

ARDUINO PLATFORMASIDAN FOYDALANIB SUV SARFINI HISOBLOVCHI DASTURIY VA TEXNIK TA'MINOT ISHLAB CHIQISH

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Annotatsiya. Mazkur maqolada Arduino platformasiga asoslangan holda suv sarfini hisoblovchi dasturiy va texnik ta'minot ishlab chiqish masalasi ko'rib chiqilgan. Qurilma yordamida suvdan foydalanish jarayonini nazorat qilish, resurslarni tejash hamda ekologik barqarorlikka erishish imkoniyatlari tahlil etilgan.

Kalit so'zlar: Arduino, suv sarfi, sensor, ekologik barqarorlik, iqtisodiy samaradorlik.

DEVELOPMENT OF SOFTWARE AND EQUIPMENT FOR CALCULATING WATER CONSUMPTION USING THE ARDUINO PLATFORM

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Abstract. This article discusses the development of software and hardware for water consumption measurement based on the Arduino platform. The possibilities of controlling water usage, saving resources, and achieving environmental sustainability through this device are analyzed.

Keywords: Arduino, water consumption, sensor, environmental sustainability, economic efficiency.

Kirish. Global miqyosda suv resurslarining tanqisligi va ularning noto'g'ri sarfi ekologik muammolarni keltirib chiqarmoqda. Aholi sonining ko'payishi, sanoatning kengayishi va qishloq xo'jaligida suvga bo'lgan talabning ortib borishi bu muammoni yanada dolzarb qilmoqda. Shuning uchun zamonaviy texnologiyalar yordamida suv

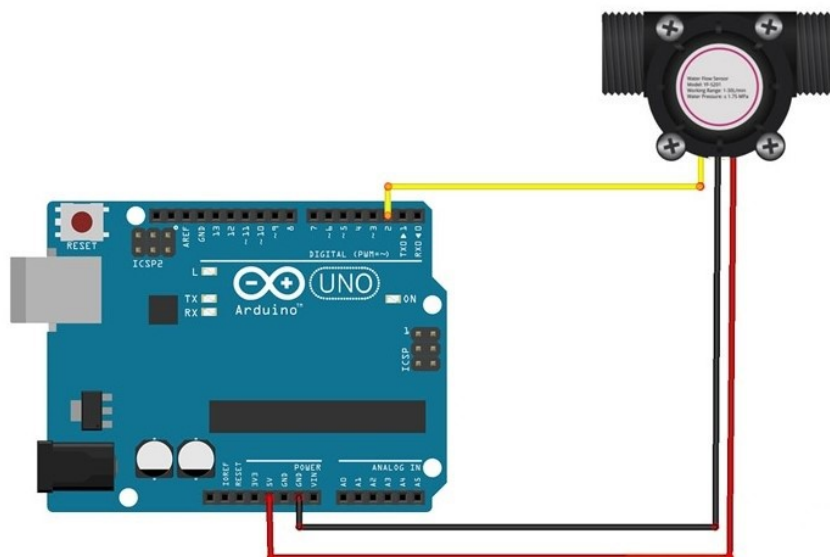
sarfini nazorat qilish zarurati ortmoqda. Yangi ijtimoiy-iqtisodiy bu sharoitda mutaxassisni ish bilan ta'minlash kafolati ishlab chiqish bilan belgilanadi

yuqori malaka, turli masalalar bo'yicha vakolatlarining paydo bo'lishi, asosiy kasbi bilan bog'liq. Sun'iy intellekt yordamida katta ma'lumotlar tahlili va bulutdagi kelajakdagi yutuqlar hisoblash monitoring usullarini yanada takomillashtirish va jarayonlarni optimal yechimga olib kelish yanada moslashuvchan va samarali hisoblanadi.

Loyihaning dolzarbligi. Suvdan oqilona foydalanish O'zbekistonning barqaror rivojlanish strategiyasida muhim o'rin tutadi. Arduino platformasi asosida ishlab chiqilayotgan qurilma orqali suv sarfini real vaqt rejimida o'lchash va nazorat qilish imkoniyati mavjud. Bu esa, resurslardan samarali foydalanishga xizmat qiladi.

Loyihaning iqtisodiy samaradorligi. Ushbu loyiha oddiy texnologik echimlar asosida amalga oshirilgan bo'lib, arzon narxdagi komponentlar orqali sifatli natijaga erishish mumkin. Qurilma suvdan ortiqcha foydalanishni aniqlash orqali iqtisodiy yo'qotishlarning oldini olishga yordam beradi.

Suv resurslarini tejashning ahamiyati. Suv resurslarini tejash nafaqat iqtisodiy, balki ekologik jihatdan ham muhimdir. Nazorat qilinadigan suv sarfi ortiqcha isrofgarchilikning oldini olib, tabiiy resurslarning uzoq muddatga yetishini ta'minlaydi.



1-rasm. Qurilmalarning ulanish sxemasi.

Ekologik barqarorlik. Suv sarfini boshqarish orqali atrof-muhitga salbiy ta'sirni kamaytirish, yerosti suvlarining kamayishini oldini olish va ekologik muvozanatni saqlab qolish mumkin.

Qo'llanilgan usullar. Loyiha doirasida Arduino UNO mikrokontrolleri, suv oqim sensori (YF-S201), LCD displey, buzzer, va boshqa komponentlardan foydalanildi. Dastur C++ tilida yozilib, Arduino IDE muhiti orqali qurilmaga yuklandi.

Olingan natijalar. Qurilma suv sarfini aniq o'lchab, LCD displeyda ko'rsatadi. Belgilangan limitdan oshganda buzzer yordamida ogohlantirish signali beradi. Tajriba sharoitida qurilma yuqori aniqlik bilan ishladi.

Dastur kodi:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
volatile int flow_frequency;
unsigned int l_minute;
unsigned long currentTime, cloopTime;

void flow () {
    flow_frequency++;
}

void setup() {
    pinMode(2, INPUT);
    digitalWrite(2, HIGH);
    attachInterrupt(digitalPinToInterrupt(2), flow, RISING);
    lcd.begin(16, 2);
    currentTime = millis();
    cloopTime = currentTime;
}
```

```

void loop () {
  currentTime = millis();
  if (currentTime >= (cloopTime + 1000)) {
    cloopTime = currentTime;
    l_minute = (flow_frequency * 60 / 7.5);
    flow_frequency = 0;
    lcd.clear();
    lcd.print("Suv sarfi: ");
    lcd.print(l_minute);
    lcd.print(" L/min");
  }
}

```

Texnik qurilma tasnifi:

- Arduino UNO – boshqaruv moduli
- YF-S201 suv oqim sensori – suv oqimini o‘lchovchi sensor
- 16x2 LCD display – natijalarni ko‘rsatuvchi qurilma
- Signalizatsiya (buzzer) – ogohlantirish tizimi
- USB kabel va quvvat manbai



2-rasm. Suv sarfini o‘lchovchi sensor.

Muammo va kamchiliklar:

- Qurilma faqat oqim miqdorini hisoblaydi, bosim yoki sifat tahlili mavjud emas.
- Internetga ulanmagan, ya'ni IoT funksiyalari yo'q.
- Sensorning ishlashi suvning tarkibiga qarab o'zgarishi mumkin.

Xulosa va takliflar. Arduino platformasiga asoslangan suv sarfini hisoblovchi qurilma kichik hajmda, arzon va samarali nazorat tizimi bo'lib, mahalliy xo'jaliklarda joriy etish uchun mosdir. Kelgusida IoT texnologiyalarini joriy qilish, natijalarni masofadan monitoring qilish va mobil ilova bilan integratsiya qilish orqali tizim yanada mukammallashtirilishi mumkin.

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