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LIBRARY ieee, lpm;
USE ieee.std_logic_1164.all;
USE ieee.std_logic_unsigned.all;
USE lpm.lpm_components.all;

ENTITY homework7 IS
	Generic (address :IN std_logic_vector(9 DOWNTO 0);
			cs :IN std_logic;
			q :OUT std_logic_vector(2 DOWNTO 0));
	PORT( clk, resetn : IN std_logic;
		pixelout : OUT std_logic_vector(2 DOWNTO 0));
END homework7;

ARCHITECTURE behavior OF homework7 IS
BEGIN
	PROCESS
		VARIABLE prow : INTEGER RANGE 0 TO 479 := 0;
		VARIABLE pcol : INTEGER RANGE 0 TO 639 := 0;
		VARIABLE count : INTEGER RANGE 0 TO 2 := 0;
		VARIABLE paddress :std_logic_vector(9 DOWNTO 0):= "0000000000";

BEGIN
	rom1: lpm_rom     --megafunction to input data from picture
	GENERIC MAP (lpm_width => 3, lpm_widthad => 10,
		--3-bits per pixel
		LPM_FILE => "picture.mif",     --and 10-bit address
		LPM_ADDRESS_CONTROL => "UNREGISTERED",
		--for 1024 locations
		LPM_OUTDATA => "UNREGISTERED")
	PORT MAP(paddress => address, memenab => cs, q => q);
```

```
        IF(resetn = '0') THEN   --check if resetn = 0 (active low)
                pcol := 0;
                prow := 0;
                paddress := "0000000000";     --pixel address
        END IF;
        IF(clk'EVENT AND clk = '1') THEN
                count := count + 1;
                IF(count = 2) THEN      --2 clock cycles = 40ns
                        count := 0;
                        pcol := pcol + 1;   --advance column count
                        paddress := paddress + 1;
                        IF(pcol = 639) THEN      --check for end of row
                                pcol := 0;      --reset column count to 0
                                prow := prow + 1;    --advance row count
                        END IF;
                        IF(pcol >= 13 AND pcol <= 45 AND prow >= 19 AND prow <= 51) THEN
                                --check if count is within the visible area
                                pixelout <= q; --output picture when in visible area
                        ELSE
                                pixelout := "000";      --area outside picture is black
                        END IF;
                        IF(prow = 479) THEN
                                prow := 0;       --reset prow to 0 when last row is reached
                        END IF;
                END IF;
        END IF;
END PROCESS;
END behavior;
```