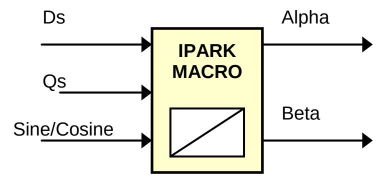
I_PARK *Inverse Park Variable Transformation*

Description

This transformation projects vectors in orthogonal rotating reference frame into two phase orthogonal stationary frame.



Availability

This IQ module is available in one interface format:

1) The C interface version

Module Properties

Type: Target Independent, Application Independent

Target Devices: 28x Fixed Point or Piccolo

C Version File Names: ipark.h

IQmath library files for C: IQmathLib.h, IQmath.lib

C Interface

Object Definition

The structure of IPARK object is defined by following structure definition

```
typedef struct {  _iq  Alpha;         // Output: stationary d-axis stator variable
                  _iq  Beta;          // Output: stationary q-axis stator variable
                  _iq  Angle;         // Input: rotating angle (pu)
                  _iq  Ds;            // Input: rotating d-axis stator variable
                  _iq  Qs;            // Input: rotating q-axis stator variable
               } IPARK;

typedef IPARK *IPARK_handle;
```

Item	Name	Description	Format*	Range(Hex)
Inputs	Ds	Direct axis(D) component of transformed signal in rotating reference frame	GLOBAL_Q	80000000-7FFFFFFF
	Qs	Quadrature axis(Q) component of transformed signal in rotating reference frame	GLOBAL_Q	80000000-7FFFFFFF
	Angle	Phase angle between stationary and rotating frame	GLOBAL_Q	00000000-7FFFFFFF (0 – 360 degree)
	Sine	Sine of the phase angle between stationary and rotating frame	GLOBAL_Q	80000000-7FFFFFFF
	Cosine	Cosine of the phase angle between stationary and rotating frame	GLOBAL_Q	80000000-7FFFFFFF
Outputs	Alpha	Direct axis(d) component of the transformed signal	GLOBAL_Q	80000000-7FFFFFFF
	Beta	Quadrature axis(q) component of the transformed signal	GLOBAL_Q	80000000-7FFFFFFF

*GLOBAL_Q valued between 1 and 30 is defined in the IQmathLib.h header file.

Special Constants and Data types

IPARK

The module definition is created as a data type. This makes it convenient to instance an interface to the Inverse Park variable transformation. To create multiple instances of the module simply declare variables of type IPARK.

IPARK_handle

User defined Data type of pointer to IPARK module

IPARK_DEFAULTS

Structure symbolic constant to initialize IPARK module. This provides the initial values to the terminal variables as well as method pointers.

Methods

IPARK_MACRO(IPARK_handle);

This definition implements one method viz., the inverse Park variable transformation computation macro. The input argument to this macro is the module handle.

Module Usage

Instantiation
The following example instances two IPARK objects
IPARK ipark1, ipark2;

Initialization
To Instance pre-initialized objects
IPARK ipark1 = IPARK_DEFAULTS;
IPARK ipark2 = IPARK_DEFAULTS;

Invoking the computation macro
IPARK_MACRO (ipark1);
IPARK_MACRO (ipark2);

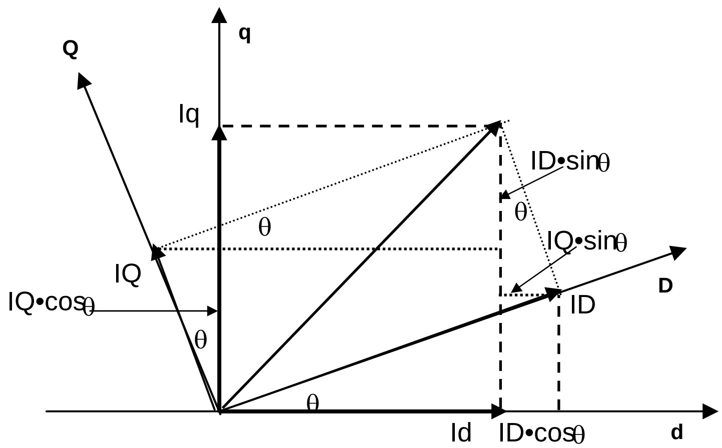
Example
The following pseudo code provides the information about the module usage.

```
main()
{

}

void interrupt periodic_interrupt_isr()
{
        ipark1.Ds = de1;                // Pass inputs to ipark1
        ipark1.Qs = qe1;                // Pass inputs to ipark1
        ipark1.Angle = ang1;            // Pass inputs to ipark1

        ipark2.Ds = de2;                // Pass inputs to ipark2
        ipark2.Qs = qe2;                // Pass inputs to ipark2
        ipark2.Angle = ang2;            // Pass inputs to ipark2

        IPARK_MACRO (ipark1);           // Call compute macro for ipark1
        IPARK_MACRO (ipark2);           // Call compute macro for ipark2

        ds1 = ipark1.Alpha;             // Access the outputs of ipark1
        qs1 = ipark1.Beta;              // Access the outputs of ipark1

        ds2 = ipark2.Alpha;             // Access the outputs of ipark2
        qs2 = ipark2.Beta;              // Access the outputs of ipark2

}
```

Technical Background

Implements the following equations:

$$\begin{cases} Id = ID \times \cos\theta - IQ \times \sin\theta \\ Iq = ID \times \sin\theta + IQ \times \cos\theta \end{cases}$$



Next, Table 1 shows the correspondence of notations between variables used here and variables used in the program (i.e., ipark.c, ipark.h). The software module requires that both input and output variables are in per unit values.

	Equation Variables	Program Variables
Inputs	ID	Ds
	IQ	Qs
	θ	Angle
	sin	Sine
	cos	Cosine
Outputs	id	Alpha
	iq	Beta

Table 1: Correspondence of notations