

**Qabilov Sirojiddin Sherqulovich ,  
Muminov Elyor Normurodovich**

<sup>1</sup> *Teacher of the Department of "Artificial Intelligence" at the Tashkent University of Information Technologies named after Muhammad Al-Khwarizmi*

[qobilov.sirojiddin92@gmail.com](mailto:qobilov.sirojiddin92@gmail.com)

<sup>2</sup> *Teacher of the Department of "Artificial Intelligence" at the Tashkent University of Information Technologies named after Muhammad Al-Khwarizmi*

[emuminov864@gmail.com](mailto:emuminov864@gmail.com)

Geophysics is a science that studies the physical properties and processes of the Earth, allowing us to understand and use natural phenomena in practice. Geophysical signals are the result of physical processes in the Earth's interior and exterior and through them [2]. Analysis and modeling of these signals play an important role in oil and gas exploration, natural disaster forecasting, and environmental monitoring. The use of the spline method in processing geophysical signals provides high accuracy and efficiency [5]. Spline-based modeling is an urgent approach for modern geophysical research. Developments in this direction expand the possibilities of searching for natural resources and predicting hazards. This work aims to analyze the process of restoring geophysical signals using the spline method and evaluate the error of the spline. First, we begin the work with the following analytical function selection process

$$f(x) = \frac{\sin(2\pi\sqrt{x})}{x^2 + 1}, \quad x \in [0.1, 0.2]$$

Function  $C^\infty$  to the class belonging is, all in between continuous and differentiable. This function on cubic spline interpolation done Interpolation for 10 equal numbers in the range [0.1, 2.0] distributed knot points selected :

$$x_i = 0.1 + i \cdot h, \quad h = \frac{2 - 0.1}{9} \approx 0.2111, \quad i = 0, \dots, 9$$

Selected all  $x_i$  at points function real values  $f(x_i)$  calculating [3]. The spline  $S(x)$  is obtained from this points through built. Final from interpolation then, 10 straight distributed control at points  $f(x)$  and the values of  $S(x)$  calculating exited and their differences  $|f(x) - S(x)|$  in appearance following errors schedule compiled :

*Table 1. Errors schedule*

No.	x	f(x)	S(x)	f(x) - S(x)
1	0.100000	0.905608	0.905608	0.000000
2	0.300000	-0.270988	-0.274663	0.003675
3	0.600000	-0.726531	-0.732040	0.005509
4	0.700000	-0.574085	-0.575713	0.001629
5	0.900000	-0.175069	-0.175110	0.000041
6	1.200000	0.231309	0.231396	0.000086
7	1.400000	0.308529	0.308559	0.000031
8	1.600000	0.279667	0.279645	0.000022

9	1.800000	0.197821	0.197884	0.000063
10	2.000000	0.102658	0.102658	0.000000
Max :				0.048917

Above in the table every one chosen control on point analytical function  $f(x)$  and natural cubic spline through constructed  $S(x)$  values given . They between the difference is in the form  $|f(x) - S(x)|$  accuracy error with evaluated [1,4].

The following The graph of the curve  $f(x)$  line as complete on the line , and  $S(x)$  dotted line on the line depicted . Node points separately red points through separated . From the graph apparently as it stands , spline model every one knot on point analytical to the function complete suitable arrived , in between and smooth interpolation provided .

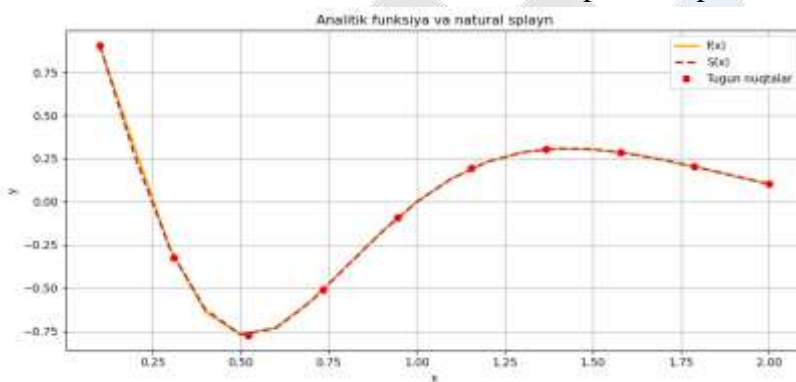


Figure 1. selected analytical function spline method through restoration graph .

From the graph apparently as it stands , spline model every one knot to the function  $f(x)$  at the point complete suitable comes and in between smooth interpolation provides . Errors usually  $10^{-3}$  from small be , model is high accuracy provided .

**Geophysicist signal reconstruction using natural spline and error estimation**

This in the department geophysical signal data on spline interpolation using restoration practice Done .

Table 2. Signal values

No.	x	y (signal)
1	0.000000	0.176405
2	0.526316	0.366360
3	1.052632	0.512702
4	1.578947	0.734640
5	2.105263	0.802686
6	2.631579	0.974452
7	3.157895	1.148777
9	4.210526	0.930442
10	4.736842	0.877514
11	5.263158	0.823703
12	5.789474	0.588147
14	6.842105	0.053491
15	7.368421	-0.278574
16	7.894737	-0.440887
17	8.421053	-0.700389
18	8.947368	-0.856670

19	9.473684	-1.007006
20	10.000000	-0.984360

Every for one x the error is of the form  $\varepsilon(x) = |f(x) - S(x)|$  calculated. In the graph interpolation lines and errors shown.

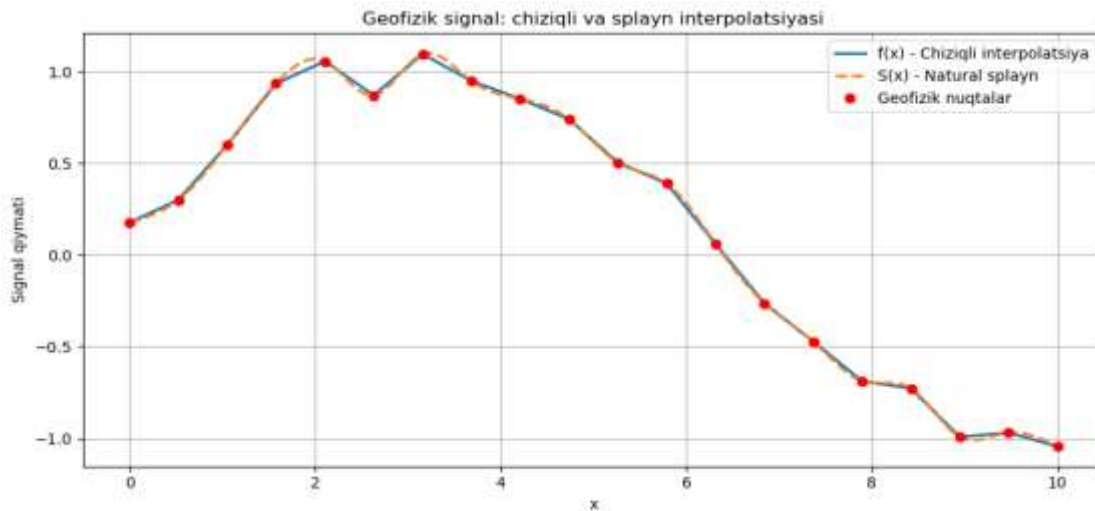


Figure 2. Graphical representation of the interpolation result

Table 3. Interpolation results and accuracy mistakes

x	f(x) ( linear )	S(x) ( spline )	f(x) - S(x)
0.000000	0.176405	0.176405	0.000000
0.526316	0.324433	0.322108	0.002325
1.052632	0.472461	0.471858	0.000603
1.578947	0.620489	0.623657	0.003168
2.105263	0.768518	0.763065	0.005452
2.631579	0.888520	0.894188	0.005668
3.157895	1.086775	1.073706	0.013069
3.684211	0.991552	0.997287	0.005735
4.210526	0.896328	0.889917	0.006410
4.736842	0.801104	0.803911	0.002807
5.263158	0.705881	0.705881	0.000000
5.789474	0.515791	0.513821	0.001970
6.315789	0.378551	0.383788	0.005237
6.842105	0.064785	0.060605	0.004180
7.368421	-0.247371	-0.246570	0.000801
7.894737	-0.459238	-0.459842	0.000604
8.421053	-0.671105	-0.669392	0.001713
8.947368	-0.882972	-0.884241	0.001269
9.473684	-0.994840	-0.994168	0.000672
10.000000	-1.006708	-1.006708	0.000000

Received results linear interpolation and natural spline interpolation between the difference clear showed . Spline method of the signal high smoothness level recovered , errors

and whole in between control under This approach geophysicist signals digital in modeling reliable , physical to the laws suitable interpolation method that confirms [5,8].

In the study geophysicist signals spline method based on modeling issue studied. Cube splines interpolation and grinding advantages determined and practical in terms of from the test Geophysical in the data uncertainty and violations eliminate in the process of spline methods high accuracy provided. Digital calculation algorithms based on signal modeling effective Done . Results geology and land resources search in the fields application for useful that shown.

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