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## AUTOMATIC IRRIGATION SYSTEM WITH TEMPERATURE MONITORING USING ARDUINO

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**Annotatsiya:** *Suv tirik mavjudotlar uchun asosiy ehtiyojdir. O'zbekiston qishloq xo'jaligi ishonchli suv manbai bo'lmagan mussonlarga bog'liq. Hozirgi kunda mamlakatimiz suv tanqisligi muammosiga duch kelmoqda. Shu bois mamlakatimizda fermer xo'jaliklarini tuproq turiga qarab suv bilan ta'minlaydigan sug'orish tizimi zarur. "Haroratni nazorat qiluvchi avtomatik sug'orish tizimi" bo'yicha ushbu loyiha haroratni aniqlashda nasos motorini YOQISH va O'CHIRGAN avtomatik sug'orish mexanizmini yaratishga mo'ljallangan. U, shuningdek, hosil bo'yicha ishlab chiqarish uchun juda muhim omil bo'lgan fermaning real vaqt haroratini kuzatib boradi. Dehqonchilikda tegishli sug'orish vositalaridan foydalanish muhim ahamiyatga ega. Bu Arduino va boshqa komponentlarning oson, ammo foydali tizimidan foydalanadi, ular haroratni aniqlaydi va fermalar suv talab qilganda va ob-havo isib ketganda suv nasosini yoqadi.*

**Kalit so'zlar:** *Sug'orish tizimi, Harorat monitoringi, motor nasosi, Arduino, nasos, AVR mikrokontrolleri, harorat sensori (LM35), Arduino platasi.*

**Annotation:** *Water is the basic need for living beings. Uzbek agriculture is dependent on the monsoons which is not a reliable source of water. In the present days, our country is facing the problem of water scarcity. Therefore there is a need for an irrigation system in the country which can provide water to farms according to their soil types. This project on "Automatic Irrigation System with temperature monitoring" is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the temperature. It also monitors the real time temperature of the farm which is a very crucial factor for the production according to the crop. In the domain of farming, utilization of appropriate means of irrigation is significant. It employs an easy yet useful system of Arduino and other components which detects the temperature and turns on the water pump whenever the farms requires water as and when the weather gets hot.*

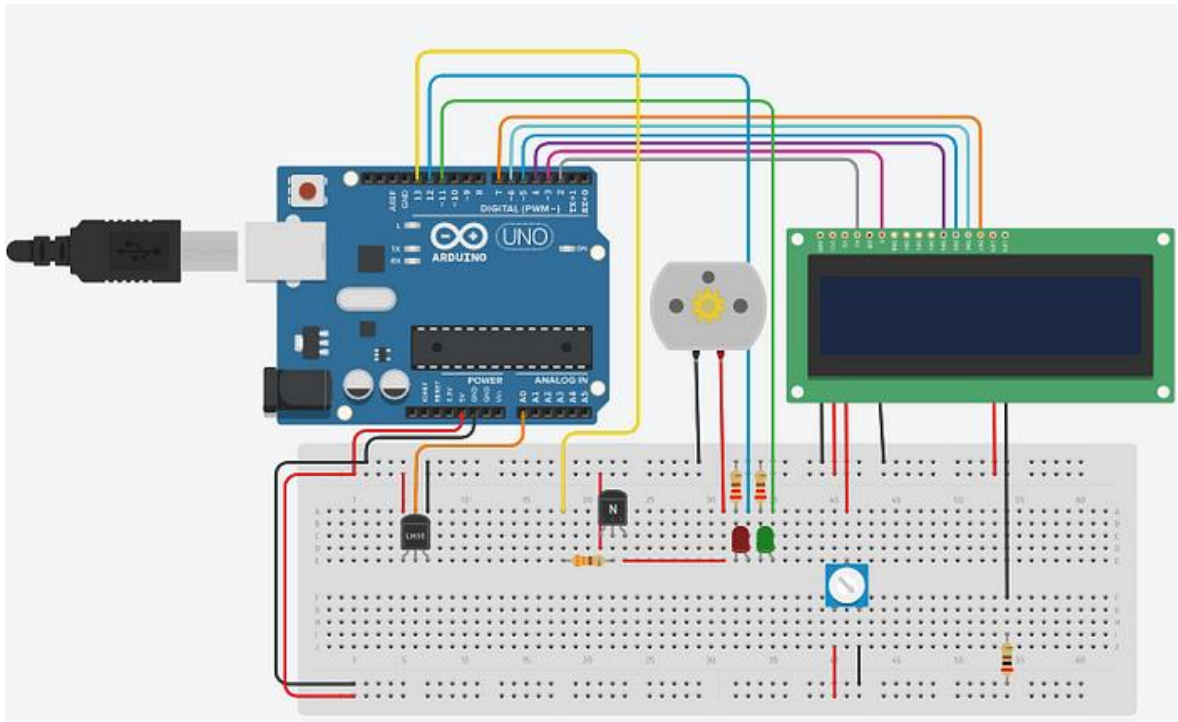
**Keywords:** *Irrigation system, Temperature monitoring, motor pump, Arduino, pump, AVR microcontroller, temperature sensor (LM35), Arduino board.*

**Аннотация:** *Вода является основной потребностью живых существ. Сельское хозяйство Узбекистана зависит от муссонов, которые не являются надежным источником воды. В настоящее время наша страна сталкивается*

*с проблемой нехватки воды. Поэтому в стране существует потребность в ирригационной системе, которая могла бы обеспечивать водой хозяйства в соответствии с их типом почвы. Этот проект «Автоматическая система полива с контролем температуры» предназначен для создания автоматического механизма полива, который включает и выключает двигатель насоса при определении температуры. Он также отслеживает температуру фермы в режиме реального времени, что является очень важным фактором для производства в зависимости от урожая. В области земледелия большое значение имеет использование соответствующих средств орошения. Он использует простую, но полезную систему Arduino и других компонентов, которые определяют температуру и включают водяной насос всякий раз, когда ферме требуется вода, когда погода становится жаркой.*

**Ключевые слова:** Система полива, мониторинг температуры, мотопомпа, Arduino, насос, микроконтроллер AVR, датчик температуры (LM35), плата Arduino.

**Introduction.** In Uzbekistan, agriculture plays an important role in the economy and development of the country. In the present era, the farmers have been using conventional techniques in which the farmers irrigate the land at the regular intervals manually. These traditional methods usually use more amount of water and it causes lower production due to inappropriate amount of water usage in irrigation. In order to minimize the water usage and maximize the production rate, there is a need in the residential/commercial irrigation industry for an irrigation controller that responds to soil moisture sensors for conserving water. As Continuous increasing demand of food requires the control in highly specialized greenhouse vegetable rapid improvement in food production technology by using controlled irrigation and real time temperature monitoring. it is a simple and precise method for country like Uzbekiston, where the economy is majorly based on agriculture. It also helps in saving time, reduces the human errors and efforts. The controller should be “user friendly”, i.e., easy to program and requiring a minimum number of keys or push-buttons to operate the controller..



*Figure 1 Circuit diagram*

**Material and methods** Description of circuit diagram: The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.[1]



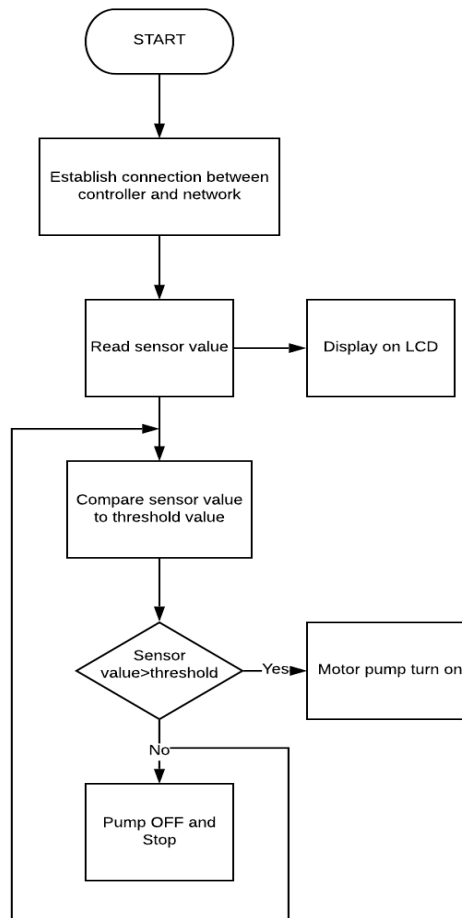
*Figure 2 Arduino Uno R3*

Temperature sensor (LM35): The LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess

low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ °C.

The LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used for displaying alphabets and numeric value. A 16X2 LCD has two registers namely, command and data. The register select is used to switch from one register to other. RS=0 for command register, whereas RS=1 for data register. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.[2]

**DC MOTOR:** A **DC motor** is any of a class of rotary [electrical motors](#) that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



*Figure 2. Process flow*

Using code:

```
#include <LiquidCrystal.h>
```

```
const int LM35 = A0;  
const int motor = 13;  
const int LedRed = 12;  
const int LedGreen = 11;
```

```
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
```

The above code declares the library for an LCD and lets the arduino board control the LCD, apart from that we also declare the different terminals according to the connections made.

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```

void setup() {
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.print("Automated Plant");
  lcd.setCursor(0,1);
  lcd.print("Watering System!");
  pinMode(motor, OUTPUT);
  pinMode(LedRed, OUTPUT);
  pinMode(LedGreen, OUTPUT);
  delay(2000);
  lcd.clear();
  lcd.print("Temp= ");
  lcd.setCursor(0,1);
  lcd.print("WaterPump= ");
}

```

The setup() function is called when a sketch starts. Use it to initialize variables, pin modes, start using libraries, etc. The setup() function will only run once, after each powerup or reset of the Arduino board. We also declared what the LCD has to show upon initialising and apart from that what each led, motor, etc has to do.

```

void loop() {

  int value = analogRead(LM35);
  float Temperature = value * 899.0 / 1002.0;
  lcd.setCursor(6,0);
  lcd.print(Temperature);
  lcd.setCursor(11,1);

  if (Temperature > 45){
    digitalWrite(motor, HIGH);
    digitalWrite(LedRed, HIGH);
    digitalWrite(LedGreen, LOW);
    lcd.print("ON ");
  }
  else {
    digitalWrite(motor, LOW);
    digitalWrite(LedRed, LOW);
    digitalWrite(LedGreen, HIGH);
    lcd.print("OFF");
  }

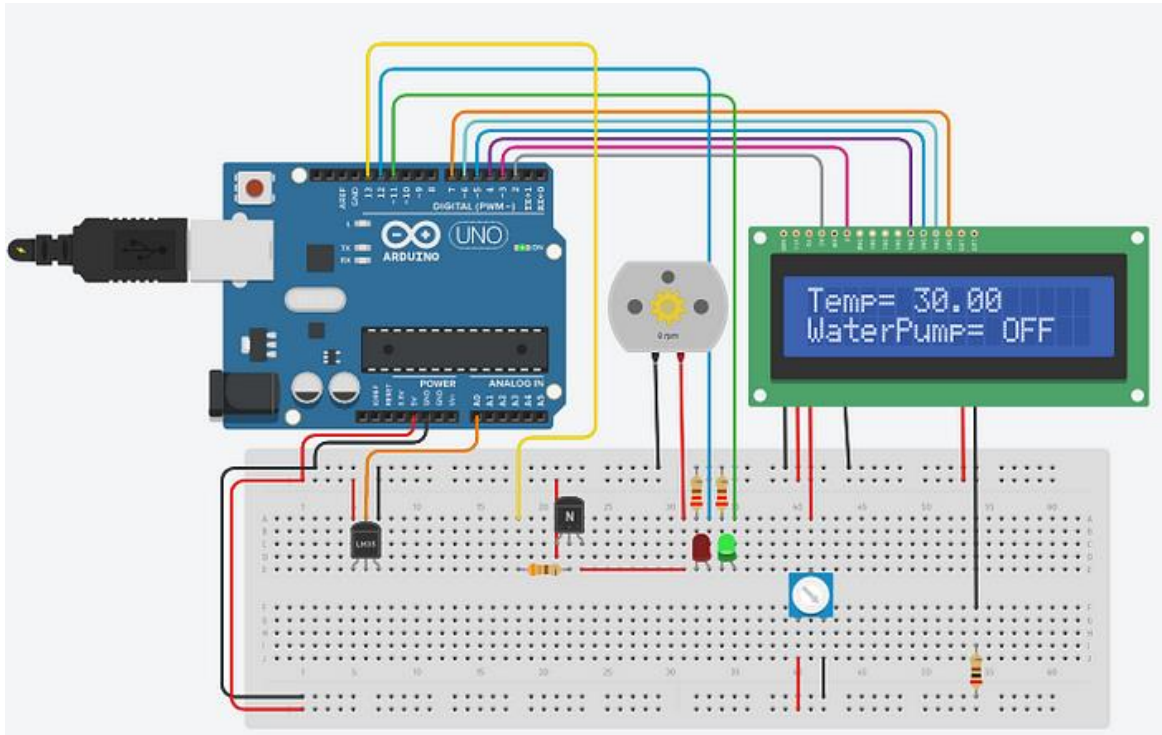
  delay(1000);
}

```

After creating a setup() function, which initializes and sets the initial values, the loop() function does precisely what its name suggests, and loops consecutively, allowing your program to change and respond. Use it to actively control the Arduino

board. The loop function is where a chunk of the process is done. Here we use if-else condition to declare the threshold temperature, the temperature value, after it is read by the thermistor is stored in the arduino which then uses the if-else condition to decide whether or not to turn on the pump. The threshold value is 45 oC.

Operation



*Figure 3. When temperature is less than threshold value the pump remains off*

**Conclusion.** It can hereby seen that the combination of hardware and software provides a economic irrigation controlling system which is extremely user friendly because it requires very less human interference for it operations once it is manufactured and implemented. It not only saves the most precious gift of the nature, i.e., water. It also helps the farmers to grow their crops under controlled conditions and under continuous observation by temperature monitoring. Hence, this project “Automatic Irrigation System with temperature monitoring” also helps in increased and good quality production.

### References:

1. Насирдинова, Ё. А. (2020). XX аср охири ва XXI аср ўзбек-француз адабий алоқалари тараққиёти.«Ўзбекистон таржимашунослар форуми–2020» Республика илмий-амалий конференция. ТДШУ.
2. Насирдинова, Ё. А. (2020). Ўзбек миллий уйғониш даври адабиётининг ўзбек-француз адабий алоқалари “Ренессанс” ида тутган ўрни.“. Qiyosiy

adabiyotshunoslik: O ‘tmishi, buguni, istiqbollari Respublika ilmiy-amaliy anjumani maqolalar to ‘plami”. TDЎзТАУ–Тошкент.

3. Насирдинова, Ё. А. (2019). Таниқли адабиётшунос ва таржимашунос олим.«Ўзбекистон таржимашунослар форуми–2019» Республика илмий-амалий конференция. ТДШУ.

4. Насирдинова, Ё. А. (2019). Ўзбек фольклори ва мумтоз адабиёти намуналари француз тилида. Фил. ф. ф. д. дис.

5. Насирдинова, Ё. А. (2019). Реми Дор и узбекская литература. Навоий таваллудига бағишланган “Алишер Навоий ижодий меросининг умумбашарият маънавий-маърифий тараққиётидаги ўрни” мавзусидаги III халқаро илмий-амалий конференция материаллари. НДПИ.

6. Насирдинова, Ё. А. (2018). " ДЕВОНУ ЛУҒОТИТ ТУРК" НИ ФРАНЦУЗ ТИЛИГА ТАРЖИМА ҚИЛИШ ЙЎЛИДАГИ ИЛК ТАЖРИБА ҲАҚИДА. ИЛМИЙ ХАВАРНОМА. НАУЧНЫЙ ВЕСТНИК Учредители: Андижанский государственный университет им. ЗМ Бабура, (2), 88-91. URL: <https://elibrary.ru/item.asp?id=47350593>

7. Насирдинова, Ё. А. (2018). " ДЕВОНУ ЛУҒОТИТ ТУРК" НИ ФРАНЦУЗ ТИЛИГА ТАРЖИМА ҚИЛИШ ЙЎЛИДАГИ ИЛК ТАЖРИБА ҲАҚИДА. ИЛМИЙ ХАВАРНОМА. НАУЧНЫЙ ВЕСТНИК Учредители: Андижанский государственный университет им. ЗМ Бабура, (2), 88-91.

8. Насирдинова, Ё. А. (2018). Ўзбек халқ романик дostonларида эпитет табиати ва уларнинг таржимаси “Илмий мунозара: муаммо, ечим ва ютуқ” мавзусидаги халқаро илмий-амалий конференция материаллари.

9. Насирдинова, Ё. А. (2018). Реми дор туркий халқлар фольклори таржимони ва тадқиқотчиси ёхуд унинг ўрта осие халқ эртақ ва афсоналари ҳақида. Хорижий филология № 2.

10. Насирдинова, Ё. А. (2018). Хорижий тилшунослик ва адабиётшуносликнинг қиёсий-типологик таҳлили” номли халқаро илмий-амалий конференция материаллари.

11. Насирдинова, Ё. А. (2017). Фозил шоир ва унинг Нурали дostonининг француз тилига таржимаси ҳақида.“. In Китобхонлик маданияти ва бадий таржима маҳорати” мавзусидаги халқаро илмий-амалий конференция материаллари. СДЧТИ–Самарқанд.

12. Насирдинова, Ё. А. (2016). Дoston таржимасида эпик штамплар ва стилистик қолипларнинг берилиши.“Тил. Маданият. Таржима ва мулоқот” мавзусидаги халқаро илмий-амалий конференция материаллари. СДЧТИ.

13. Насирдинова, Ё. А. (2015). Халқ дostonларида фразеологизмлар ва хос сўзлар, уларнинг таржимада берилиши.“Бадий таржима: амалиёт, назария ва

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танқид” мавзусидаги республика илмий-амалий конференция материаллари. ЖДПИ.

14. Насирдинова, Ё. (2025). Научно-литературный анализ монографии французского востоковеда Марка Тутана «Un empire de mots». Зарубежная лингвистика и лингводидактика, 3(2), 20-28. <https://inlibrary.uz/index.php/foreign-linguistics/article/view/80412>

15. Насирдинова, Ё. (2025). Наследие поколений: некоторые размышления о вкладе Содирхона и Афтондила Эркиновых в Навоиведение. Зарубежная лингвистика и лингводидактика, 3(2), 145-152. <https://inlibrary.uz/index.php/foreign-linguistics/article/view/76184>

16. Nasirdinova, Y. (2024). RHYTHM AND POETICS IN TRANSLATIONS OF UZBEK EPIC MONUMENTS INTO FRENCH. IMRAS, 7(6), 541-545. <https://journal.imras.org/index.php/sps/article/view/1606>

17. Nasirdinova, Y. (2024). THE RENAISSANCE OF FRENCH ORIENTALISM IN CENTRAL ASIA: A REVIEW AND PERSPECTIVES. IMRAS, 7(5), 230-239. <https://journal.imras.org/index.php/sps/article/view/1353>

18. Насирдинова, Ё. А. (2019). ПРОБЛЕМЫ ВОСПРОИЗВЕДЕНИЯ ПОЭТИЧЕСКОГО РИТМА В ПЕРЕВОДЕ УЗБЕКСКИХ ЭПИЧЕСКИХ ПАМЯТНИКОВ НА ФРАНЦУЗСКИЙ ЯЗЫК (НА ОСНОВЕ ПЕРЕВОДА УЗБЕКСКОЙ НАРОДНОЙ ПОЭМЫ «НУРАЛИ» НА ФРАНЦУЗСКИЙ ЯЗЫК). Научно-методический и теоретический журнал, 77. [https://www.academia.edu/download/59197820/sociosfera\\_1-1920190509-90626-46f960.pdf#page=77](https://www.academia.edu/download/59197820/sociosfera_1-1920190509-90626-46f960.pdf#page=77)

19. Насирдинова, Ё. А. (2018). ДОСТОНЛАРДА ТИПИК ЎРИНЛАР: НУРАЛИ ДОСТОНИДА ЭПИК ОТНИ ЭГАРЛАШ ВА УНИНГ ФРАНЦУЗЧА ТАРЖИМАСИ. In *Культурология, искусствоведение и филология: современные взгляды и научные исследования* (pp. 144-148). <https://elibrary.ru/item.asp?id=35081939>