



ELEKTRONNING ELEKTR VA MAGNIT MAYDONLARIDAGI HARAKATI BILAN ISHLASH METODIKASI

Abgurasulova Mushtariybegim Otabek qizi
Ў'jduvon 1-son kasb hunar maktabi fizika fani o'qituvchisi

ANNOTATSIYA

Ushbu maqolada hozirgi kunda dolzarb bo'lgan fizika fanida virtual laboratoriyalar 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.

Zamonaviy O'zbekistonda mutaxassislar tayyorlash sifatini oshirish tizimini isloh qilish muammosi tobora o'tkirlashib bormoqda, bu esa davlatning bozor munosabatlariga kirib kelishi natijasida yuzaga keladigan yangi ijtimoiy ehtiyojlar bilan bog'liq.

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

Kirish

Ta'lim sohasida amalga oshirilayotgan islohotlarning asosiy qismini, albatta, oliy ta'lim tizimidagi islohotlar tashkil etadi. Xususan, O'zbekiston Respublikasida oliy ta'lim tizimini isloh qilishning ustuvor yo'nalishlarini belgilash, mustaqil fikrlaydigan yuqori malakali kadrlar tayyorlash jarayonini sifat jihatidan yangi bosqichga ko'tarish, oliy ta'limni modernizatsiya qilish, ilg'or ta'lim texnologiyalariga asoslangan holda ijtimoiy soha va iqtisodiyot tarmoqlarini rivojlantirish maqsadida davlatimiz rahbarining 2019-yil 8 oktabrdagi farmoni bilan tasdiqlangan O'zbekiston Respublikasi oliy ta'lim tizimini 2030-yilgacha rivojlantirish Konsepsiyasi sohadagi yangi islohotlar uchun debocha vazifasini bajarib bermoqda. Ushbu hujjatga intellektual taraqqiyotni jadallashtirish, raqobatdosh kadrlar tayyorlash, ilmiy va innovatsion faoliyatni samarali tashkil etish hamda xalqaro hamkorlikni mustahkamlash maqsadida fan, ta'lim va ishlab chiqarish integratsiyasini rivojlantirish singari vazifalar asos qilib olindi.

Ta'lim islohatlarining zamonaviy bosqichi jamiyatda yuz berayotgan yangilanishlarning tezkorligi, ta'lim muassasalariga qo'yilayotga yangi, yanada



yuqori talablarga tezroq moslashish bilan bog'liq dolzarb vazifalarni ilgari surmoqda.

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 laboratoriyalarini 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 modellashtirish uchun quyidagicha dastur tuzamiz:

```
Private Sub Command1_Click()
```

```
‘ 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 = "Elektr.rtf" ‘ faylni yuklash
```

```
P1.Print
```

```
P1.Print "Bir jinsli elektr maydonidagi harakat"
```

```
P1.Print "E="; E / 1000; "(kV/m)Vo="; v0 / 10000000#: "(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 = 0
```

```
11 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 = "Davriy.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 = 0.0000000005: a = 0.0000000005: dt = 1E-16kx
=
10000000000000#: ky = 2000000000000#
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 = 0.000000000000885: m = 9E-31t = 0: t1 = 0.000000000001
n = 10: k = 200000: k1 = k * l
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
```

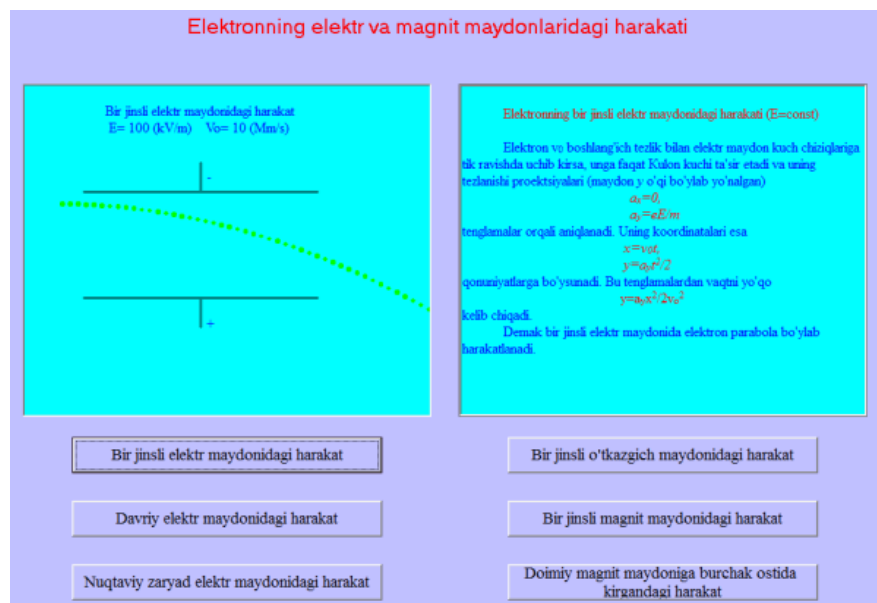


```

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

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

Talabalarning mustaqil bilim olishida, o‘tilgan mavzuni takrorlashda hamda olgan bilimlarini tekshirishda trenajyor, ma'lumotli, o'yin, nazorat qilish dasturlarini qo'llash, ularni o'rganilayotgan mavzu bo'yicha amaliy bilim va malakalarini



shakllantirishda muhim ahamiyatga ega bo'ladi hamda o'quvchilarning amaliy qobiliyatlari va malakalarini shakllantirishda muhim rol o'ynaydi.

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. Ta'lim islohatlarining zamonaviy bosqichi jamiyatda yuz berayotgan yangilanishlarning tezkorligi, ta'lim muassasalariga qo'yilayotga yangi, yanada yuqori talablarga tezroq moslashish bilan bog'liq dolzarb vazifalarni ilgari surmoqda.

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