CORDIC Algorithm

Fixed Point Simulation Description

The CORDIC is also combined by independent elements, which each one complete one steps in the formula.



And a high level function will handle the error measurement and calculation order decision for one certain initial value. The highest function is designed to scan the entire value domain as same as what to do in the floating cases.

All of following functions should be designed in fixed point operations.

Considering the simulation, the saturation operation should be done in the fixed-point calculations, which cannot follow the task documents.

# CORDIC Element Function

There are several inputs for the function, as that x\_k, y\_k, z\_k, referring the formula, and order: element order equals k, and that mode is the CORDIC mode with triangle format, in which 1 stands for sin and cos function, 2 for arctan and 3 for square root.

The output x\_k1, y\_k1, z\_k1 are the results in the formula.

After the coefficients of e\_k and u are selected depending on parameter mode, the results by the formula can be obtained.

# Certain Angle and Certain Order Function

There are several inputs for the function, where w is value for calculation and order is required calculation order, and mode is CORDIC format as same as defined in CORDIC element function.

There are some outputs also. The value is/are calculation result(s), and real\_value is the result(s) value from the MATLAB function, and err is the CORDIC error against to the real\_value.

The initial values are selected considering parameter mode. There will be CORDIC calculations.

# Certain Angle and Ports Bit-Wide Searching Function

There are several inputs for the function, where w is value for calculation and order is required calculation order, err\_limitation is the allowed maximum error, and mode is CORDIC format as same as defined in CORDIC element function.

There are some outputs also. The value is/are calculation result(s), and real\_value is the result(s) value from the MATLAB function, and err is the CORDIC error against to the real\_value.

The initial values are selected considering parameter mode. There will be CORDIC calculations. The output bit\_wide is searched as the minimum bit-wide to reach the error limitation.

# Value Domain Scan Function

The inputs, where step is the number of scanning step in the entire value domain, and err\_limitation is the allowed maximum error, and bit\_limitation is the allowed maximum bit-wide, and order is the CORDIC order obtained by floating algorithms, and mod is CORDIC mode as same as defined in CORDIC element function.

There are some outputs also. The order is the CORDIC order to reach the error limitation, and max\_err is the maximum CORDIC error from the real value.

The value domain depends on the parameter mode. And after one scanning loop to get the minimum bit-wide in the domain, there will be another loop to get the maximum error in the angles.