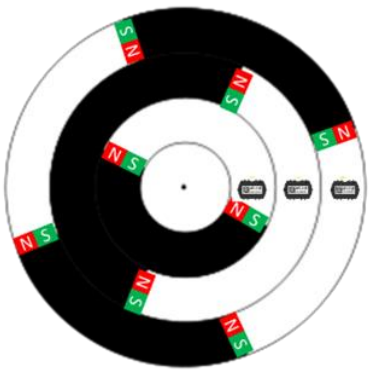
Wiegand position encoder with Gray code generation

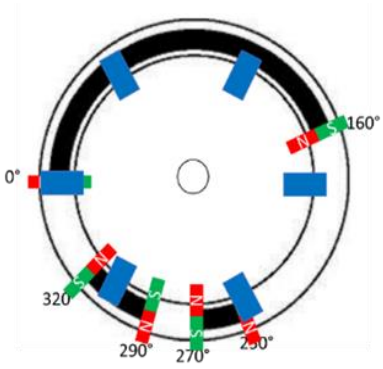
Continuous rotation angle and speed position determination

Invention

Optical and magnetic sensors are currently normally used to measure rotation angle. A previous invention by the Aachen University of Applied Sciences (see Wiegand position encoder, Ref. No. 6361) describes a cheaper method that uses the Wiegand effect to determine the rotation angle, change in rotation angle, and speed or distance.



Simple layout of a three-bit Wiegand Gray code system with alternately arranged magnets in a radial orientation (top), six-bit STGC (bottom).



A refinement has now combined the Wiegand effect with Gray code. It involves a variant of the developed rotation angle sensor with several ring segments attached to a disk at various distances from the center and various Wiegand sensors that detect the ring segment transitions.

The figure shows the orientation of such a sensor using a three-bit Gray code as an example. Magnets are arranged radially in the various areas (black/white) so that polarity for adjacent magnets on a track alternates. Each of the three Wiegand sensors records a track: The transitions are detected, and an evaluation circuit uses them to show the rotation angle with a Gray code. This system can be set up not only for three-bit Gray codes, but for as many ring segments as required.

A second variant of the rotation angle sensor can be used for single-track Gray code (STGC). The magnets are defined in alternating orientation and mounted at irregular intervals on the rotating disk. The sensors are mounted in fixed positions at regular intervals. For a six-bit STGC, the magnets are mounted at the angle positions shown in the figure, and the sensors are arranged at 60° intervals.

Commercial Opportunities

As an absolute encoder, the new rotation angle sensor can be used to detect rotation direction (as a conventional rotation angle sensor does in motor control units, for example) and for other applications in electrical machines. Its essential advantages are that it can be operated without its own energy supply system, the transitions are much sharper than Hall sensors, and it is much less sensitive to magnetic interference than are Hall sensors.

Current Status

A prototype of a technical solution using this invention has been created. It can be used to demonstrate the benefits and utility of the invention. It has been registered with the German Patent and Trade Mark Office. It can be registered in other countries in the priority year or upon later PCT registration. We are offering interested companies the opportunity to license and refine the technology in collaboration with the inventors and the Aachen University of Applied Sciences.

Relevant Publications

Some publications are planned.

An invention of the Aachen University of Applied Science.

Competitive Advantages

- Resistant to magnetic interference
- Scalable resolution
- Can be used as an absolute encoder
- Suitable for high speeds
- Can be energy self-sufficient in operation

Technology Readiness Level

1 2 3 **4** 5 6 7 8 9

Technology validated in lab

Industries

- Electrical engineering
- Measurement technology
- Sensors

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