

```

In[369]:= MVVerlet[x0_, v0_, m_, q_, dt_, n_, BF_] :=
Module[{X, V, alpha, x, v, d, C, j},
 $\lfloor$ 模块
X = Table[0., {i, 1, n}];
 $\lfloor$ 表格
X[[1]] = x0;
V = Table[0., {i, 1, n}];
 $\lfloor$ 表格
V[[1]] = v0;
x = x0;
v = v0;
alpha = q dt / (2 m);
For[j = 2, j <= n, j = j + 1,
 $\lfloor$ For循环
d = v + alpha Cross[v, BF[x]];
 $\lfloor$ 叉积
x = x + d dt;
C = BF[x];
 $\lfloor$ 常量
v = (d + alpha Cross[d, C] + alpha^2 C d.C) / (1 + alpha^2 C.C);
 $\lfloor$ 叉积  $\lfloor$ 常量  $\lfloor$ 常量  $\lfloor$ 常量  $\lfloor$ 常量
X[[j]] = x;
V[[j]] = v;
];
Return[{X, V}];
 $\lfloor$ 返回
]

In[370]:= ShowTrajectory[pts_] :=
Show[Graphics3D[Table[Line[{pts[[jj]], pts[[jj + 1]]}], {jj, 1, Length[pts] - 1}]]]
 $\lfloor$ 显示  $\lfloor$ 三维图形  $\lfloor$ 表格  $\lfloor$ 线段  $\lfloor$ 长度

```

```

dt = 0.005
n = 5000
x0 = {1, 0, 0}
v0 = {0, 1, 0.1}
BF[{x_, y_, z_}] = {0, 0, 1}
m = 1
q = 1

```

Out[371]=

0.005

Out[372]=

50000

Out[373]=

{1, 0, 0}

Out[374]=

{0, 1, 0.1}

Out[375]=

{0, 0, 1}

Out[376]=

1

Out[377]=

1

In[378]:=

{X, V} = MVVerlet[x0, v0, m, q, dt, n, BF]

Out[379]=

```

{{{1, 0, 0}, {1.00001, 0.005, 0.0005}, ... 49.996 ... ,
{1.76924, -0.973016, 24.999}, {1.76438, -0.97185, 24.9995}}, { ... 1 ... }}}

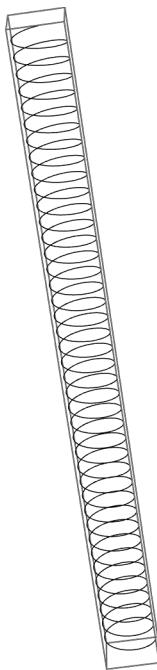
```

内存中的大小: 12 MB + 显示更多 显示全部 图标化 将完整的表达式保存到笔记本中

In[380]:=

```
In[381]:= ShowTrajectory[X]
```

```
Out[381]=
```



```
In[382]:=
```

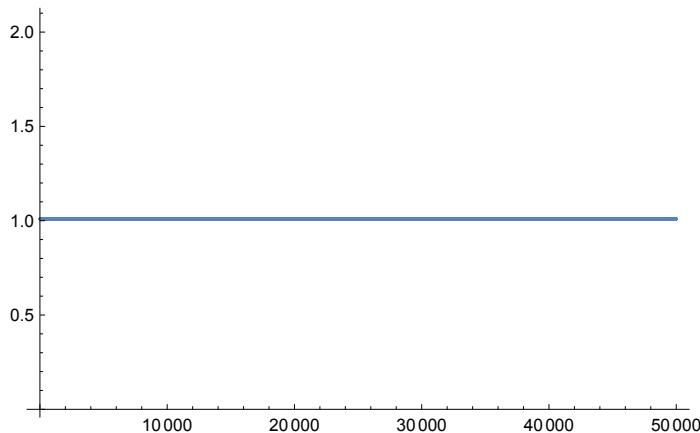
```
In[383]:= vsquared = Table[V[[jj]].V[[jj]], {jj, 1, Length[V]}];
```

|
表格 | 长度

```
ListPlot[vsquared]
```

|
绘制点集

```
Out[384]=
```



```

x0 = {1, 0, 0}
v0 = {0.0, 0.1, 0.3}
n = 50 000
BF[{x_, y_, z_}] = {y, -x, 0}
{X, V} = MVVerlet[x0, v0, m, q, dt, n, BF]
ShowTrajectory[X]
vsquared = Table[V[[jj]].V[[jj]], {jj, 1, Length[V]}];
ListPlot[vsquared]

```

[绘制点集]

Out[406]= {1, 0, 0}

Out[407]= {0., 0.1, 0.3}

Out[408]= {y, -x, 0}

Out[409]=

```

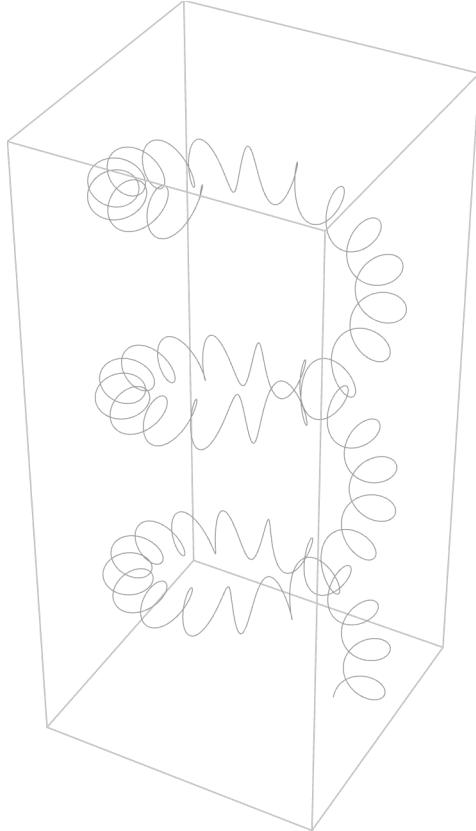
{{{{1, 0, 0}, {1., 0.0005, 0.0015}, ... 49.996 ... ,  

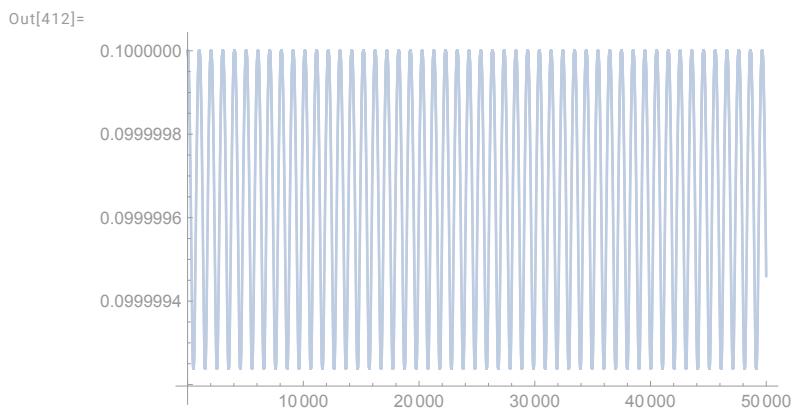
{0.253653, -1.34042, 6.51387}, {0.254272, -1.34172, 6.51322}}, {... i ...}}

```

内存中的大小: 12 MB + 显示更多 ■■■ 显示全部 ⋮ 图标化 ▾ → 将完整的表达式保存到笔记本中 ⚙

Out[410]=





```
In[413]:= 
x0 = {1, 0, 0}
v0 = {0.0, 0.05, 0.05}
n = 50 000
BF[{x_, y_, z_}] = {y, -x, 0}
{X, V} = MVVerlet[x0, v0, m, q, dt, n, BF]
ShowTrajectory[X]
vsquared = Table[V[[jj]].V[[jj]], {jj, 1, Length[V]}];
表格 长度
ListPlot[vsquared]
绘制点集
```

Out[413]=
 $\{1, 0, 0\}$

Out[414]=
 $\{0., 0.05, 0.05\}$

Out[415]=
 $50\,000$

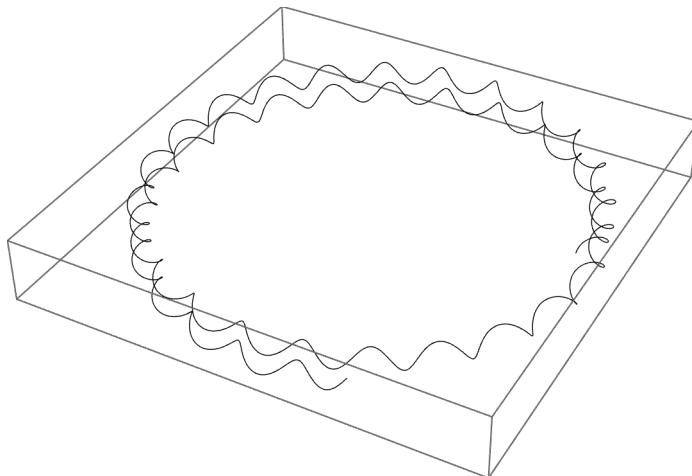
Out[416]=
 $\{y, -x, 0\}$

Out[417]=

$\{\{(1, 0, 0), \{1., 0.00025, 0.00025\}, \dots 49\,996 \dots, \\ \{0.391844, -0.930941, -0.241671\}, \{0.392012, -0.930703, -0.241471\}\}, \{\dots 1\dots\}\}$

内存中的大小: 12 MB + 显示更多 显示全部 图标化 将完整的表达式保存到笔记本中 设置

Out[418]=



Out[420]=

