

Using A Numerical Method and A New Mathematical Technique to Analyze Gum Arabic Production Data

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Abstract

Our problem is that Gum Arabic needs a certain environmental condition. Factors that influence are difference, Gum Arabic is one of the most important Agricultural exports of North Kordofan State which it used in various industries, its found that Gum Arabic is planning during the rainy season which is joined with temperatures. We aim to analyze Gum Arabic Production Data in North Korodfan State in the period 2011–2017 and to compare with the temperature .We followed the numerical mathematical method using the Newton’s interpolating method and a new mathematical technique using Matlab and we found the following some results : We have the same two polynomials , increasing the production of Gum Arabic in North kordofan State when the temperature increases in addition to the difference in the production of Gum Arabic at the same temperatures is due to other factors that that we leave to the researchers .

Keywords: Numerical Method, New Mathematical Technique , Analyze , Gum Arabic Production Data , Temperatures.

1. Introduction:

The statistical data will be analyzes using Newten’s interpolating method and Matlab program. Both of two methods depend on study dependent and independent variables , statistical data of Gum Arabic in North Kordofan State in the period 2011-2017 reused to study the relation between the production as a dependent variable (y) and temperatures as an independent variable to measure it’s influence on production then to make comparative between Newton’s interpolating method and Matlab programming. To present and display results.

2.Methodology:

i. Newton’s Interpolating Method:

The numerical analysis is provide convenient methods for obtaining useful solutions to mathematical problems and for enlivening useful information from available solutions which are not expressed in tradable forms – such problems may eadi be formulated, for Example in terms of an algebraic or transcendental equations, or aninteyral equation or in terms of asset such equations. [1]

Analytical solution’s when variable may be of unacceptable prosse in themselves, Bart my be of unacceptable form because the fact that they are not amerable to dired interpolation in numerical terms, in which case the numerical analyst may attempt to devise a method for effecting that interpolating in satisfactory way, or he may prefer to base his numerical analysis instead upon the original formation.

More frequently, there is known method of obtaining the solution in a precise form, convenient, or other wise. In such a case, it is necessary either to attempt to approximate the problem satisfactorily by one which is amenable. [1]

Definition (2.1):

Newton’s interpolating Method used different steps to find the polynomial which is not more than (P_{R+1}) from the polynomial which is not more than degree of (P_R) form scheduled data.

x_0	x_1	x_2	...	x_R	x_{R+1}
y_0	y_1	y_2	...	y_R	y_{R+1}

Definition (3.2):

In this Method there are two cases to find the polynomial.

First Case:

If there is an obvious relation between values of dependent variable and independent variable the polynomial will be.

$$P_{R+1}(x) = P_R + C_{R+1}(x - x_0)(x - x_1)(x - x_2) \dots (x - x_R)$$

$$C_{R+1} = \frac{y_{R+1} - P_R(x_{R+1})}{(x_{R+1} - x_0)(x_{R+1} - x_1) \dots (x_{R+1} - x_R)}$$

Second Case:

If there is no obvious relation between, the dependent and independent variable - to find the polynomial we will follow a set of steps suppose that: [1]

$$P_0(x) = c_0 = y_0$$

$$P_1(x) = P_0(x) + c_1(x - x_0)$$

$$c_1 = \frac{y_1 - P_0(x_1)}{(x_1 - x_0)}$$

$$P_2(x) = P_1(x) + c_2(x - x_0)(x - x_1)$$

$$c_2 = \frac{y_2 - P_1(x_2)}{(x_2 - x_0)(x_2 - x_1)}$$

$$P_{R+1}(x) = P_R(x) + C_{R+1}(x - x_0)(x - x_1)(x - x_2) \dots (x - x_R)$$

$$C_{R+1} = \frac{y_{R+1} - P_R(x_{R+1})}{(x_{R+1} - x_0)(x_{R+1} - x_1)(x_{R+1} - x_2) \dots (x_{R+1} - x_R)}$$

ii. Introduction to Matlab:

In 1960 and 1970 before the appearance of personal computer, Complex and large scale calculation were done on large subroutines main frames using code primarily developed with for TRAN- As number of related large subroutine were developed for specific computational process they were organized into public domain packaged and distributed free. [4]

Matlab was originally created as front end for of these, the UNPAOK Package. a group of routines for working with matrices and linear algebra the primary developer, professor Cleve Moler at the university of New Mexico – eventually founded Mathwork.INC. to further develop and market the product in a commercial setting.[3]

From the original Matlab, a high powered suite of application has evolved. The Current generation release .The Matlab R2006 suite. Feature the Newest kernel, 7.3. it is largely backward compatible with recent Matlab releases . But there may be some slight change. [3]

a. How to get Started:

We have two types to start Matlab program:

- Look for the Network Application folder and double click on it.
- Double click on that After 30 second, Matlab with pen and see screen shape. [3]

b. Simple Arithmetic with Matlab:

The basic arithmetic operators are + , - , *
(for Multiplication, / (for divide) & ^ for powers.

c. The Order of Operations and pulling brackets in the following calculation does Matlab the

* or the [^]first

>> 3²*4

* things inside brackets are done first

* with in a bracket or expression generally operations closest to a value are done first [7]

d. Functions:

Matlab has large number of put in functions Exp is e^x

Sin x is $\sin(x)$, $\log(x)$ is the natural log of x .

For help on particular topic type Help topic. [3]

e. Plot:

To plot with separated points use plot ($t, y'', 8''$)

To get much more information about plot type help plot.

Plot two function

To plot 2 function, say $w = te^t$ and $u = t^3 \log(1 + 10)$

On the same graph with e.g. [3]

f. Dynamics for Two:

Create afile tow-m containing : function

$Y = two(t, x)$

$k_1 = -.2 * x(1) + 2 * x(2);$

$k_2 = -3 * x(1) - 0.5 * x(2);$

$y = [r_1; r_2]$

Where r_1 and r_2 respectively are the first line and second line of the right hand of the system.[3]

3. Gum Arabic:

Gum Arabic or gum Acacia has been and Important commercial product for thousands of years. The gum is direct sticky exudation obtained from the stems and branches of several species of Acacia truss specially Acacia Senegal and A. Seyal. The gum is produced by trees, 3-30 years old, and the biosynthesis process, referred to as gummosis, is most prevalent when the trees are subjected to trees conditions such as wounding.[2]

i. Soil:

Poor soil lock of moisture, or hot temperature.

ii. Production:

Sudan has traditionally been the world's large Product or of Gum Arabic.[2]

iii. Objective of Gum Arabic:

It has a cytstal purecalar. It has ability to create is a thin an sticky transparent layer also it has ability to solve with 55% of concentration.

Gum Arabic used as food, and medicines and so on. [2]

4. Analysis and Discussion:

Interpolation lies at the heart of dissocial numerical analysis there are two main reasons for this, the first is that in hand computation there is continuous need to look up the value of a function in a table. In order to find the value of the function at no tabulated, argument, it is necessary to interpolate. Moreover, the highly accrual tables at small increments of the argument we take for granted today are mostly of comparatively recant origin. [1]

i. Statistical Data using Newton's Interpolating Method:

- Gum Arabic production will analyze during 2011/2017 in North Kordofan State .
- The temperatures during 2011/2017 in North Kordofan State.

Table No. (1)

Years	(x) Degrees of Temperature°C	Production (tons)
2011	34.9	103181
2012	34.7	81744
2013	35.5	653097
2014	34.8	61967
2015	34.8	91550
2016	32.5	201156
2017	34.9	96566

Table No. (2)

x	34.9	34.7	35.5	34.8	34.8	32.5	34.9
y	103181	81744	653097	61967	91550	201156	96566

Create $p_0 \cdot p_1 \cdot p_2 \cdot p_3 \cdot p_4 \cdot p_5 \cdot p_6$

Let $p_0(x) = C_0 = y_0 = 103181$

$$p_1(x) = p_0(x) + C_1(x - x_0) \Rightarrow C_1 = \frac{y_1 - p_0(x_1)}{(x_1 - x_0)}$$

$$= \frac{81744 - 103181}{34.7 - 34.9} = 1.07.185$$

$$p_1(x) = p_0(x) + C_1(x - x_0) = 103181 + 107185(x - 34.9)$$

$$= 107185x - 3637575.5$$

$$p_2(x) = p_1(x) + C_2(x - x_0)(x - x_1)$$

$$C_2 = \frac{y_2 - p_1(x_2)}{(x_2 - x_0)(x_2 - x_1)} = \frac{653097 - (107185(35.5) - 3637575.5)}{(35.5 - 34.9)(35.5 - 34.7)}$$

$$= 1.011677 = 1$$

$$p_2(x) = 1.07185(x) - 36137575.5 + 1011677(x - 34.9)(x - 34.7)$$

$$= 1.07185x - 3637575.5 + 1011677(x^2 - 69.6x + 121.03)$$

$$= 1.011677x^2 - 7.0305536x + 7.1419$$

$$p_3(x) = p_2(x) + C_3(x - x_0)(x - x_1)(x - x_2)$$

$$C_3 = \frac{y_3 - p_2(x_3)}{(x - x_0)(x - x_1)(x - x_2)}$$

$$= \frac{61967 - (1.01167(34.8)^2 - 7.0305536(34.8) + 12215.33662)}{(34.8 - 34.9)(34.8 - 34.7)(34.8 - 35.5)}$$

ii. Statistical Data using Matlab:

```
clear all
clc
x=[34.9 34.7 35.5 34.8 35 32.5 34.8];
y=[103181 81744 653097 61967 91550 201156 96566];
for i = 1:6
c(i) = ((y(i+1) - y(i))/(x(i+1) - x(i)))
end
p=(c(1)+c(2)+c(3)+c(4)+c(5)+c(6))
```

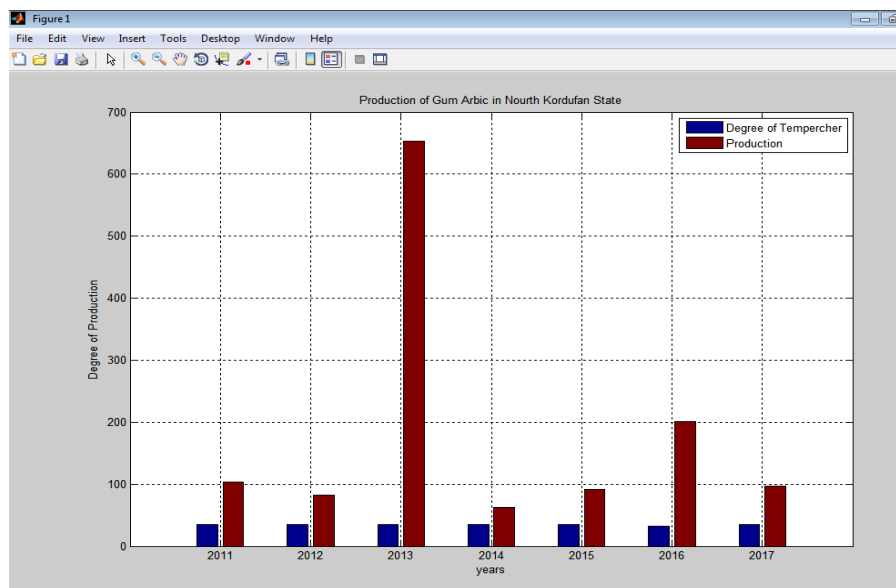
Solution

```
c =
    1.0719e+05
c =
    1.0e+05 *
    1.0719    7.1419
c =
    1.0e+05 *
    1.0719    7.1419    8.4447
c =
    1.0e+05 *
    1.0719    7.1419    8.4447    1.4791
c =
    1.0e+05 *
    1.0719    7.1419    8.4447    1.4791    -0.4384
c =
    1.0e+05 *
    1.0719    7.1419    8.4447    1.4791    -0.4384    -0.4547
p =
    1.7244e+06
```

iii. Program of Graphic:

```
clear all
clc
x=[2011;2012;2013;2014;2015;2016;2017];
y=[34.9 103.181;34.7 81.744;35.5 653.097;34.8 61.967;35 91.550;32.5 201.156;34.8 96.566];
bar(x,y)
legend('Degree of Temperatures ','Production')
xlabel('years');
ylabel('Degree of Production');
title('Production of Arabian Gum North Kordufan State');
grid
shg
```

Solution



Discussion and Results:

The performance of the Matlab functions designed was evaluated in North Kordofan State and analyze the Gum Arabic production data . Matlab functions were selected to test data for validation .This study has pursued a new style in analysis and calculating of data by using Matlab program other studies that used the manual processing .This study was a great success in the Gum Arabic production data as sample by using high quality program (Matlab) and very accuracy in the results but failed something prediction results in future . and solved this problem by use map of rains as reference contain all levels of rains after this solving we achieved more than 95% accuracy for analysis data .We found similarities between this study and other studies in the analysis and counting of data in usage of computer processing however, this study was characterized by used a lot of data from different area as well .Through the graphic we noticed that a slight difference in temperature leads to slight in the production of Gum Arabic and that the highest level of production was in the year 2013 due to the high temperatures in that year .

Conclusion:

We presents computers processing systems for Gum Arabic production data by using Newton's interpolating method and Matlab program for analysis and counting and classification of data. We found that the analysis using Matlab is best than the analysis using Newton's interpolating method , because Matlab reduces the analysis time and also reduces the arithmetic errors during the analysis using Newton's interpolating method , as it helps us to provide the solution graphically , A new algorithm is designed based on the type of data and compared results with each year in State, Matlab functions results showed excellent efficiency with 95 % accuracy for analysis, counting and classification, so we recommended to use Matlab to analyze and count various mathematical problems in our life.

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