

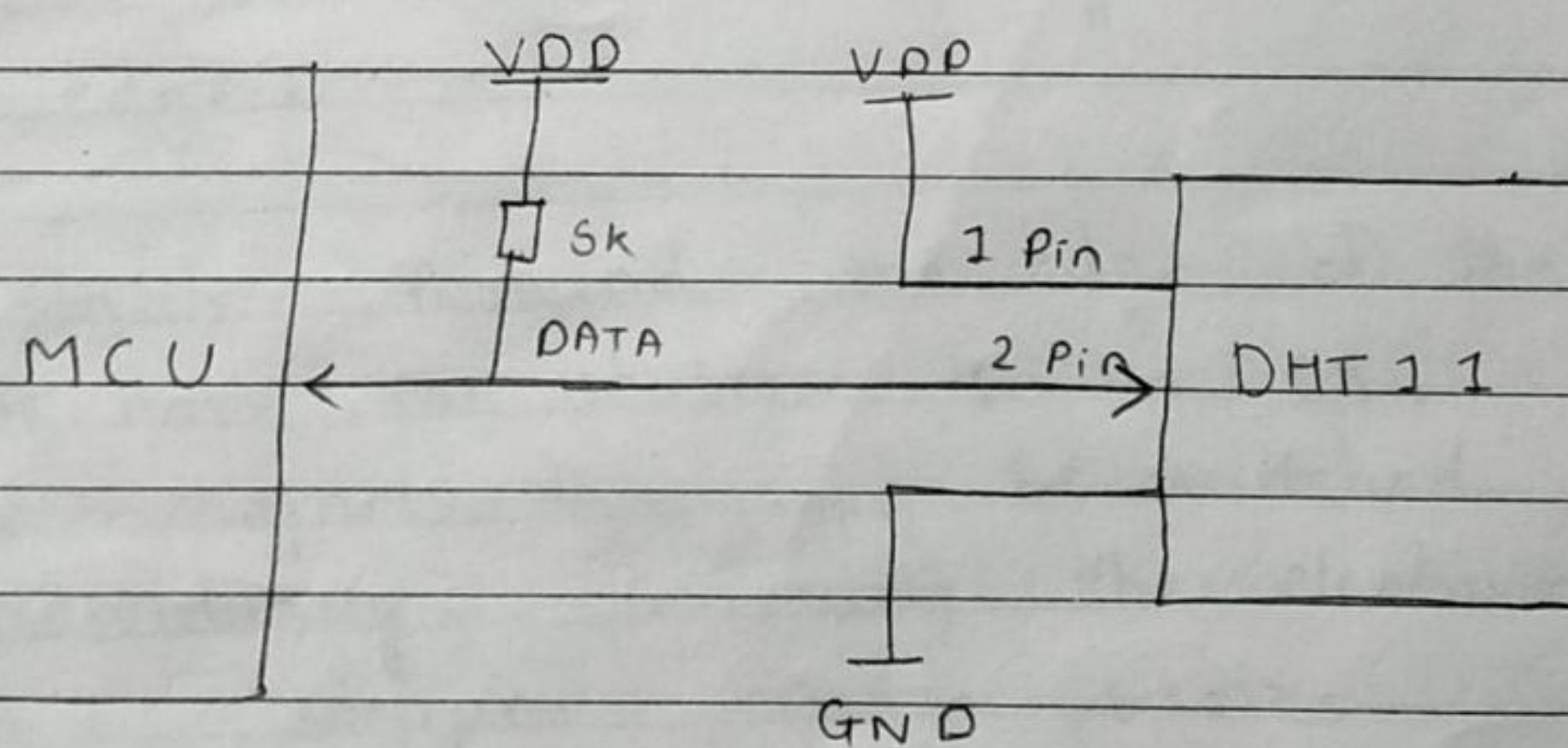
DoT - Exp - 6

Date _____
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Aim :- To study Experiment based on DHT 11 (Temperature & humidity) sensor. Write an application to find out the temperature & humidity.

Requirement :- Raspberry Pi board, DHT 11 sensor, LED's, Resistors, Jumper cables and / or breadboard.

Theory :- DHT 11 is a Humidity & Temperature Sensor, which generates calibrated digital output. DHT 11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc & get instantaneous results. DHT 11 is a low cost humidity & temperature sensor which provides high reliability & long term stability. DHT 11 is a part of DHT XX series of Humidity sensors. The DHT 11 Humidity & Temperature Sensor consists of 3 main components.



DHT 11 Sensor Circuit

Steps to perform Experiment:

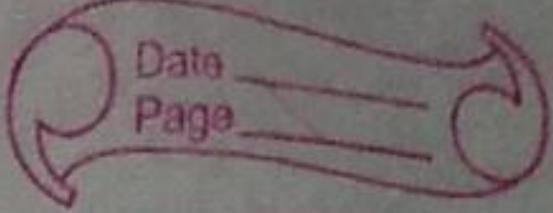
1. For getting the results from DHT 11 we required to download python library for DHT 11 as follows,

- i) Can git clone <https://github.com/adafruit/Adafruit-Python-DHT.git>
- ii) cd Adafruit-Python-DHT
- iii) sudo apt-get update
- iv) sudo apt-get install build-essential python-dev
- v) sudo python setup.py install.

2. Wait & run the appⁱⁿ program to show the temperature & humidity of environment

Conclusion :- Thus we have studied interfacing of DHT 22 sensor with Raspberry Pi board & usage of DHT sensor & getting the temperature & humidity.

DOT Exp - 7



Title :- Experiment based on interfacing to control the operations of stepper motor remotely using DOT kit.

Requirement :- Raspberry Pi board, Stepper motor, Jumper cables and / or breadboard

Theory :- Stepper Motors work under a very similar principle to DC motors, except they have many coils instead of just one. So to operate a stepper motor, one must activate these different coil patterns to generate motor rotation.

The rotor :- The rotor itself is made from two discs, a little like gears, one of which is a magnetic north pole (red) and the other is a south pole (blue). When we put the 2 discs back to back, we get north & south pole teeth alternating around the edge.

The stator :- Around the edge of the rotor, we have the stator: In the ex., four electromagnets that can be switched on & off individually. Generally the electromagnets in a stepper motor works in pairs, with each opposing pair of magnets switching on together to make a north pole at the same time, followed by the magnets at right angles, which also work together.

steps to perform Experiment :-

- Provide power supply to stepper motor
- Make pin connections with RPi
- Write & run the app17 to observe the rotation of steppers motor
- To control steppers motor we need to perform installations as follows.

(i) Install apache web server

sudo apt-get install apache2

(ii) install PHP

sudo apt-get install php5

(iii) Allow permission to execute apache web

sudo nano /etc/sudoers

(iv) Goto last lines of sudoers files &

write the lines as

www. data ALL = (ALL) NOPASSWD: ALL

(v) Save & close the file

(vi) Write python programs in /var/www

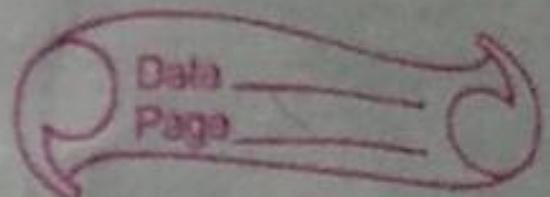
(vii) Change permission of program files
for execution purpose.

(viii) Write php / html script in / var/www/
html / index.html

(ix) Open web browser from remote machine
& type address of RPi along with
saved programme name

Conclusion :- Thus we have studied working of
stepper motor & interfacing of stepper
motor with Raspberry Pi board, also
to operate stepper motor operations
from remote machine.

POT Exp - 8



Title :- Create a simple web interface using POT kit control the connected LED's remotely through the interface.

Requirement :- Raspberry Pi board, LED's Resistors, Jumper cables & 100 breadboard.

Theory :- LED stands for light-emitting diode, LEDs are composed of a semiconductor light source. In the simplest terms, a light-emitting diode (LED) is a semiconductor device that emits light when an electric current is passed through it. Light is produced when the particles that carry the current combine together within the semiconductor material.

Since light is generated within the solid semiconductor material, LED's are described as solid-state devices. The term solid-state lighting, which also encompasses organic LEDs, distinguishes the lighting technology from other sources that use heated filaments.

Steps to perform Experiment:

- ① Connect the LED's with resistors to RPi using GPIO pins & ground pins
- ② Perform the steps of installation of web servers & sudoers permission like in previous experiments
(if perform in previous experiment no need to repeat in this exp)

- (iii) Write a php / html script for accessing LED's from remote machine.

Conclusion :- Thus we have studied basics of LEDs and accessing them from remote machine.

Title :- Experiment based on IoT kit to control the operations of elevator.

Requirement :- Raspberry Pi board, elevator simulator, Jumper cables and / or breadboard.

Theory :-

An elevator or lift is a vertical transport vehicle that efficiently moves people or goods between floors of a building. They are generally powered by electric motors that either drive traction cables and counterweight systems, or pump hydraulic fluid to raise a cylindrical piston.

steps to perform Experiment:

- (i) Connect the elevator simulator to respective GPIO pins of RPi
- (ii) Write an app in to perform operations of elevator.
- (iii) Run the app & observe the elevator operations.

Conclusion :- Thus we have studied basic operations of elevator & interfacing of elevator with RPi.

Title :- Study and implement clustering and configuring devices using MPI library.

Requirement : Three Raspberry Pi boards, 8 port switch, Patch chords, Internet.

Theory :- What is computer cluster?

A computer cluster consists of a set of connected computers that work together so that, in many aspects, they can be viewed as a single system. A computer cluster provides much faster processing speed, larger storage capacity, better data integrity, superior reliability & wider availability of resources. Following are the major advantages of using computer clusters,

- Cost efficiency
- Processing speed
- Improved network infrastructure
- Flexibility
- High availability of resources

Raspberry Pi cluster.

Raspberry Pi clustering is normally divided into following 3 steps.

- Installing MPICH
- Installing MPI4PY
- Installing & configuring Raspbian for cluster

Before starting Raspberry pi clustering, we need to change some configuration in all Pi's.

i) Installing MPICH.

MPICH is a high-performance & widely portable implementation of the MPI (Message Passing Interface) standard, designed to implement all of MPI-1, MPI-2 & MPI-3. (including dynamic process management, onesided operations, parallel I/O, and other extensions).

ii) Installing MPI4PY

MPI4PY is an implementation of MPI such as MPICH or OpenMPI, which is used to create a platform to write parallel programs in a distributed system such as a linux cluster with distributed memory.

iii) Installing & configuring Raspbian for cluster

Now work from first Pi only which is our Master Pi. But make sure that all sema-
iring Pi's are connected & available in same computer network. Once all the pi's are powered on, using our Master Pi, we should be able to get the IP addresses of each Pi on the network.

Conclusion :- Thus we have implemented Raspberry Pi cluster using MPI library for python development environment.