UITSTON KO‘PRIGINI TA’LIMDA EHM YORDAMIDA O‘RGATISH UCHUN DASTUR YARATISH

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ANNOTATSIYA

Mazkur maqolada uitston ko‘prigini ta’lim jarayonida elektron hisoblash mashinalari (EHM) yordamida o‘rgatishga mo‘ljallangan dastur yaratish masalalari yoritilgan. Dastur orqali talabalarga ko‘prik sxemasining tuzilishi, ishlash prinsipi, elektr qarshiliklarini aniqlash usullari hamda amaliy hisob-kitoblarni interaktiv tarzda tushuntirish ko‘zda tutilgan. Shuningdek, virtual laboratoriya elementlari, animatsiyalar va test topshiriqlari yordamida mavzuni samarali o‘zlashtirish imkoniyati yaratiladi. Tadqiqot natijasida yaratilgan dastur ta’lim samaradorligini oshirish, talabalar bilimini mustahkamlash hamda zamonaviy axborot texnologiyalarini fizika va texnika fanlariga integratsiya qilishga xizmat qiladi.

Kalit so‘zlar: *Uitston ko’prigi (Wheatstone bridge), Elektr qarshiliklari, innovatsion ishlanma.*

ABSTRACT

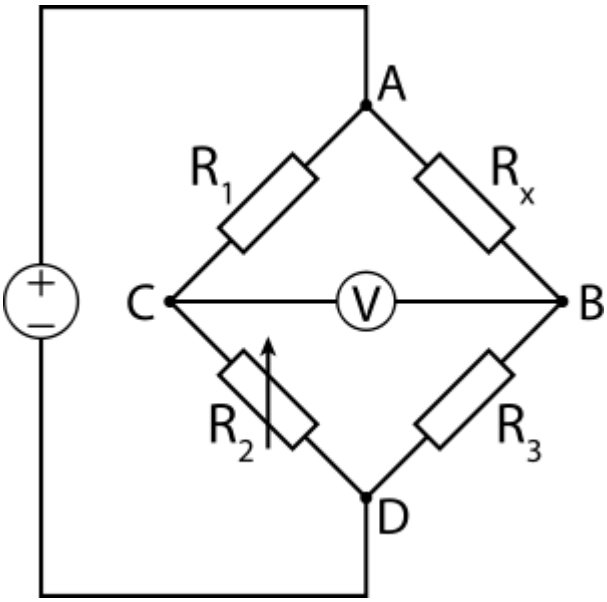
This article discusses the issues of creating a program designed to teach the Wheatstone bridge in the educational process using electronic computers (ECM). The program provides for interactive explanations of the structure of the bridge circuit, the principle of operation, methods for determining electrical resistances, and practical calculations to students. It also provides an opportunity to effectively master the subject using virtual laboratory elements, animations, and test tasks. The program created as a result of the research serves to increase educational efficiency, consolidate students' knowledge, and integrate modern information technologies into physics and engineering.

Keywords*: Wheatstone bridge, Electrical resistances, innovative development.*

KIRISH

Elektr qarshiliklar qurilmalarda turli xil algoritmik funksiyalarni bajarishda qo’llaniladi. Rezistorlarning ulanishi undan o’tayotgan zaryadlar miqdorini

kamaytirish xizmat qiladi. Uitston ko’prigi orqali resiztorlardan o’tayotgan zaryadlar o’qimi va miqdori, yo’nalishi o’zgarishi mumkun. Shu sababdan Uitston ko’prigi ustida tadqiqot o’tkazib fizik elektr jarajonlarni diqqat bilan o’rganish ilmiy innovatsion ishlanmalarni yaratishga xizmat qiladi.



Uitston ko’prigi (Wheatstone bridge) — bu elektr zanjirlarida qarshiliklarni yuqori aniqlik bilan o‘lchashga mo‘ljallangan klassik ko‘prik sxemasi bo‘lib, u muvozanat (balans) prinsipiga asoslanadi. Uitston ko’prigi (Wheatstone bridge) to‘rtta qarshilikdan iborat yopiq zanjirdir. U ikki parallel tarmoqdan tashkil topadi va ularning o‘rtasiga sezgir o‘lchov asbobi (odatda galvanometr) ulanadi.

Asosiy elementlar:

- R1, R3 — ma’lum qarshiliklar
- R2 — sozlanadigan (etalon) qarshilik
- Rx — noma’lum qarshilik

$$V = \left(\frac{R_x}{R_3 + R_x} - \frac{R_1}{R_1 + R_2} \right) V_s$$

Qanday ishlaydi?

Wheatstone bridge 4 ta qarshilikdan tashkil topgan “ko‘prik” ko‘rinishidagi zanjirdir:

- 2 ta ma’lum qarshilik (R1 va R2)
- 1 ta o‘zgaruvchan yoki sozlanadigan qarshilik (R3)
- 1 ta noma’lum qarshilik (Rx)

O‘rtasida esa galvanometr ulanadi.

Ishlash tamoili

Ko‘prik “muvozanat” holatiga kelganda (ya’ni galvanometr nol ko‘rsatganda), quyidagi tenglik bajariladi:

$$\frac{R1}{R2} = \frac{R3}{Rx}$$

Shundan noma’lum qarshilikni topish mumkin:

$$Rx = \frac{R2 \cdot R3}{R1}$$

Oddiy tushuncha

Agar ko‘prikning ikkala tomoni “balans” bo‘lsa, o‘rtadagi asbobdan tok o‘tmaydi — shu paytda hisoblash eng aniq bo‘ladi.

Qayerlarda ishlatiladi?

- Elektr qarshiliklarni aniqlashda
- Laboratoriya o‘lchovlarida
- Aniqlik talab qilinadigan elektronika qurilmalarida
- Strain gauge (deformatsiya o‘lchash)
- Termistorlar (harorat o‘lchash)
- Bosim sensorlari
- Yorug‘lik sensorlari (LDR)

Afzalligi

- Juda yuqori aniqlik beradi
- Kichik o‘zgarishlarni ham sezadi

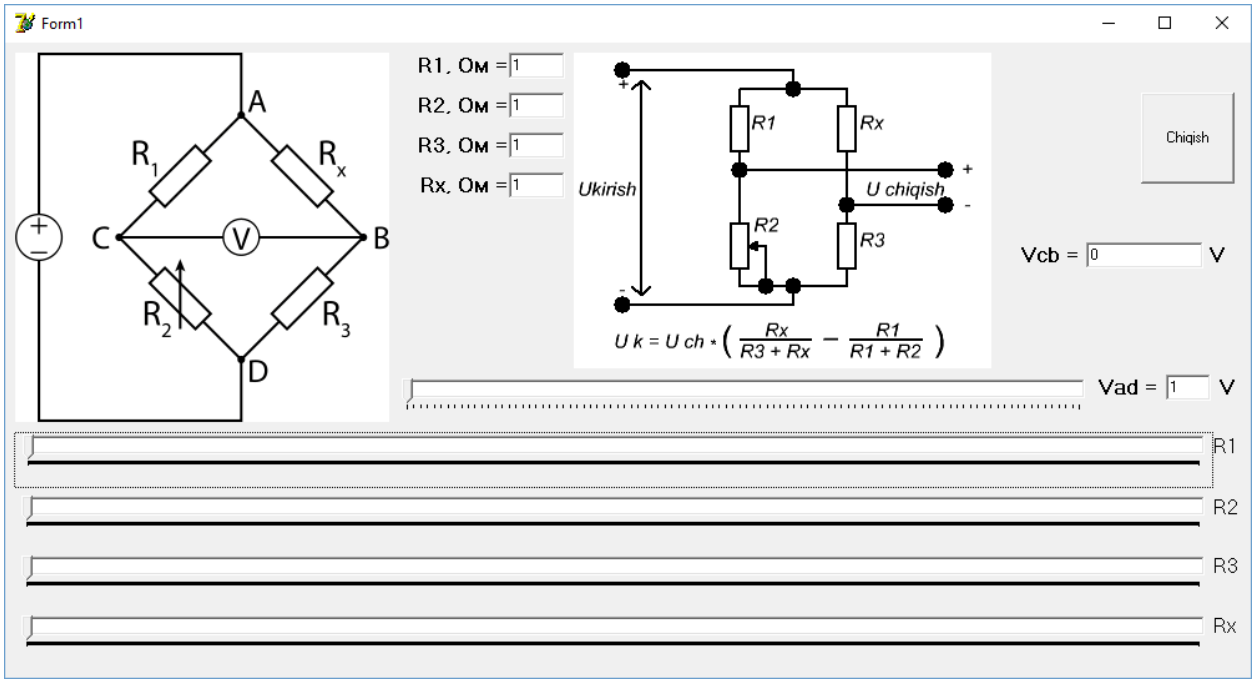
Ushbu ma’lumotlar asosida Delphi dasturlash muhiti yordamida dastur kodlari yozildi va Windows tizimida ishlaydigan dastur yaratildi.

```
unit Rezistor;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, ExtCtrls, ComCtrls, StdCtrls;
type
  TForm1 = class(TForm)
    Image1: TImage;
    TrackBar1: TTrackBar;
    TrackBar2: TTrackBar;
    TrackBar3: TTrackBar;
    TrackBar4: TTrackBar;
    Edit1: TEdit;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
```

```
    Label4: TLabel;
    Edit2: TEdit;
    Edit3: TEdit;
    Edit4: TEdit;
    Label5: TLabel;
    Label6: TLabel;
    Edit5: TEdit;
    Timer1: TTimer;
    TrackBar5: TTrackBar;
    Edit6: TEdit;
    Chiqish: TButton;
    Image2: TImage;
    Label7: TLabel;
    Label8: TLabel;
    Label9: TLabel;
    Label10: TLabel;
    procedure Timer1Timer(Sender: TObject);
    procedure ChiqishClick(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form1: TForm1;
  R1,R2,R3,Rx,Vgene:integer;
implementation
{$R *.dfm}
procedure TForm1.Timer1Timer(Sender: TObject);
var
Vvixod:real;
begin
R1:=TrackBar1.Position;     Edit1.Text:=IntToStr(R1);
R2:=TrackBar2.Position;     Edit2.Text:=IntToStr(R2);
R3:=TrackBar3.Position;     Edit3.Text:=IntToStr(R3);
Rx:=TrackBar4.Position;     Edit4.Text:=IntToStr(Rx);
```

```
Vgene:=TrackBar5.Position;  Edit5.Text:=IntToStr(Vgene);
Vvixod:=Vgene*( (Rx/(R3+Rx)) - (R1/(R1+R2)) );
Edit6.Text:=FloatToStr(Vvixod);
end;
procedure TForm1.ChiqishClick(Sender: TObject);
begin
Close
end;
end.
```



Uitston ko'prigi asosida tadqiqot o'tkazish uchun yaratilgan dastur ko'rinishi

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