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--
-- Purpose:
--     utility package of cordic
--
-- Discussion:
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--
-- Licensing:
--
--     This code is distributed under the GNU LGPL license.
--
-- Modified:
--
--     2012.03.16
--
-- Author:
--
--     Young W. Lim
--
-- Functions:
-- Conv2fixedPt (x : real; n : integer) return std_logic_vector;
-- Conv2real (s : std_logic_vector (31 downto 0) ) return real;
--
-----

```

```

library STD;
use STD.textio.all;

```

```

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

```

```

package cordic_pkg is

```

```

    function Conv2fixedPt (x : real; n : integer) return std_logic_vector;
    function Conv2real (s : std_logic_vector (31 downto 0) ) return real;

```

```

    constant clk_period : time := 20 ns;
    constant half_period : time := clk_period / 2.0;

```

```

    constant pi : real := 3.141592653589793;
    constant K : real := 1.646760258121;

```

```

end cordic_pkg;

```

```

package body cordic_pkg is

```

```

-----
function Conv2fixedPt (x : real; n : integer) return std_logic_vector is
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```

```

    constant shft : std_logic_vector (n-1 downto 0) := X"2000_0000";
    variable s : std_logic_vector (n-1 downto 0) ;
    variable z : real := 0.0;
-----

```

```

begin

```

```

    -- shft = 2^29 = 536870912
    -- bit 31 : msb - sign bit
    -- bit 30,29 : integer part
    -- bit 28 ~ 0 : fractional part
    -- for the value of 0.5
    -- first 4 msb bits [0, 0, 0, 1] --> X"1000_0000"
    --

```

```

    -- To obtain binary number representation of x,
    -- where the implicit decimal point between bit 29 and bit 28,
    -- multiply "integer converted shft"
    --

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```

    z := x * real(to_integer(unsigned(shft)));

```

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    s := std_logic_vector(to_signed(integer(z), n));

```

```
    return s;
```

```
end Conv2fixedPt;
```

```
-----  
-----  
function Conv2real (s : std_logic_vector (31 downto 0) ) return real is
```

```
-----  
-----  
    constant shft : std_logic_vector (31 downto 0) := X"2000_0000";  
    variable z : real := 0.0;
```

```
-----  
-----  
begin
```

```
    z := real(to_integer(signed(s))) / real(to_integer(unsigned(shft)));
```

```
    return z;
```

```
end Conv2real;
```

```
-----  
-----  
end cordic_pkg;
```