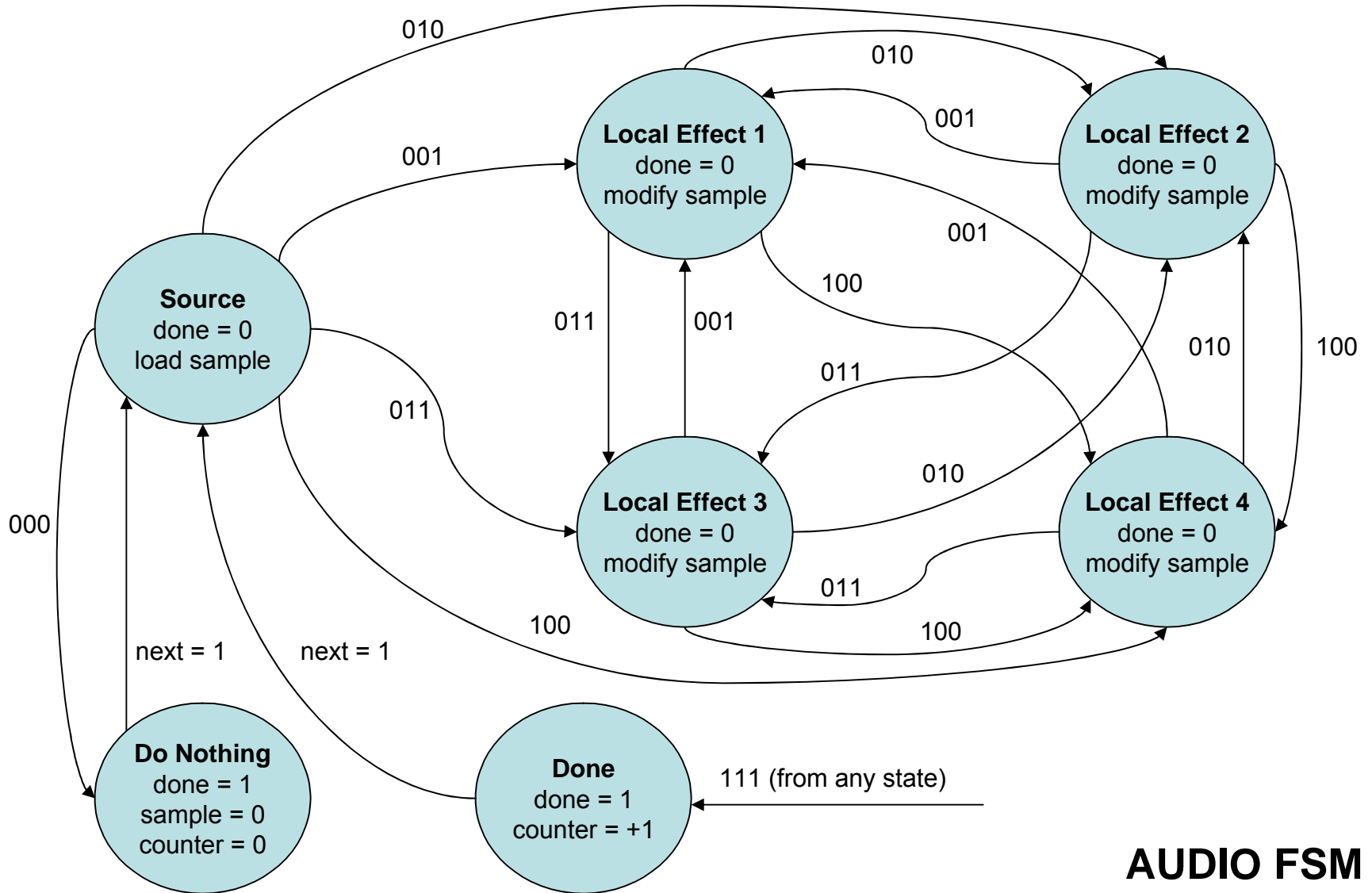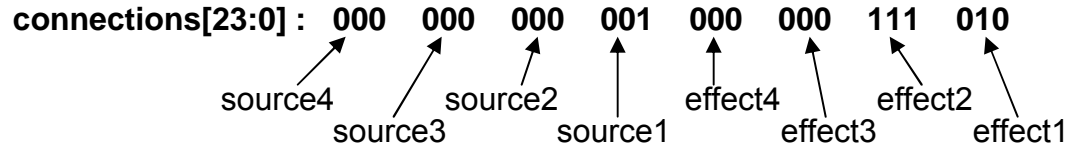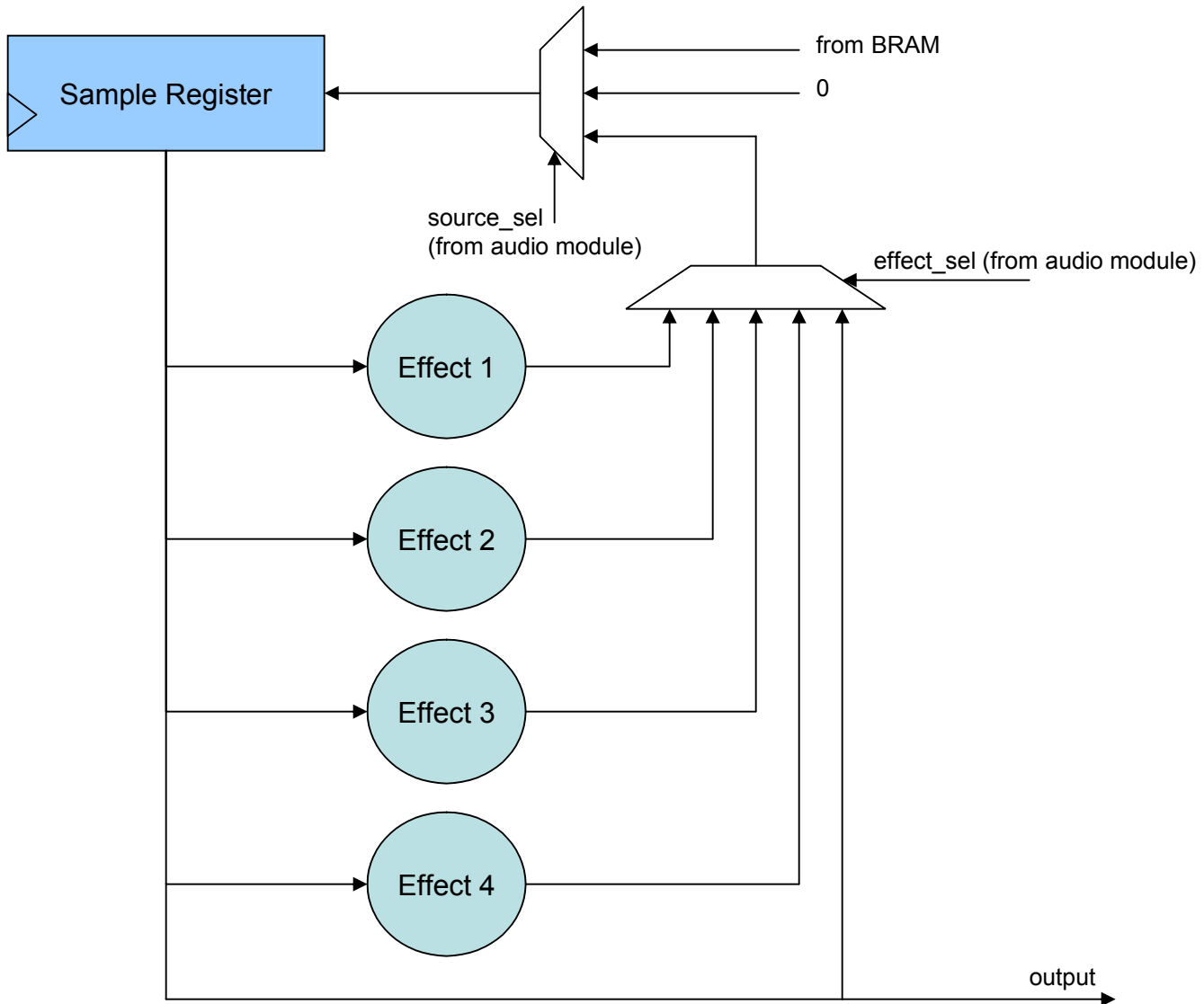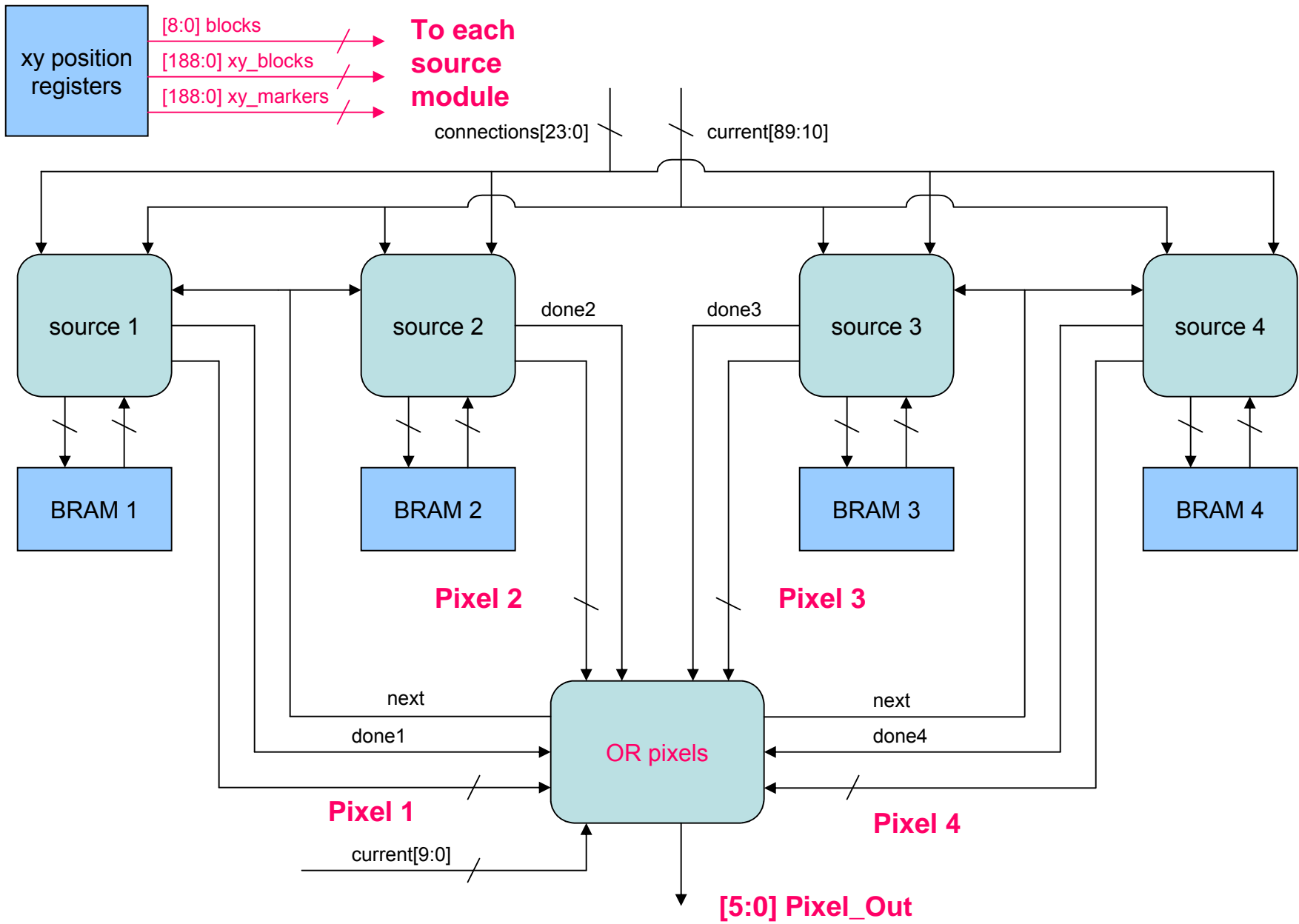
output

BLOCK DIAGRAM 4 – Generating the visual output