## Лабораторная работа №1

## Обработка экспериментальных данных методом наименьших квадратов

## Задание

- **1.** Изучить метод наименьших квадратов и применить его на практике для получения линейной и квадратичной функциональных зависимостей. Вывести систему линейных уравнений в общем виде для нахождения коэффициентов прямой и параболы.
- **2.** По исходным экспериментальным данным (таблица) составить свою систему уравнений и решить ее методом Гаусса. Написать программу на ЭВМ, реализующую данный процесс. Протестировать ее на контрольном примере.
- 3. Построить точечную диаграмму экспериментальных данных и графики аппроксимирующих функций для линейного и квадратичного случаев.
- **4.** Оценить погрешности метода наименьших квадратов. Найти среднее квадратическое отклонение. Провести анализ работы и сделать выводы.

1											Приложение 3
x	0.16	0.11	0.92	0.96	0.12	0.76	0.64	0.08	0.18	0.563	
v	3.24	3.39	1.28	0.83	3.44	1.47	1.93	3.85	3.10	2.041	
	,										
x	0.168	0.115	0.928	0.962	0.129	0.762	0.646	0.085	0.186	0.563	
v	5.524	5.605	3.264	3.072	5.497	3.579	3.645	5.667	5.131	4.127	
	3		1		T	1	Tana	T	10.000	10.750	
v	7.962	7 957	0.928	3.300	0.129	0.762	0.646	8.393	7.362	5.086	
U	17.902	11.931	13.199	13.300	11.047	13.033	14.402	1017.1	11102	12.000	
	4										
x	0.168	0.115	0.928	0.962	0.129	0.762	0.646	0.085	0.186	0.563	
v	8.943	9.091	4.388	4.029	9.065	4.911	5.700	9.443	8.417	6.373	
	-										
	5	0.115	0.928	0.962	0.129	0.762	0.646	0.085	0.186	0.563	
v	0.168 5.861	6.212	2.868	2.647	6.198	3.499	3.529	6.511	5.955	4.185	
I	13.601	0.212	12.000	12.011	10.270						
	6	2	3	4	5	L	7	5	9	10	
x	0.168	0.115	0.928	0.962	0.129	0.762	0.646	0.085	0.186	0.563	
v	6.961	7.578	3.587	3.604	7.301	4.331	0.915	0.262	6.783	5.025	

7									
x 1.577	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1 622	1.004
v 0.427	0.033	0.297	0.004	0.052	-0.098	0.565	0.260	0.082	1.034
					1.070	1003	10.200	10.002	0.834
8									
x 1.577	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
v 2.000	2.397	2.264	1.987	2.266	1.837	2.339	2.260	1.928	2.819
					121007	12.007	12.200	11.720	14.017
9									
x 1.577	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
v 1.464	1.594	2.053	1.149	1.184	0.898	1.840	1.445	1.167	3.048
	4			140			121110	12.1201	10.010
10									
x 1.577	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
v 2.568	2.365	2.808	2.242	2.145	1.854	2.764	2.361	2.174	3.829
11									
x 1.577	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
v 1.044	1.406	1.425	0.930	1.186	1.246	1.452	1.424	1.386	2.166
12.011	12.100		14.5						
12									
	1.538	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
2 610	2.390	2.566	1.789	2.069	1.776	2.633	2.136	2.302	3.327
v 2.518	The state of the s								

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P.	3									
phones	2 1.577	12 520	Tana							
	2.518	2.390	1.333	1.847	1.797	1.910	1.371	1.527	1.632	1.034
Y_	4.310	12.390	2.566	1.789	2.069	1.776	2.633	2.136	2.302	3.327
13	3				1	1				10.021
-	2.358	2.737	2.738	2.758	2.315	2.728	2.426	2.958	2 170	Tana
y	-0.017	0.598	0.398	0.806	-0.029	0.379	0.246	0.863	2.178	2.006
14	1					1	10.210	10,003	1-0.104	-0.055
x	2.358	2.737	2.738	2.758	10016	Va zan	laune	Tanana .		
	2.348	2.313	2.637	2.504	1.948	12.728	2.426	2.958	2.178	2.006
		12.515	12.031	1 2.304	1.948	2.299	2.249	3.128	2.032	1.948
1	THE REAL PROPERTY.									
	2.358	2.737	2.738	2.758	2.315	2.728	2.426	2.958	2.178	2.006
y	1.501	2.245	1.937	2.101	1.425	1.924	1.272	2.709	0.819	1.008
1	6									
x	2.358	2.737	2.738	2.758	2.315	2.728	2.426	2.958	2.178	2.006
y	2.162	3.302	2.956	3.040	2.430	3.006	2.548	3.880	2.124	2.197
-	7									
	2.358	2.737	2.738	2.758	2.315	2.728	2.426	2.958	2.178	2.006
y	1.026	1.823	1.888	1.957	1.126	1.990	1.069	2.569	1.028	0.908
1	8									
x	2.358	2.737	2.738	2.758	2.315	2.728	2.426	2.958	2.178	2.006
y	2.296	2.865	3.022	2.840	1.941	2.715	2.189	3.385	1.871	2.074
1	9									
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	3 744	3 802	3.001	3 720	3 803	3 270	3 409	3.307	3.856	3.917
	3.244	3.802	3.001	3.720	3.803	3.270	3.409	3.307	3.856	3.917
y	1.375	3.802	3.001	3.720	3.803	3.270	3.409	_		
20	1.375	3.018	1.173	2.710	3.012	1.818	-	_		
y 20 x	1.375 ) 3.244	3.018	3.001	3.720		_	1.783	1.929	3.382	3.724
20 x y	3.244 3.301	3.018	1.173	2.710	3.803	3.270	3.409	3.307	3.382	3.724
20 x y	3.244 3.301	3.018	3.001	3.720	3.803	3.270	3.409	3.307	3.382	3.724 3.917 5.735
2(x y 21 x )	3.244 3.301 3.244	3.018 3.802 5.227	3.001 2.892	2.710   3.720   5.075	3.803 5.162	3.270	3.409	3.307 3.856	3.382	3.724
2(x y 211 x y y	3.244 3.301 3.244 4.282	3.802 5.227 3.802	3.001 2.892 3.001	3.720 5.075	3.803 5.162 3.803	3.270 3.693	3.409 3.992 3.409	3.307 3.856	3.382 3.856 5.251	3.724 3.917 5.735
20 x y 21 x y 222	3.244 3.301 3.244 4.282	3.802 5.227 3.802 7.337	3.001 2.892 3.001 3.001 3.124	3.720 5.075 3.720 6.952	3.803 5.162 3.803 7.643	3.270 3.693	3.409 3.992 3.409	3.307 3.856	3.382 3.856 5.251	3.724 3.917 5.735
20 x y 21 x y 22 x 22 x	3.244 3.301 3.244 4.282	3.802 5.227 3.802 7.337	3.001 2.892 3.001 3.124	3.720 5.075 3.720 6.952	3.803 5.162 3.803 7.643	3.270 3.693 3.270 4.214	3.409 3.992 3.409 4.756	3.307 3.856 3.307 4.284	3.856 5.251 3.856 7.686	3.917 5.735 3.917 8.554
20 x y 21 x y 222 x 1	3.244 3.301 3.244 4.282 3.244 5.296	3.802 5.227 3.802 7.337	3.001 2.892 3.001 3.001 3.124	3.720 5.075 3.720 6.952	3.803 5.162 3.803 7.643	3.270 3.693 3.270 4.214	3.409 3.992 3.409 4.756	3.307 3.856 3.307 4.284	3.856   5.251   3.856   7.686	3.917   5.735   3.917   8.554
20 x y 21 x y 22 x 23 23	3.244 3.301 3.244 4.282 3.244 5.296	3.802 5.227 3.802 7.337 3.802 8.499	3.001 2.892 3.001 3.124 3.001 3.839	3.720 5.075 3.720 6.952 3.720 7.772	3.803 5.162 3.803 7.643 3.803 8.600	3.270 3.693 3.270 4.214 3.270 5.152	3.409 3.992 3.409 4.756 3.409 5.836	3.307 3.856 3.307 4.284 3.307 5.431	3.856 5.251 3.856 7.686 3.856 8.894	3.917 5.735 3.917 8.554 3.917 9.545
20 x y 21 x y 22 x 23 x 1	3.244 3.301 3.244 4.282 3.244 5.296	3.802 5.227 3.802 7.337	3.001 2.892 3.001 3.124	3.720 5.075 3.720 6.952	3.803 5.162 3.803 7.643	3.270 3.693 3.270 4.214	3.409 3.992 3.409 4.756	3.307 3.856 3.307 4.284	3.856   5.251   3.856   7.686	3.917   5.735   3.917   8.554

Вариант пекориях

Bapuausa 12-80:

2									1	
x	3.244	3.802	3.001	3.720	3.803	3.270	3.409	3.307	3.806	3.917
y	4.399	6.635	3.524	6.468	6.881	4.462	5.115	4.519	7.198	7.691
2	5						3.2.2	1.017	1,170	7.091
x	4.302	4.381	4.626	4.886	4.808	4.872	4.382	4.181	4.483	4.418
y	5.496	5.645	6.894	8.135	7.738	8.272	5.567	4.883	6.175	5.681
2				i						
x	4.302	4.381	4.626	4.886	4.808	4.872	4.382	4.181	4.483	4.418
V	7.105	7.689	8.964	10.384	9.929	10.455	7.570	6.787	8.035	7.940
2'	7									
<u>y</u>	4.302	4.381	4.626	4.886 17.850	4.808 16.571	4.872	4.382	4.181	4.483	4.418
21	4.302	-	14.606	17.850	16.571	17.478	-	10.723	13.098	4.418
x y	4.302 11.417	12.517	_	-		_	12.559	_	-	4.418
x 21 x	4.302 11.417 8 4.302 12.832	12.517	14.606	17.850	16.571	17.478	12.559 4.382 13.315	10.723 4.181 11.559	13.098 4.483 14.088	4.418
21 2 2 2 2 2 2 2	4.302 11.417 8 4.302 12.832	12.517	14.606	17.850	16.571	4.872   18.610	12.559 4.382 13.315	10.723   4.181   11.559	13.098 4.483 14.088	4.418 12.843 4.418 13.447
2: x y 2: x	4.302 11.417 8 4.302 12.832	12.517 4.381 13.092	14.606 4.626 15.730	17.850 4.886 18.489	16.571   4.808   17.934	17,478 4.872 18.610	12.559 4.382 13.315	10.723 4.181 11.559	13.098 4.483 14.088	4.418 12.843 4.418 13.447
21 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4.302 11.417 8 4.302 12.832 9 4.302 8.967	12.517   4.381   13.092   4.381	14.606 4.626 15.730	17.850 4.886 18.489 4.886	4.808   17.934   4.808	4.872   18.610	12.559 4.382 13.315	10.723   4.181   11.559	13.098 4.483 14.088	4.418 12.843 4.418 13.447 4.418 9.643
2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2	4.302 11.417 8 4.302 12.832 9 4.302 8.967	12.517   4.381   13.092   4.381	14.606 4.626 15.730	17.850 4.886 18.489 4.886	4.808   17.934   4.808	4.872   18.610	12.559 4.382 13.315	10.723   4.181   11.559	13.098 4.483 14.088	4.418 12.843 4.418 13.447 4.418 9.643