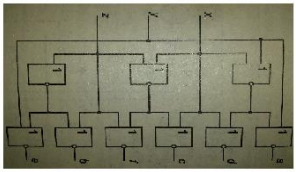
UDC 004.94

An approach to position sensor error correction in brushless DC motor

Stepanov V.Y.
Belarusian National Technical University

BLDC find application in wide area of devices –from electric cars to home appliances thanks their reliability and smooth control. There is only one important thing to know about BLDC- to proper control one needs to detect rotor position, which is used to phase commutation.

The rotor position sensor (RPD) is a positional feedback element. DPR is designed to generate signals that carry information about the relative position of the axes of the rotor poles and the axes of the phases of the stator windings of the motor. The DPR signal serves to control of the power switches which connect the phases of the motor to the supply voltage, the way that the motor will produce the maximum torque. The hardware decoder of the sensor is shown in Figure.



Existing controllers, for example Motorola MC 33035 convert data from sensor (channel) and identify rotor position by using logic circuit. Our design is to reconstruct rotor position in case of failure one of the channels.

To simulate the operation of the decoder, a C # program was developed which allows simulating operation of the decoder with the initial data on the rotor position close to true one. The rotor position is chosen in a pseudo-random manner, simulating the situation of the beginning of the rotor position sensor operation when previous data is not available.

Program also has other features, such as:

1) data processing similar to real hardware decoder circuits based on OR-NOT logic operations;

2) generation of errors at pseudo-random moments of simulation time;

3) simulation errors in one or more sensor channels simultaneously;

4) storage of previous rotor position values detects by each sensor channel separately; 5) two error correction algorithms based on the stored values of the previous rotor position and, if the error was not corrected after applying the first algorithm, using of the second algorithm based on the calculation of necessary rotor position to achieve the required rotation angle at the current control iteration.