ELEKTRONNING ELEKTR VA MAGNIT MAYDONLARIDAGI HARAKATINI MODELLASHTIRISH

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Annotatsiya. *Ushbu maqolada hozirgi kunda dolzarb bo'lgan fizika fanida virtual labaratoriyalar va elektron darsliklar yaratishda ishlatiladigan dastur xususida yoritilgan. Bundan tashqari, elektronning boshlang'ich tezligi va maydonga uchib kirish burchagiga hamda elektr va magnit maydonlari kuchlanganliklarining qiymatlariga qanday bog'langanligi to'g'risida tahlil etilgan.*

Kalit so'zlar: *elektron, magnit maydon, modellashtirish, vaqt intervali, nuqtaviy zaryad, virtual labaratoriya, elektron darslik.*

МОДЕЛИРОВАНИЕ ДВИЖЕНИЯ ЭЛЕКТРОНОВ В ЭЛЕКТРИЧЕСКОМ И МАГНИТНОМ ПОЛЯХ

Аннотация. *В данной статье описывается актуальная на сегодняшний день программа, используемая для создания виртуальных лабораторий и электронных учебников по физике. Кроме того, было проанализирована связь начальной скорости электрона и угла входа в поле со значениями напряженностей электрического и магнитного полей.*

Ключевые слова: *электрон, магнитное поле, моделирование, интервал времени, точечный заряд, виртуальная лаборатория, электронный учебник.*

SIMULATION OF ELECTRON MOTION IN ELECTRIC AND MAGNETIC FIELDS

Abstract. *This article describes the currently relevant program used to create virtual laboratories and electronic textbooks in physics. In addition, the relationship between the initial electron velocity and the angle of entry into the field with the values of the electric and magnetic fields was analyzed.*

Keywords: *electron, magnetic field, modeling, time interval, point charge, virtual laboratory, electronic textbook.*

KIRISH

Hozirgi ta'lim jarayonini texnologiyalar va axborotlarsiz tasavvur qilib bo'lmaydi. Shuning uchun ham ayni vaqtda respublikamiz ijtimoiy hayotiga shiddatli tezlikda axborotlar oqimi kirib kelmoqda. Bu axborotlarni tez su'ratlarda qabul qilib olish, ularni tahlil etish, qayta ishlash va umumlashtirish hamda o'quvchiga yetkazib berishni yo'lgan qo'yish ta'lim tizimi oldida turgan dolzarb muammolardan biri hisoblanadi. Ta'lim muassasalarida axborot ta'lim muhitini tashkil etishni maqsadi tayyorlanayotgan mutaxxasisga bo'lajak o'qituvchi shaxsiga qo'yiladigan talablar bilan bevosita bog'liq holda ishlab chiqiladi. Bevosita axborot texnologiyalaridan foydalangan holda sinf darsliklari labaratoriyalarini virtual jarayonlar asosida tasavvur etishimiz va qo'llashimiz mumkin.

TADQIQOT MATERIALLARI VA METODOLOGIYASI

Ushbu maqolada biz fizika dasrligidagi mavzularga asoslangan holda elektronning elektr va magnit maydonlaridagi harakatini modellashtirishuchun quyidagicha dastur tuzamiz:

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Private Sub Command1_Click()
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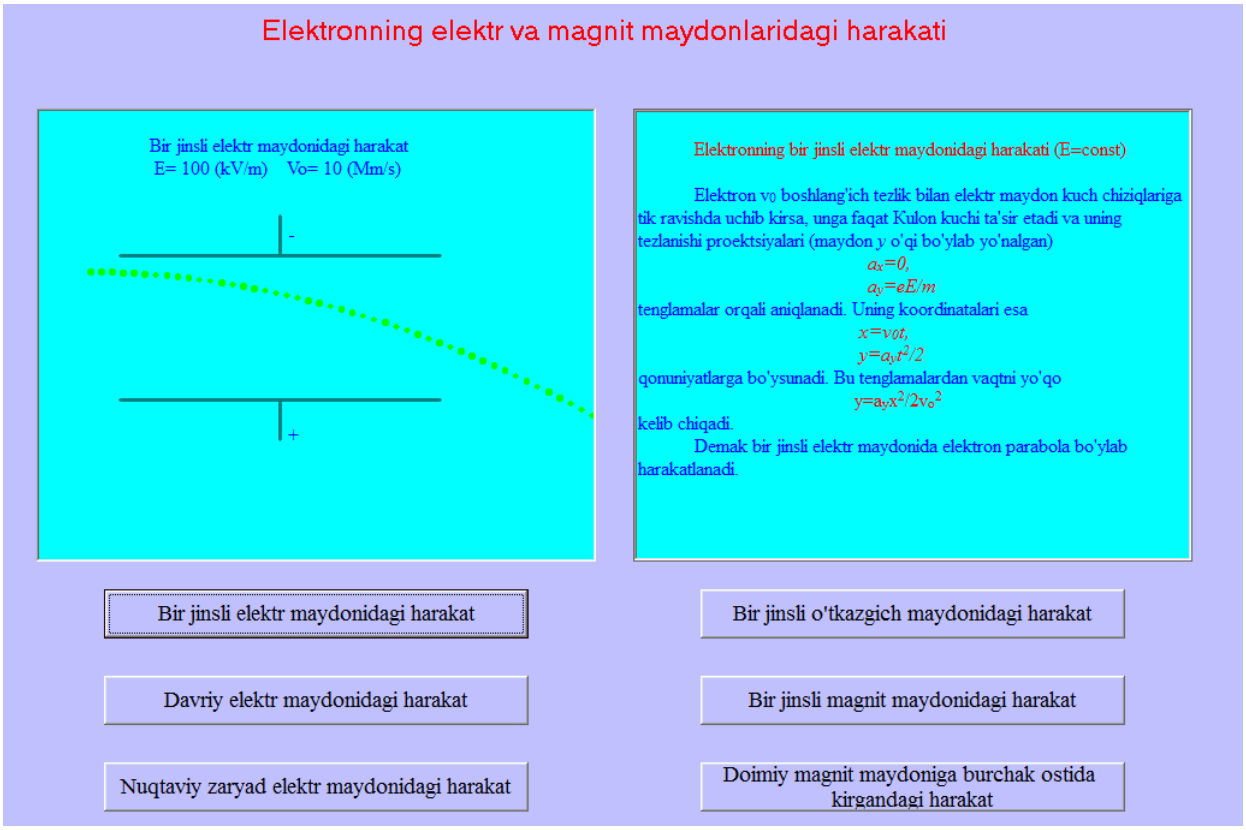
‘ Bir jinsli elektr maydonidagi harakat
P1.Cls
‘ elektronning zaryadi, massasi, tezligi va elektr maydon kuchlanganligi
q = 1.6E-19: m = 9.1E-31: E = 100000#: v0 = 10000000#: l = 0.02
a = q * E / m: tm = 1.7 * l / v0: dt = tm / 50 ‘elektron tezlanishi va vaqt intervali
kx = 200000: ky = 20000
RTF.FileName = "Elektrr.rtf"  ‘faylni yuklash
P1.Print
P1.Print "Bir jinsli elektr maydonidagi harakat"
P1.Print "E="; E / 1000; "(kV/m)Vo="; v0 / 1000000#; "(Mm/s)"
P1.Line (3000, 1300)-(3000, 1800), QBColor(3)  ‘ kondensatorni chizish
P1.PSet (3100, 1400), vbCyan: P1.Print "-"
P1.Line (1000, 1800)-(5000, 1800), QBColor(3)
P1.Line (1000, 3600)-(5000, 3600), QBColor(3)
P1.Line (3000, 3600)-(3000, 4100), QBColor(3)
P1.PSet (3100, 3900), vbCyan: P1.Print "+"
t = 0  x = 0  y = 0111 x = x + v0 * dt ‘koordinatalary = a * x ^ 2 / (2 * v0 ^ 2)
P1.Circle (x * kx + 500, y * ky + 2000), 20, QBColor(4) ‘Grafik chizish
For j = 1 To 2000000: Next j
P1.Circle (x * kx + 500, y * ky + 2000), 20, QBColor(10) ‘Grafik chizish
For j = 1 To 2000000: Next jt = t + dt
If t < tm Then GoTo 111End Sub
Private Sub Command2_Click() ‘Davriy elektr maydonidagi harakatP1.Cls
q = 1.6E-19: m = 9.1E-31: E0 = 100000#: v0 = 10000000#: l = 0.02
tm = 1.7 * l / v0: dt = tm / 50: w = 1E+15kx = 200000: ky = 20000
RTF.FileName = "Davr.rtf" ‘faylni yuklash
For iw = 1 To 4P1.Cls
P1.Print
P1.Print "Davriy elektr maydonidagi harakat"
P1.Print "Eo="; E0 / 1000; "(kV/m)Vo="; v0 / 1000000#; "(Mm/s)"
w = 1E+15 * 10 ^ iw
P1.Print "w="; w; "(Gs)" P1.Line (3000, 1300)-(3000, 1800), QBColor(3)
P1.Line (1000, 1800)-(5000, 1800), QBColor(3)
P1.Line (1000, 3600)-(5000, 3600), QBColor(3)
P1.Line (3000, 3600)-(3000, 4100), QBColor(3)
t = 0: x = 0: y = 0
111 x = x + v0 * dt E = E0 * Cos(w * dt)a = q * E / m
y = a * x ^ 2 / (2 * v0 ^ 2)
P1.Circle (x * kx + 1000, y * ky + 3000), 20, QBColor(4)For j = 1 To 2000000: Next j
P1.Circle (x * kx + 1000, y * ky + 3000), 20, QBColor(10)
For j = 1 To 2000000: Next jt = t+ dt
  If t < tm Then GoTo 111Next iw
End Sub
Private Sub Command3_Click()  ‘Nuqtaviy zaryad maydonidagi harakatP1.Cls
```

```
k = 12600#: v0 = 1800000#: p0 = 0.000000005: a = 0.000000005: dt = 1E-16kx =
1000000000000#: ky = 200000000000#
P1.Cls RTF.FileName = "Nuqta.rtf"
P1.Print "Nuqtaviy zaryad maydonidagi harakat"
P1.Print "Vo="; v0 / 1000000#; "(Mm/s)"
For j = 1 To 200:
P1.Circle (a * kx - 200, 900), j, QBColor(4): Next j
P1.Line (a * kx - 280, 900)-(a * kx - 120, 900), vbWhite
P1.Line (a * kx - 200, 820)-(a * kx - 200, 980), vbWhiteFor p = p0 To 2 * p0 Step p0 / 4
x = 0: y = p: vx = v0: vy = 0
31 r2 = (a - x) ^ 2 + y ^ 2: r = Sqr(r2)
fx = -k / r2 * (a - x) / r 'kuch komponentalari
fy = -k / r2 * y / r
vx = vx + fx * dt 'tezliklarvy = vy + fy * dt
x = x + vx * dt    'koordinatalar
y = y + vy * dt
X1 = x * kx: Y1 = y * kyIf X1 < 0 Then GoTo 32
If X1 > 7000 Then GoTo 32If Y1 < 0 Then Go To 32
If Y1 > 5600 Then GoTo 32
P1.Circle (X1, Y1 * 1.7 + 800), 15, QBColor(3) 'trayektoriyani chizish
For j = 1 To 1000000: Next j
P1.Circle (X1, Y1 * 1.7 + 800), 15, QBColor(8)
For j = 1 To 2000000: Next jGoTo
 Next p
End Sub
Private Sub Command4_Click() 'Bir jinsli sim maydonidagi harakatP1.Cls
a = 0.002: pi = 3.1415926: l = 0.005
R0 = -0.000000004
q = -1.6E-19: E0 = 0.00000000000885: m = 9E-31t = 0: t1 = 0.00000000001
n = 10: k = 200000: k1 = k * 1
Cls: RTF.FileName = "Sim.rtf"P1.Print
P1.Print "Bir jinsli sim maydonidagi harakat"
For p = 0 To 0.012 Step 0.004
vx = 10000000#: vy = 0: x = -l: y = p
220 For j = 1 To 100: P1.Circle (500 + l * k, 1500 + a / 2 * k1), j, vbRed: Next jFor i = 0
To n
r = Sqr(x * x + (a / 2 + y) * (a / 2 + y))z = -R0 * q / (2 * pi * E0)
f = z / r
fx = f * x / r: fy = f * (a / 2 + y) / rwx = fx / m: wy = fy / m
vx = vx + wx * t1: vy = vy + wy * t1x = x + vx * t1: y = y + vy * t1
t = t + t1Next i
x9 = (x + l) * k: y9 = y * k1 + 2300If x9 < 0 Then GoTo 490
If x9 > 7000 Then GoTo 490If y9 < 0 Then GoTo 490
If y9 > 5600 Then GoTo 490 P1.Circle (x9, 1.1 * y9), 20, vbGreenGoTo 220
```

490 For j = 0 To 2000000: Next jNext p
End Sub
Private Sub Command5_Click()
'Bir jinsli magnit maydonidagi harakat
P1.Cls
m = 9E-31: q = 1.6E-19: b = 0.1: pi = 3.1415926
w = q * b / m: t9 = 2 * pi / w: k = 2000000RTF.FileName = "Mag.rtf"
For v = 2000000# To 16000000# Step 4000000#
f = 0: t = 0
r = m * v / (q * b)P1.Cls
P1.Print
P1.Print "Bir jinsli magnit maydonidagi harakat"
P1.Print "B="; b; " Tl";:
P1.Print "w="; Left(w / 1000000000#,5); " GGs"
P1.Print "v="; v / 1000; " km/s";:
P1.Print "R="; r * 1000; " mm"
P1.Print "Aylanish radiusining tezlikka bog'liqligi"
t1 = t9 / 300
f = f + w * t1
y = r * Sin(f): z = r * (1 Cos(f))t = t + t1 x8 = z * k + 1500y8 = y * k + 2500
P1.Circle (500 + x8, 1000 + y8), 20, vbRedFor j = 1 To 300000: Next j
P1.Circle (500 + x8, 1000 + y8), 20, vbGreenFor j = 1 To 300000: Next j
If t > t9 Then GoTo 52GoTo 140
52 Next vEnd Sub
Private Sub Command6_Click()
'Doimiy magnit maydoniga burchak ostida kirgandagi harakat
m = 0.000000000009: q = 1.6: b = 0.1: pi = 3.1415926w = q * b / m: t9 = 2 * pi / w: t1 = t9 / 200k = 100000000#: v = 200000: s = 0.3
RTF.FileName = "Bur.rtf"
For aa = 0 To pi / 2 Step pi / 10aaa = aa * 180 / pi
P1.Cls: P1.Print
P1.Print "Doimiy magnit maydoniga burchak ostida kirgandagi harakat"P1.Print "Vo va B orasidagi burchak:"; Left(aaa, 5)
v1 = v * Cos(aa): v2 = v * Sin(aa)f = 0: t = 0: x = 0
r = m * v2 / (q * b)
230: f = f + w * t1: t = t + t1
y = r * Sin(f): z = r * (1 - Cos(f)): x = x + v1 * t1x8 = (x + z / 1.4) * k + 1000
y8 = (y - z / 2.8) * k + 1600
P1.Circle (x8 - 500, y8 + 1700), 20, vbBlueFor j = 1 To 300000: Next j
P1.Circle (x8 - 500, y8 + 1700), 20, vbGreenFor j = 1 To 300000: Next j
If x8 > 7500 Then GoTo 330
If aa = pi / 2 And f > 10 * pi Then GoTo 330GoTo 230
330 Next aaEnd Sub

TADQIQOT NATIJALARI

Dastur ishga tushirilganda va “Bir jinsli elektr maydonidagi harakat”tugmasi tanlanganda ekranda quyidagi animatsion tasvir paydo bo‘ladi:



1-rasm. Elektronning elektr va magnit maydonlaridagi harakati

MUHOKAMA

Dastur elektronning harakatini animatsion namoyish etuvchi oyna, bu harakat haqida ma’lunmotlar beruvchi oyna ham oltita tugmalardan iborat. Foydalanuvchilar bu yerdan ixtiyoriy tugmani tanlab, elektronning elektr maydonida parabola bo‘ylab, magnit maydonida aylana va vintsimon trayektoriya bo‘ylab harakatlanishini bevosita rangli va jonli tarzda kuzatishlari mumkin.

XULOSA

Xulosa o’rnida shuni aytish mumkinki, bu jarayonlarning boshlang‘ich parametrlarga, ya’ni elektronning boshlang‘ich tezligi va maydonga uchib kirish burchagiga hamda elektr va magnit maydonlari kuchlanganliklarining qiymatlariga qanday bog‘langanligini o‘rganish mumkin. Shunig uchun bu dastur fizikaning “Elektr va magnetizm” bo‘limidan virtual laboratoriyalar va elektron darsliklaryaratishda, masalalar yechishda muxim ahamiyatga ega.

REFERENCES

1. “XXI asr pedagogikasining dolzarb vazifalari”Xalq ta’limi”, 2007-yil
2. M.Z.Nosirov “Fizik jarayonlarini kompyuterda modellashtirish”Andijon-2022
3. Kamenskiy S.E., Orexov V.P.Fizikadan masalalar yechish metodikasi. “O’qituvchi” nashriyoti.T.:1976.
4. B.L. Farberman. "Progressivniye pedagogicheskiye texnologii" - T. 1999.