Practical No. 10: Demonstrate the operation of stepper motor for various speed rotation.

I Practical significance: Stepper motors convert electricity into rotation. Not only does a stepper motor convert electrical power into rotation, but it can be very accurately controlled in terms of how far it will rotate and how fast. Stepper motors are typically used for holding or positioning applications.

II Industry/Employer expected outcome:

Apply basic concept of electrical engineering in various application in relevant technical field. Identify different types of supply sources, equipment and machines.

III Course level learning outcome:

Use different electrical machines by making connection.

IV Laboratory Learning Outcome

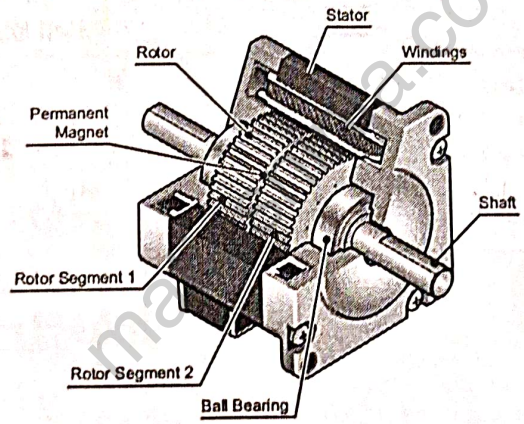
Demonstrate the stepper motor operation.

V Relevant Affective Domain related outcome

Follow safety electrical rules for practices.

VI Relevant Theoretical background

The construction of a stepper motor is fairly related to a DC motor. It includes a permanent magnet like Rotor which is in the middle & it will turn once force acts on it. This rotor is enclosed through a no. of the stator which is wound through a magnetic coil all over it. The stator is arranged near to rotor so that magnetic fields within the stators can control the movement of the rotor.



Stepper Motor

The stepper motor can be controlled by energizing every stator one by one. So the stator will magnetize & works like an electromagnetic pole which uses repulsive energy on the rotor to move forward. The stator's alternative magnetizing as well as demagnetizing will shift the rotor gradually &allows it to turn through great control.

The stepper motor working principle is Electro-Magnetism. It includes a rotor which is made with a permanent magnet whereas a stator is with electromagnets. Once the supply is provided to the winding

VII Actual circuit diagram used in laboratory

Student should draw the relevant circuit diagram under the guidance of teacher

VIII Required resources/apparatus/equipment with specifications:

Sr. No.	Name of Resource	Suggested Broad Specification	Quantity
1	Stepper motor	Suitable range	1 No.
2	Stepper motor driver	Suitable range	1 No.
3	Stepper motor controller	Suitable range	1 No.
4	Power supply	Suitable range	1 No.
5	Connecting wires	Suitable wires	1 No.

IX Precautions to be followed

1. The motor constantly draws electrical currents
2. The motor will be overheated if you leave the power on for an extended period
3. Make sure to disconnect the power (Vcc) to the Darlington array I you are not debugging/testing it.

X. Procedures

Student should write the procedure under the guidance of teacher.

1) The motor constantly draws electrical currents
2) The motor will be overheated if you leave the power on for an extended period.
3) Make sure to disconnect the power (Vcc) to the Darlington array I you are not debugging / testing it.

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Quantity
1
1

1] →

→ To change the rotation speed of stepper motor - adjust the pulse frequency sent to the motor driver in the code or software controlling it. This alters the timing between steps, effectively changing the speed control features or pins for adjustments.

2].

→ To reverse a stepper motor's rotation, swap to sequence of control signals sent to the motor driver in the code. This changes the direction of rotation.

3]

→ 1] CNC machines
2]. 3D printers.
3] Robbotics.
4]. Automation.
5] Camera platforms.
6]. Medical equipments. (pumps,
7] Packaging machines.
8]. Automatic system.
9]. Textile machine.
10]. Consumer electronices.

XI Resources Used (Student should the required resources)

S. No.	Name of Resource	Suggested Broad Specification	Quantity
1	Stepper Motor	Suitable Range	1
2	Power Motor	Suitable Range	1

XII Actual Procedure followed

1] Connect stepper to micro-controller
2] Run code for low medium & high speed
3] Observe step & pause on each speed (Rotation of motor)

XIII Observations

We observe the operation of stepper motor rotate step by step with the help.

XIV Results

The rotation of stepper motor rotate step by step with the help of controlling devices.

XV Interpretation of results

The rotation of stepper motor rotate step by step with the help of controlling device.

XVI Conclusions and recommendation

Hence, we have studied to demonstrate the operation of stepper motor for various speed rotation the direction of rotation of stepper motor on be controlled by controllin.g speed.

XVII Practical related questions.

1. How to change the rotation speed of a stepper motor?
2. How to reverse the rotation direction?
3. Enlist the applications of stepper motor.

XVIII References/Suggestions for further reading

1. https://www.monolithicpower.com/stepper-motors-basics-types-uses
2. https://www.orientalmotor.com/stepper-motors/technology/stepper-motor-basics.html
3. https://www.elprocus.com/stepper-motor-types-advantages-applications/
4. https://eepower.com/technical-articles/stepper-motors-part-1-an-overview/