



Probability of Seed Germination Monitoring System



Introduction

Objective:

- Build a system to predict germination probability using environmental sensors.

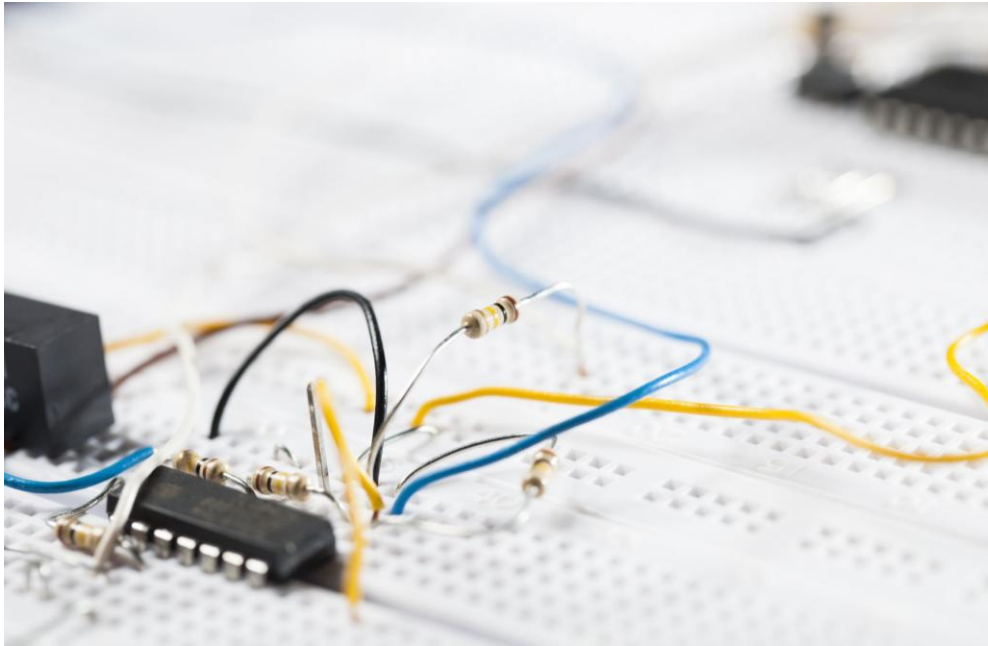
Components Used

Hardware:

- Arduino Uno
 - Soil Moisture Sensor (Capacitive)
 - DHT11 (Temperature/Humidity)
 - LDR (Light Sensor)
 - I2C LCD (16x2)
-

Software:

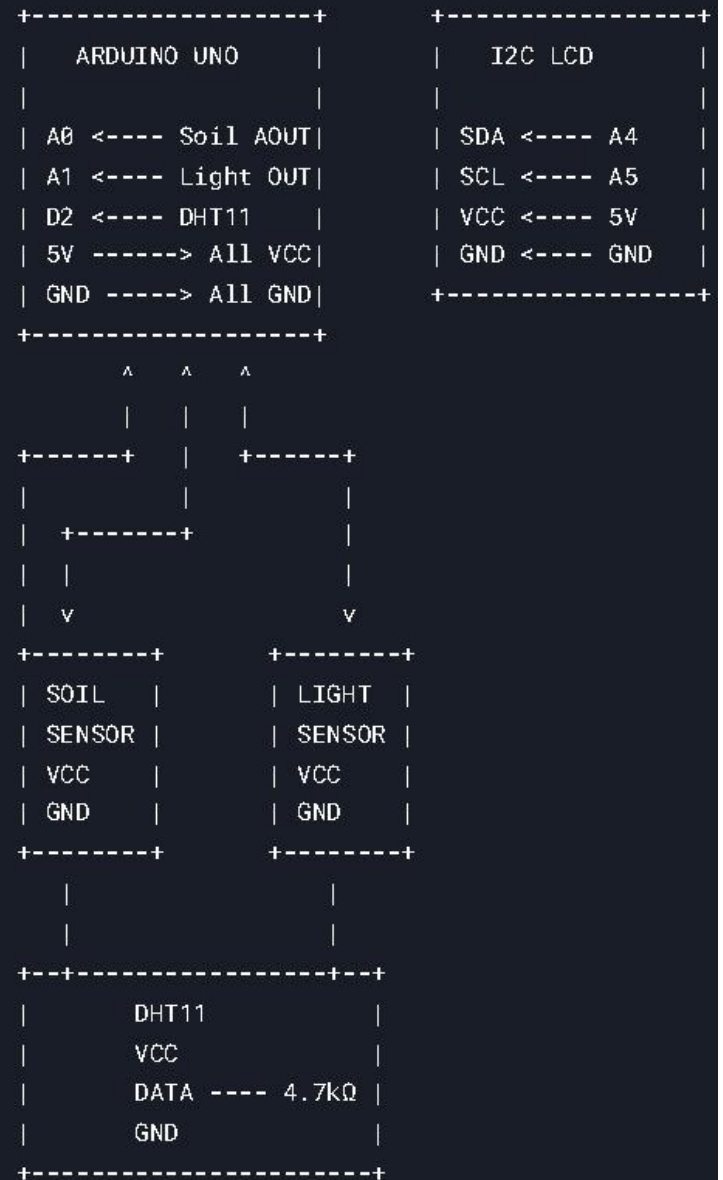
- Arduino IDE
 - Libraries: LiquidCrystal_I2C, DHT.h
-



Circuit Diagram

Key Connections:

- Sensors → Arduino pins
- I2C LCD wiring



Working Principle



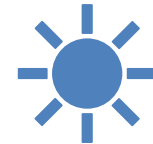
Sensors' Role:



Soil moisture →
Hydration level



DHT11 → Ambient
temperature/humidity



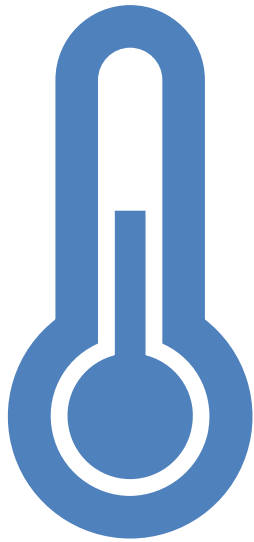
LDR → Light exposure



Germination
Probability Formula:



Weighted sum of
sensor factors
(temperature +
moisture + light)



Calibration Process

- Soil Moisture Sensor: dryValue = 1023, wetValue = 550 (from your tests)
- LDR: Dark = 1005, Bright = 10 (adjusted via map())
- DHT11: No calibration needed

Code Logic

Pseudocode:

- 1. Read sensors → Raw values
- 2. Convert to % (map + constrain)
- 3. Calculate probability weights
- 4. Display on LCD + Serial Monitor

Key Functions:

- `calculateProbability()`
- `updateLCD()`

Results & Output

```
Output  Serial Monitor  X
Message (Enter to send message to 'Arduino Uno' on 'COM5')

-----
SEED GERMINATION MONITORING
-----

Temperature: 0.9°C      [ALERT: TOO COLD FOR GERMINATION]
Humidity: 0%           [ALERT: TOO DRY]
Soil Moisture: 0%       [ALERT: CRITICALLY DRY]
Light Intensity: 29%    [Suboptimal Light]
Germination Probability: 9.0% [LOW CHANCE]
-----

TEMP:0.90,HUM:0.00,MOIST:0,LIGHT:29,PROB:9.00
-----

Temperature: 32.0°C     [ALERT: TOO HOT FOR GERMINATION]
Humidity: 35%           [Suboptimal Humidity]
Soil Moisture: 0%       [ALERT: CRITICALLY DRY]
Light Intensity: 29%    [Suboptimal Light]
Germination Probability: 9.0% [LOW CHANCE]
-----
```



Challenges & Solutions

- Challenge: LCD not displaying text →
Solution: Adjusted contrast potentiometer
- Challenge: Sensor noise → Solution:
Added calibration
- Challenge: I2C address conflict →
Solution: Used scanner to find address

Applications

Agriculture: Optimize
seed planting conditions

Greenhouses:
Automated monitoring

Research: Data collection
for plant studies

Future Improvements



Add IoT
(WiFi/Bluetooth) for
remote monitoring



Integrate a water
pump for auto-
irrigation



Use machine
learning for better
predictions

Conclusion

Summary:

- Successfully built a system to predict germination probability
- Calibrated sensors for accurate readings

Learnings:

- Sensor integration, calibration, and debugging

Thank You!

- Nayan Sharma (23BCE0779)
- Amil Mahajan (23BKT0027)
- Prithvi P Reddy (23BKT0014)

