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--------------------------------------------------------------------------------
--
--  Purpose:
--
--    ROM Model
--
--  Discussion:
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--
--  Licensing:
--
--    This code is distributed under the GNU LGPL license.
--
--  Modified:
--
--    2012.04.02
--
--  Author:
--
--    Young W. Lim
--
--  Parameters:
--
--    Input:
--
--    Output:
--------------------------------------------------------------------------------

library STD;
use STD.textio.all;

library IEEE;
use IEEE.std_logic_1164.all;
use IEEE.numeric_std.all;

use WORK.cordic_pkg.all;



entity rom is
  generic (
    WD     : in natural := 32;
    SH     : in natural :=  5;
    PWR    : in natural := 64);

  port (
    addr   : in   std_logic_vector (SH-1 downto 0) := (others=>'0');
    cs     : in   std_logic := '0';
    data   : out  std_logic_vector (WD-1 downto 0) := (others=>'0') );

end rom;

architecture rtl of rom is
   type rarray is array (natural range <>) of real;

   constant angles : rarray :=
                     (  7.853981633974483096E-01,  -- pi/4 rad
                        4.636476090008061162E-01,
                        2.449786631268641541E-01,
                        1.243549945467614350E-01,
                        6.241880999595734847E-02,
                        3.123983343026827625E-02,
                        1.562372862047683080E-02,
                        7.812341060101111296E-03,
                        3.906230131966971827E-03,
                        1.953122516478818685E-03,
                        9.765621895593194304E-04,
                        4.882812111948982754E-04,
                        2.441406201493617640E-04,
                        1.220703118936702042E-04,
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                        6.1035156174208775022E-05,
                        3.0517578115526096862E-05,
                        1.5258789061315762107E-05,
                        7.6293945311019702634E-06,
                        3.8146972656064962829E-06,
                        1.9073486328101870354E-06,
                        9.5367431640596087942E-07,
                        4.7683715820308885993E-07,
                        2.3841857910155798249E-07,
                        1.1920928955078068531E-07,
                        5.9604644775390554414E-08,
                        2.9802322387695303677E-08,
                        1.4901161193847655147E-08,
                        7.4505805969238279871E-09,
                        3.7252902984619140453E-09,
                        1.8626451492309570291E-09,
                        9.3132257461547851536E-10,
                        4.6566128730773925778E-10,
                        2.3283064365386962890E-10,
                        1.1641532182693481445E-10,
                        5.8207660913467407226E-11,
                        2.9103830456733703613E-11,
                        1.4551915228366851807E-11,
                        7.2759576141834259033E-12,
                        3.6379788070917129517E-12,
                        1.8189894035458564758E-12,
                        9.0949470177292823792E-13,
                        4.5474735088646411896E-13,
                        2.2737367544323205948E-13,
                        1.1368683772161602974E-13,
                        5.6843418860808014870E-14,
                        2.8421709430404007435E-14,
                        1.4210854715202003717E-14,
                        7.1054273576010018587E-15,
                        3.5527136788005009294E-15,
                        1.7763568394002504647E-15,
                        8.8817841970012523234E-16,
                        4.4408920985006261617E-16,
                        2.2204460492503130808E-16,
                        1.1102230246251565404E-16,
                        5.5511151231257827021E-17,
                        2.7755575615628913511E-17,
                        1.3877787807814456755E-17,
                        6.9388939039072283776E-18,
                        3.4694469519536141888E-18,
                        1.7347234759768070944E-18,
                        1.7347234759768070944E-18,
                        1.7347234759768070944E-18,
                        1.7347234759768070944E-18,
                        1.7347234759768070944E-18  );


  signal dinInc : std_logic_vector (SH-1 downto 0);

begin

  ROM: process (addr, cs)
    type darray is array (0 to PWR) of std_logic_vector (WD-1 downto 0);
    variable romData : darray;
    variable initRom : boolean := false;
    variable cntInt : integer := 0;
    variable angleMin : std_logic_vector (WD-1 downto 0);
  begin  -- process Reg
    if (initRom=false) then
      for i in 0 to PWR-1 loop
        romData(i) := Conv2fixedPt(angles(i), WD);
      end loop;  -- i
      initRom := true;
    end if;
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    if cs = '1' then                    -- asynchronous reset (active low)
      data <= romData(to_integer(unsigned(addr)));
    else
      data <= (others=>'1');
    end if;
  end process ROM;

end rtl;
```