モーメント法による導体棒上の電荷分布の解析 (パルス展開ポイントマッチング法)

Mathematica6
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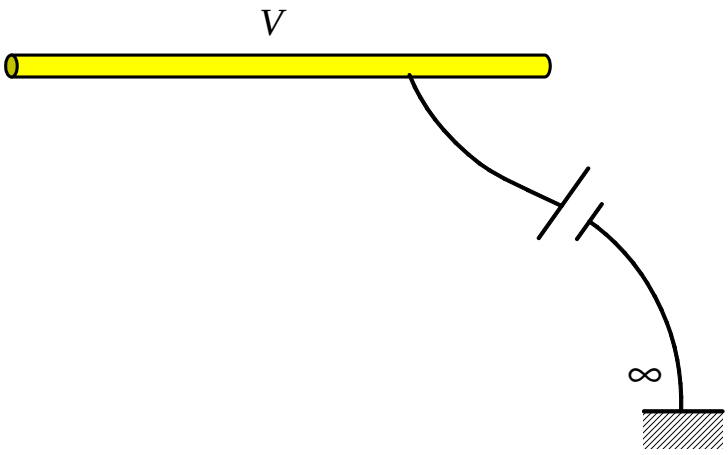

シンプソンの公式で数値積分する関数を定義 (汎関数バージョン)

In[1]:=
```
simpi[f_, {ξ_, a_, b_}, n_] := Module[{h = (b - a) / (2 * n), x, i},
    x[i_] := a + h * i;
  h/3 ((f /. {ξ → x[0]}) + 4 Sum[(f /. {ξ → x[2 * i - 1]}), {i, 1, n}] +
      2 Sum[(f /. {ξ → x[2 * i - 2]}), {i, 2, n}] + (f /. {ξ → x[2 * n]})) // N
  ];
```

Parameters of a Wire

In[2]:=
```
l = 1.0; (* ワイヤー長 *)
a = 0.001; (* ワイヤー半径 *)
volt = 1.; (* ワイヤー電位 *)
nn = 30; (* 分割数,unknown の数 *)
ϵ = 8.854 * 10^-12;
```

Analysis Start !

In[5]:=
```
Module[{pos, r, r1, r2, r3, zz, vv, z, srcint, ii, curdist},
  pos[n_] := l*n/nn - l/2;
  r[zo_, zs_] := Sqrt[a^2 + (zo - zs)^2];
  zz[m_, n_] := simpi[1/(4*π*ϵ*r[1/2 (pos[m - 1] + pos[m]), zs]), {zs, pos[n - 1], pos[n]}, 10];
  vv[i_] := volt;

  Print["******** Now Making Z Matrix... ********"];
  zmat = Table[zz[i, j], {i, 1, nn}, {j, 1, nn}];

  Print["******** Now Making V Matrix... ********"];
  vmat = Table[vv[i], {i, 1, nn}]; qmat = Table[qq[i], {i, 1, nn}];

  Print["******** Now Solving Linear Equations... ********"];
  qmat = qmat /. Solve[zmat.qmat == vmat, qmat];
  qdist = Table[{1/2 * (pos[i - 1] + pos[i]), qmat[[1]][[i]] * 10^12}, {i, 1, nn}];
  Module[{curamp, curpha}, graphicsqdist = ListPlot[qdist, Joined → True,
     PlotStyle → {Red, AbsoluteThickness[2]}, PlotRange → {0, 14}, Frame → True, FrameLabel →
      {"Position (m)", "Line charge density (pC/m)"}, DisplayFunction → Identity];
   Show[{graphicsqdist}]]
]
```

```
******** Now Making Z Matrix... ********

******** Now Making V Matrix... ********

******** Now Solving Linear Equations... ********
```

Out[5]=