Article Side

Using the Stepperâ€“motor in Amateur Electronics by Ewan Fisher

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The stepperâ€“motor is one of the most versatile pieces of kit in the amateur electronics enthusiastâ€™s â€œcookbookâ€•. The basic function of the stepper â€“ motor is to divide rotations into incremental steps (each one an equal step). This is done by having a series of toothy electromagnets arranged around a central gear assembly.

Ordinarily the stepperâ€“motor is brushless. It is a DC motor, and it always divides a full rotation. So long as you size the motor properly for your application or end use, it can be controlled extremely precisely without the need for using an open loop controller or other kind of feedback damper.

Please note that a stepperâ€“motor is not a DC brush motor. A DC brush motor rotates in the instance of voltage being applied to its terminals, while the stepper â€“ motor takes its power from those stepped electromagnets referred to above. The electromagnets are in turn powered by an external source, normally a microcontroller.

To make a step or incremental turn, a single electromagnetic tooth is given power. That attracts the closest gear tooth, which moves accordingly. The original electromagnet is then turned off and the next electromagnetic tooth in sequence is turned on. The tooth moves to align with the new source of electromagnetism. From this you can see that only one tooth on the gear wheel is magnetised at any single time.

Because of its precise nature, the stepperâ€“motor is excellent for amateur electronics creations that require a degree of finesse you canâ€™t get with a normal DC brush motor. On the flip side, stepperâ€“motors have a larger capacity for vibration than DC Brush motors. This is because the stepping motion made by the gear wheel naturally incorporates a jerking motion, referred to in the terminology as a â€œdetentâ€•. The gear wheel is moving in a magnetic field, which encourages a bouncing motion in each step: the tooth effectively bounces past the electromagnet to which it is attracted, and the magnetic attraction pulls it back into a settled place.

As a result of this jerking motion, the stepperâ€“motor can be significantly louder than a DC brush motor. Both jerking motions and noise can be countered by ensuring first that the stepperâ€“motor you are using is the appropriate size for the load; and that you use a stepperâ€“motor with as many teeth as possible. The more teeth there are, the less travel there is between each electromagnetic nodule and so the less wavering there is in the gear wheel.

Note also that the power requirements for this kind of motor mean that direct digital control is not possible. Normally a motor controller of some sort is positioned between the digital interface and the windings of the motor. Please refer to online manuals and forums for more information before using a stepperâ€“motor.

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