

科学計算研究室 Python ゼミ

～ 11. 偏微分方程式 その 1～

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Python ソースコード

```
N = 10
lamb = 80.4
rho = 7874
c = 461
dx = 0.1

u_old = []
u_new = []

for i in range(0,N+1,1):
    u_old.append(1000)
    u_new.append(0)

u_old[0]=300
u_old[N]=300

for t in range(3601):
    for i in range(1,N,1):
        u_new[i] = u_old[i] + lamb/(rho*c*dx*dx)*(u_old[i+1] - 2*u_old[i] + u_old[i-1])

    for i in range(1,N,1):
        u_old[i] = u_new[i]

    if t%10==0 and t%600==0:
        print(t, end=" ")
        for i in range(N+1):
            print(u_old[i], end = " ")
        print()
```

Figure 1 放物型偏微分方程式の数値解法プログラム

課題

0 300 998.4495500444364 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 1000.0 998.449550044
600 300 624.460464074164 842.1494078744781 946.7439791512693 984.5929845868927 998.449550044
1200 300 535.9631951412555 729.5205802915261 859.9380669904247 929.9471269685033
1800 300 493.15438196934593 661.3049961958523 787.0284482543643 862.8734701828268
2400 300 465.0551852914915 611.9413169282012 725.9342221316125 797.4737248177938
3000 300 443.41474563133715 572.1206149452812 673.4017831755493 737.876299150907
3600 300 425.4171632936957 538.3338125986357 627.6576211047468 684.8225735433031

44364 300
93.1280861974874 984.5929845868927 946.7439791512693 842.1494078744781 624.460464074164 300
951.3335565971308 929.9471269685033 859.9380669904247 729.5205802915261 535.9631951412555 300
887.9839221237864 862.8734701828268 787.0284482543643 661.3049961958523 493.15438196934593 300
821.7745038775734 797.4737248177938 725.9342221316126 611.9413169282013 465.05518529149157 300
759.9752199711373 737.8762991509071 673.4017831755494 572.1206149452812 443.41474563133715 300
704.4809953993791 684.8225735433032 627.6576211047469 538.3338125986359 425.4171632936957 300

Figure 2 出力結果

1 時間後の鉄棒中央部分の温度は、704.48K になるということが分かった。