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ESTABLISHMENT OF STEADY TEMPERATURE FIELD

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There are many issues related to heat exchange in a number of fields such as architecture, machine building, and so on. Especially, issues related to this process do not lose its relevance. Because in our everyday life, the issues of temperature change are constantly renewed. Therefore, it is important to build software and to obtain a number of graphs and graphical results for solving such issues. The following is a software tool written in C ++ programming language to obtain a model of the issue under consideration, and the results are obtained using the built-in software tool.

Example. The transversal section is represented by a longitudinal barrier of a straight line with a rectangle. Temperatures remain constant within the limits. Determine the temperature distribution inside the beam.

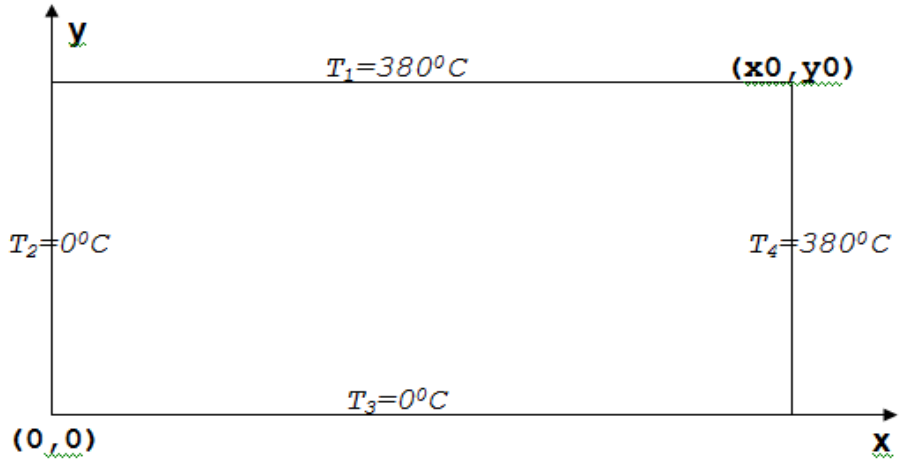

Fig. 1. Beam under the temperature

If we assume that the temperature inside the nucleus is not bound to time, then we use the first-order boundary conditions for the mathematical representation of the *Laplace* equation and the unstable temperatures within beam boundary:

$$\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}=0 \qquad \begin{matrix} T(x,0)=T_3=0, & T(x,y0)=T_1=380 \\ T(0,y)=T_2=0, & T(x0,y)=T_4=380 \end{matrix}$$

We replace the equations in the equations with central, continuous, singular schemes:

$$\frac{\partial^2 T}{\partial x^2}=\frac{T_{i+1,\,j}-2T_{i,\,j}+T_{i-1,\,j}}{\Delta x^2},\ \frac{\partial^2 T}{\partial y^2}=\frac{T_{i,\,j+1}-2T_{i,\,j}+T_{i,\,j-1}}{\Delta y^2}.$$

Using the above given equations, we write the *Laplace* equalized drawing scheme as follows:

$$\frac{T_{i+1,j}^{k+1} - 2T_{i,j}^{k+1} + T_{i-1,j}^{k+1}}{\Delta x^2} + \frac{T_{i,j+1}^{k+1} - 2T_{i,j}^{k+1} + T_{i,j-1}^{k+1}}{\Delta y^2} = 0.$$

We use the *Gauss-Zeydel* iteration process to find the satisfying solution to the boundary conditions of the equation:

$$T_{i,j}^{*} = \frac{\frac{T_{i+1,j}^{k} + T_{i-1,j}^{*}}{\Delta x^2} + \frac{T_{i,j+1}^{k} + T_{i,j-1}^{*}}{\Delta y^2}}{\frac{2}{\Delta x^2} + \frac{2}{\Delta y^2}},$$

where the value of the next step of iteration is $T_{i,j}^{*}$, the value of the previous step of iteration is $T_{i,j}^{k}$.

We use the method of *"High relaxation"* to increase the rate of approach to numerical solution:

$$T_{i,j}^{k+1} = T_{i,j}^{*} \cdot relax + T_{i,j}^{k} \cdot (1 - relax),$$

where $T_{i,j}^{k+1}$ – the calculated value for the method of *"High Relaxation" (k+1)*-iteration calculated value, $T_{i,j}^{*}$ – calculated value by method *Gauss-Zeydel*, *relax*-coefficient high relaxation ($1.0 \le relax \le 2.0$).

The program code built in C++, using the foregoing:

```
#include <iostream.h>
#include <string.h>
#include <math.h>
const int mi=20, mj=15;
float t[mi][mj];
int main(int argc, char *argv[])
{ const float t1=380, t2=0, t3=0, t4=380;
 float tnew, tzv, delta, ostt;
 const float relax=1.9, eps=0.01;
 float x0=2.0, y0=1.0, dx, dy;
 int i,j,it;
 dx=x0/mi;
 dy=y0/mj;
 ostt=2/(dx*dx)+2/(dy*dy);
 for(i=0;i<mi;i++)
 for(j=0;j<mj;j++)
 t[i][j]=0.0;
  for(j=0;j<mj;j++)
  {t[0][j]=t1; t[mi-1][j]=t3; }
  for(i=0;i<mi;i++)
```

```
{t[i][0]=t2; t[i][mj-1]=t4; }
delta=1; it=1;
FILE *f;
if((f=fopen("natija.txt","wt+"))==NULL)
{ cout<<"fayl not open";
return 0;}
char its[8], deltas[12], ts[5];
while(delta>eps)
{ delta=0;
 for(i=1;i<mi-1;i++)
 for(j=1;j<mj-1;j++)
 {tzv=((t[i+1][j]+t[i-1][j])/(dx*dx)+  (t[i][j+1]+t[i][j-1])/(dy*dy))/ostt;
 tnew=tzv+relax+(1-relax)*t[i][j];
 delta=delta+fabs(t[i][j]-tnew);
 t[i][j]=tnew;}
 delta=(delta/mi)/mj;
 it++;
 itoa(it,its,10);
 gcvt(delta,5,deltas);
 fputs("qadam=",f);
 fputs(its,f);
 fputs("\t",f);
 fputs("farq=",f);
 fputs(deltas,f);
 fputs("\n",f);
  for(i=0;i<mi;i++)
  { fputs("\n",f);
  for(j=0;j<mj;j++)
  {gcvt(t[i][j],5,ts);
  fputs(ts,f);
  fputs("\t",f);} }
  fputs("\n",f); }
 fclose(f); }
```

Now, we present the number of variables in the program code and the number of initial and subsequent iteration steps for the number of results obtained by their commentary, as well as the following:

1. *mi, mj* - measure of net;
2. *t1, t2, t3, t4* - temperatures within the material boundry;
3. *T[x][y]* - is a two-dimensional array that maintains the value of the net function;
4. *TNEW* − (k + 1) - value of the iteration;
5. *TZV* − result calculation by method Gauss-Zeydel;
6. *delta* - computation error;
7. *ostt*- difference obtained from the underdeveloped equation;

8. *relax* - relaxation coefficient;
9. *eps* - permitted errors in calculations;
10. *x0, y0, dx, dy* - integration steps within the boundaries of the sphere;
11. *i, j* - cyclic variables;
12. *it* - current iteration;
13. *res* - additional variable.

qadam=2 farq=16.791

0.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.
0.	60.362	81.256	88.489	90.992	91.859	92.159	92.263	92.299	92.311	92.315	92.317	92.317	223.86	380.
0.	11.186	18.273	21.839	23.458	24.152	24.439	24.554	24.599	24.617	24.624	24.626	24.627	176.4	380.
0.	3.621	5.9647	7.3245	8.0444	8.4003	8.5676	8.6432	8.6764	8.6906	8.6965	8.699	8.7	163.59	380.
0.	2.4571	3.6682	4.2966	4.6249	4.7933	4.8773	4.918	4.9372	4.946	4.95	4.9518	4.9525	160.32	380.
0.	2.278	3.2529	3.687	3.8878	3.9832	4.0292	4.0513	4.062	4.067	4.0693	4.0704	4.0709	159.51	380.
0.	2.2505	3.1794	3.5678	3.7331	3.805	3.837	3.8515	3.8581	3.8612	3.8626	3.8633	3.8636	159.32	380.
0.	2.2462	3.1667	3.5451	3.7015	3.7667	3.7942	3.8059	3.811	3.8132	3.8142	3.8147	3.8149	159.27	380.
0.	2.2456	3.1645	3.5408	3.6951	3.7586	3.7848	3.7956	3.8002	3.8021	3.8029	3.8033	3.8034	159.26	380.
0.	2.2455	3.1641	3.54	3.6939	3.7569	3.7827	3.7934	3.7977	3.7995	3.8003	3.8006	3.8007	159.26	380.
0.	2.2455	3.1641	3.5399	3.6936	3.7565	3.7823	3.7929	3.7972	3.799	3.7997	3.8	3.8001	159.25	380.
0.	2.2455	3.1641	3.5398	3.6936	3.7565	3.7822	3.7927	3.7971	3.7988	3.7995	3.7998	3.8	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	2.2455	3.164	3.5398	3.6936	3.7565	3.7822	3.7927	3.797	3.7988	3.7995	3.7998	3.7999	159.25	380.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	380.

qadam=81 farq=9.9202e-003

0.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.	380.
0.	41.203	49.194	50.703	51.03	51.117	51.082	51.084	51.129	51.225	51.749	54.243	65.822	120.47	380.
0.	5.939	7.7808	8.2839	8.4179	8.4303	8.4285	8.4506	8.4905	8.6492	9.3928	12.669	27.246	92.14	380.
0.	2.0876	2.722	2.884	2.9212	2.9609	2.9655	2.9618	3.0084	3.187	3.9591	7.4127	22.557	88.995	380.
0.	1.7004	2.1024	2.1832	2.2256	2.2362	2.212	2.2191	2.2704	2.4406	3.2385	6.7341	21.976	88.599	380.
0.	1.6232	1.9953	2.0993	2.1136	2.1145	2.1293	2.143	2.1834	2.3717	3.17	6.6604	21.901	88.579	380.
0.	1.6287	2.0189	2.0919	2.1091	2.1289	2.1262	2.1248	2.17	2.3474	3.1404	6.6264	21.892	88.551	380.
0.	1.6308	1.991	2.0796	2.1067	2.1082	2.1086	2.1232	2.1656	2.351	3.149	6.6502	21.892	88.573	380.
0.	1.6228	2.0049	2.093	2.1053	2.1127	2.1209	2.1257	2.1675	2.349	3.1475	6.6261	21.889	88.552	380.
0.	1.6335	2.0029	2.0807	2.1047	2.1119	2.1091	2.1207	2.1629	2.3472	3.1407	6.643	21.887	88.569	380.
0.	1.6224	1.9949	2.089	2.1064	2.1089	2.1182	2.1262	2.1689	2.3483	3.1528	6.631	21.891	88.555	380.
0.	1.6316	2.0073	2.0862	2.104	2.1122	2.1131	2.1228	2.1636	2.35	3.1422	6.6376	21.886	88.565	380.
0.	1.6297	1.9974	2.0833	2.1065	2.1095	2.113	2.1224	2.1664	2.3443	3.1476	6.6308	21.89	88.556	380.
0.	1.6265	1.9999	2.0862	2.1049	2.1106	2.1124	2.1243	2.1635	2.3496	3.1447	6.6391	21.887	88.562	380.
0.	1.6274	2.0011	2.0869	2.1053	2.1101	2.1147	2.1235	2.1655	2.3484	3.1457	6.6349	21.886	88.56	380.
0.	1.6284	1.9999	2.0844	2.1047	2.1098	2.1125	2.1227	2.1645	2.3463	3.1441	6.6314	21.882	88.554	380.
0.	1.6241	1.9959	2.0826	2.1014	2.1061	2.1099	2.1193	2.1591	2.3409	3.1305	6.6067	21.832	88.492	380.
0.	1.6088	1.9713	2.0521	2.0712	2.0746	2.0788	2.0857	2.1262	2.2931	3.0544	6.4269	21.433	87.833	380.
0.	1.4508	1.7565	1.8201	1.8337	1.8374	1.8386	1.8446	1.8722	1.9972	2.5853	5.3451	18.412	80.697	380.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	380.

The results are obtained from the first and last steps of the iterate, which results in a change in the inner temperature of the object. The built-in software allows for the physical properties of the body to be obtained by the number of models associated with temperature change for various complex structures. This is of great practical significance when designing structures to be constructed.

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STATISTICAL ANALYZING INCOMING PHONE CALLS AT THE CALL-CENTRE

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Abstract: Today receiving all incoming phone calls without loss as well as optimization of the number of operators is one of the pressing issues at the developing Call-centers. Given is the information, in this article, about analyzing incoming calls and optimization methods of the number of workers at the Call-center.

Key words: Call-center, Telecommunication System of Total Users (TSTU), Incoming calls, Electronic Digital Auto informer.

Аннотация: Сегодня получение всех входящих телефонных звонков без потерь, а также оптимизация числа операторов - одна из насущных проблем в развивающихся Call-центрах. В этой статье представлена информация об анализе входящих вызовов и методах оптимизации числа работников Call-центра.

Ключевые слова: Call-центр, телекоммуникационная система для всех пользователей (TSTU), входящие вызовы, электронный цифровой автоинформатор.

We will begin to analyze incoming calls (phone call) at the Call-centres and we will now review incoming brief calls. The Call-center, we are studying now, has working places for 50 operators and a shift work for a brigadier. The Call-center, where working time is from 00:00 to 23:00 without day off. Approximately 350-400 thousand telephone calls can be received there during a month. Calls can be accepted by both: Telecommunication System of Total Users (TSTU) and mobile phones. However, nowadays Call-centers are principally receiving calls from TSTU, that is to say TSTU is common among subscribers [1].

On the following picture regularly incoming calls at the Call-center have been analyzed. Furthermore, given is the information about the number of received (incoming phone calls) phone calls, unaccepted (rejected) calls and the average time of serving to the incoming calls.

Given is the information about the number of daily TSTU incoming calls within an hour. Weekly incoming calls are given in diagram 1.

The first picture shows data relating to daily phone calls by sequence of days of the week, that are, the first trend – Monday, the second trend – Tuesday, the third