

LAB – 9 Programming on Stepper Motor

Aim:

To write a program to run a stepper motor in Python.

Task:

1. Write a Python program to run a stepper motor in Python with following conditions. Assume a unipolar stepper motor. The step sequence should be '1010', '0110', '0101', '1001'. The term '1' represents the excitation of stepper motor winding. The motor has to move 'forward' and 'reverse' based on user request. Assume the number of steps is 2. Print the winding sequence as well as direction i.e. forward of reverse.

Algorithm:

1. Set four pins in 'Board' mode as output pins
2. Create forward and reverse sequences.
3. Get the direction and number of steps.
4. If the direction is forward then use forward sequence to excite the winding by sending '1' in appropriate pins. If the direction is reverse then use reverse sequence to excite the winding.

Pin & Circuit Diagram:



Figure 1. Pin Configuration of Board

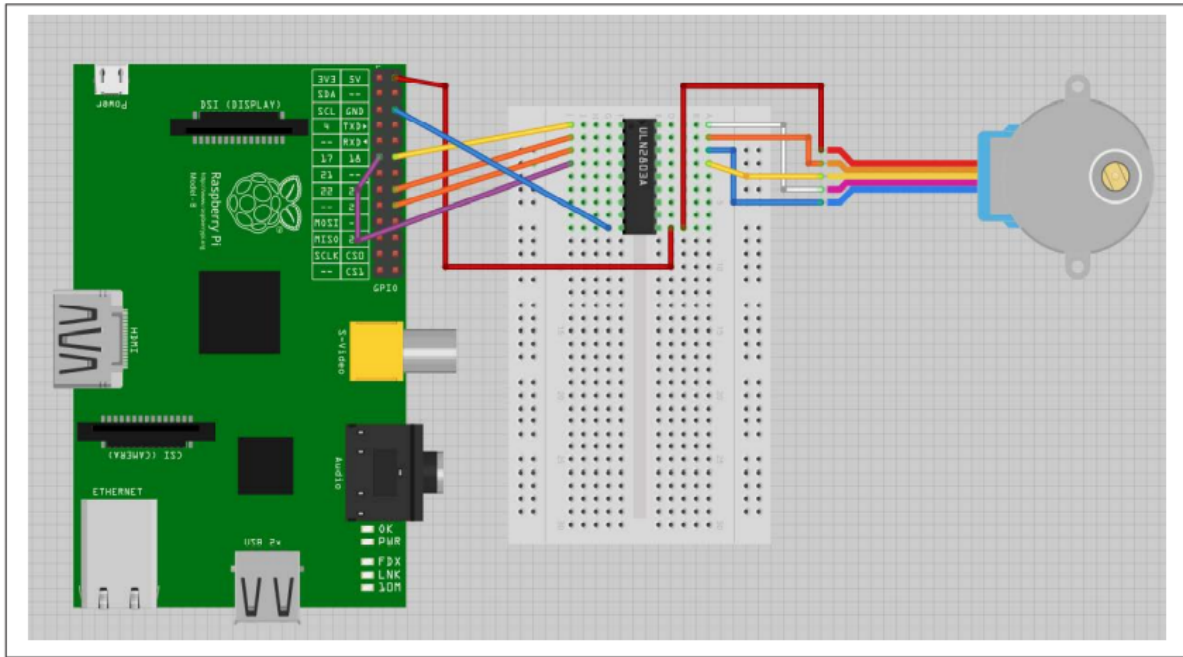


Figure 2. Raspberry Pi interfaced with unipolar stepper motor


Programs:

```

1  import RPi.GPIO as GPIO
2  import time
3  A1 = 17
4  A2 = 18
5  B1 = 22
6  B2 = 23
7  GPIO.setmode(GPIO.BCM)
8  GPIO.setup(A1, GPIO.OUT)
9  GPIO.setup(A2, GPIO.OUT)
10 GPIO.setup(B1, GPIO.OUT)
11 GPIO.setup(B2, GPIO.OUT)
12 forward_sequence = ['1010', '0110', '0101', '1001']
13 reverse_sequence = list(reversed(forward_sequence))
14 direction = input("Enter 'forward' or 'reverse': ")
15 num_steps = int(input("Enter the number of steps: "))
16 if direction == 'forward':
17     sequence = forward_sequence
18 elif direction == 'reverse':
19     sequence = reverse_sequence
20 else:
21     print("Invalid direction. Please enter 'forward' or 'reverse'.")
22     GPIO.cleanup()
23     exit()
24 for _ in range(num_steps):
25     for step in sequence:
26         GPIO.output(A1, int(step[0]))
27         GPIO.output(A2, int(step[1]))
28         GPIO.output(B1, int(step[2]))
29         GPIO.output(B2, int(step[3]))
30         time.sleep(0.5)
31 GPIO.cleanup()

```

Output:



RPi GPIO connectors:

2 5v Power	4 5v Power	6 Ground	8 BCM 14	10 BCM 15	12 BCM 18	14 Ground	16 BCM 23	18 BCM 24	20 Ground	22 BCM 25	24 BCM 8	26 BCM 7	28 BCM 1	30 Ground	32 BCM 12	34 Ground	36 BCM 16	38 BCM 20	40 BCM 21
1 3v3 Power	3 BCM 2	5 BCM 5	7 BCM 4	9 Ground	11 BCM 17	13 BCM 27	15 BCM 22	17 3v3 Power	19 BCM 10	21 BCM 9	23 BCM 11	25 Ground	27 BCM 0	29 BCM 5	31 BCM 6	33 BCM 13	35 BCM 19	37 BCM 26	39 Ground

Enter 'forward' or 'reverse': **forward**
Enter the number of steps: **5**

Pre-Lab Questions:

1. Compare Stepper Motor, DC Motor and servo motors.
2. Write about H-bridge. Use a figure if necessary.
3. In this experiment the stepper motor windings were energized in sequence. Write the name of the sequence along with merits? Write the other types of sequences.

Post Lab Questions:

1. Explain how stepper motors are used in printers. Use a figure if required.
2. Bring out an expression that connects Step Angle of stepper motor and number of rotor teeth.

Result:

Thus, a python code to run a stepper motor in Raspberry Pi was written and tested successfully.