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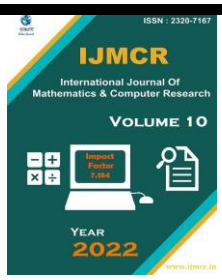

Analysis and Modeling of Cancer Data Numerically by Matlab

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ABSTRACT

Matlab develop the math works stands for matrix laboratory.It is a software package used to perform scientific computation and visualization. It capability for analysis of various scientific problems, flexibility and powerful graphic makes it a very useful software package. The aims of this paper is to analyze and modeling the Cancer data numerically and by Matlab . We followed the applied mathematical method using Matlab. And we found the following some results**:** Sport modeling helps create a cancer simulator, the Tallabic is a model for a disease vector and has helped many in medicine and other fields. Cancer is one of the most dangerous diseases in the world, with the highest death rate due to this disease, and it has many types, including colon, breast and oral cancer. There are different ways to treat cancer, including chemotherapy, removing some parts of the body and *x*-rays. And the most vulnerable to cancer are women. Mathematical modeling has contributed to determining the growth of cancerous tumors and following-up treatment methods, to reduce the spread of the disease and contribute to the treatment of serious cancer

KEYWORDS: Analysis , Modeling , Cancer Data, Numerical , Matlab

1. INTRODUCTION:

Cancer affectively all communities worldwide, approximately 12.7 million people are diagnosed with cancer and more 7.6 million died of the disease during 2008. Of these 50 cent of new cases and 63 per cent deaths occurred developing countries large variations in both cancer frequency and case fill are observed, even in relation to the major forms of cancer different regions of the world for men and women [14]. Overall, about 4 – 5 % of the population of developing countries covered by routine registration of mortality statistics. Cancer registries are another important source of data on cancer occurrence, but also cover only limited geographic areas – about 3% of the population of developing countries [9].

It result from aberration of the normal mechanisms which control cell number these are cell production by cell division and cell loess by the production of apoptosis . Most tumors are monoclonal, I. e all the cells in at tumors are have risen from one parent cell which has sunder gone a genetic change, which is then passed on to all its progeny. Because the tumor cells lack the normal control mechanisms , the clone expands due to und controlled proliferation , although the tumor is derived from one clone , further genetic changes develop in some of the progeny [5].

2. DEFINITION OF CANCER:

Definition (2.1):

Cancer are caused by combined genetic and non – genetic changes induced by environ mentioned factors that trigger in appropriate activation or in activation of a specific genes leading to neoplasm transformation or abnormal cell growth [18]

3. DIAGNOSIS OF CANCER:

Cancer diagnosis comprises the various techniques and procedures used to detect or confirm the procedures of cancer. Diagnosis typically in voles evaluation of the patients history , clinical examination , review of laboratory test results and radiological data and microscopic examination of tissue samples obtained by biopsy or fine needle aspiration . Cancer staging is the grouping cases into broad categories based on the extent of disease , that is how fare the cancer has spread from the organ or site of origin (the primary sit).Knowing the extent of disease (or stage) helps the physician determine

the most appropriate treatment to either effect a cure , decrease the tumor burden or relieve symptoms . "Early cancer " refers to stages I and II. Advanced cancer "refers to stages III and IV. Stage of disease at diagnosis is generally the most important factor determining the survival of cancer patients. [15]

3.1 Epidemiology of Selected Cancer:

i. Cancer of the Cervix:

This is the second most common cancer among women worldwide, with an estimated 530.000 new case and 275.000 deaths with overall incidence: mortality ratio of 50 per cent. Developing countries, where it is often the most common cancer among women, account for 88 per cent of cases. Wide variations in incidence and mortality from the disease exist between countries. Cases and deaths have declined markedly in the taste 40 years in most industrialized countries, partly owing to a reduction in risk factors, by mainly as result of extensive screening program s. Mon limited improvement have been observed in developing countries , where persistently high rates tend to be the rule . In India, cancer of the cervix is number one killer cancer among women. Ti is estimated that during 2008, 134.420 new case of cancer cervix occurred in the country (incidence rate of 27 per cent I ac population) and about 72.825 women died of the disease (mortality rate of 15.2 per cent I ac population). It come to 23.3 per cent of all cancer deaths in women and about 11.4 per cent of total cancer deaths in the country. Risk factors of cervix cancer [17].

a. Age:

Cancer cervix relative young women with incidence increasing rapidly from the age 25 to 45, then leveling off, and finally falling again [18].

b. Early Marriage:

Early marriage, early coitus, early childbearing and repeated child birth have been associated with increasing (17).

ii. Breast Cancer:

Breast cancer is by far the most frequent cancer among women, with an estimated 1.38 million new cases diagnosed in 2008 (about 23 per cent of all cancer). It is now the most common cancer both in developed and developing regions with about 690.000 new cases estimated in each region. Incidence rates vary from 19.3 per I ac women in eastern Africa to 89.7 per I ac women in we storm Europe. The range of mortality rate is much less, approximately 6- 19 per I ac , because of the more Favourable survival of breast cancer cases in developed countries . As a result, breast cancer ranks as the fifth cause of death from cancer, but it is still the most frequent cause of cancer death in women in developing regions. It is estimated that during the year 2008, about 115.251 new cases of breast of breast cancer in women occurred in India which accounts for 12.14 per (16). Cent of all malignant cases (an incidence cerate of 22.9 per cent of all population). About 53.592 women died of this cancer (mortality of 78.46 per cent of all cancer cases), mortality rate being 11.1 per cent population, second only to cancer cervix mortality in women. Risk factors:

a. Age:

The incidence increasing rapidly between the age 35 and 50. A slight bimodal trend in the age distribution has been observed [11], with a dip in incidence at the time of menopause. Rise in frequency often occurs after the age of 65. Women who developed their first breast cancer under the age of 40, had three times the risk of developing a second breast cancer than did those who developed their first cancer after the age of 40. Indeed the a etiologies of pre – menopausal and post – menopausal breast cancer appears to be different. Breast cancer is not only in frequent in India women, but also it occurs in them a decade earlier than in western women – the mean age of occurrence is about 42 in India, as compared to 53 in the white women [18].

b. Family History:

The risk is high in those with appositive family history of breast cancer, especially if a mother or sister developed breast cancer when premenopausal [17].

c. Parity:

Macmahon , their international case – control study found that the risk of breast cancer is directly related to the age at which women bear the first child . An early first, pregnancy is delayed to their late effect. Those whose first pregnancy is delayed their late thirties are at a higher risk than multi parous women. Unmarried women tend to have more breast tumors than that married single women, and nulliparous women had the same risk [14].

iii. Oral Cancer:

Oral cancer is one of the ten most common cancers in the world. Ti high frequency in central and south east Asian countries (e.g , India , Bangladesh , Sri lanka , Thailand , Indonesia and Pakistan) has been well documented it is estimated that during the year 2008 , about 2.6 I ac new cases and 1.27 I ac death occurred worldwide with a mortality rate of 1.9 per I ac population . Epidemiological features of oral cancer.

a. Tobacco:

Approximately 90 per cent oral cancer in south East Asia are linked to tobacco chewing and tobaccos smoking.

b. Alcohol:

Data in dictate that oral cancer canal so be caused by high concentration of alcohol, and that alcohol appears to have a synergistic effect in tobacco user [17].

3.2 Incidence of Cancer:

Cancer incidence is defined as the frequency of occurrence new case of cancer in a specific for a given period of time. It can be expressed as the absolute number of caser as a rate per unit – time, with cancer cases as the numerator the corresponding person – time at risk as the denominate comparisons of incidence rate can elucidate the underlying risk factors, aid planning and prioritization of resources of cancer control, and monitor and evaluate the impact of spies of primary prevention intervention. [9] Cancer is second only

to coronary artery disease as being the commonest cause of death in the western world. For example, in Scotland during 1990s (the most recent year for which complete figure are available), 31480 new cancer patients were registered, and there were 15030 death . This given an incidence of 5555 per million op population for males for males and 6746 fore females . Based on current incidence cancer rate it is estimated that 1 in 3 people will develop cancer at some times during their life . There is a subs tan tile disparity in the ability high – quality cancer registration date between high – and low – to middle – re source countries while 83% of the north America population were comprehensively covered in the 9th volume of (15, only 6%, 4% and 1% of the respective south America, Asian and African country tries had registries accepted for inclusion [7]. In some measure an individuals likelihood of developing a cancer is expressed by national in cadence and mortality rates. For example residents of the United States have about a one in five chance of cancer. There were, it is estimated about 556,000 deaths from cancer in 2003s, representing 23% of all mortality a frequency surpassed only by death caused by cardiovascular by cardiovascular disease. These data do not in clued an additional 1 million , for the most part readily curable , non-melanoma cancers of the skin and 100,000 cases of carcinoma in situ , largely of the uterine cervix but also of the breast . The major organ sites affected and the estimated frequency of cancer death are shown. The most common tumors in men are prost ate, lung, and colorectal cancer. In women, cancer of the breast, lung and colon and rectum are the most frequent. Cancer of the lung, female breast, prostate and colon / rectum constitution more than 50% of cancer diagnose and cancer diagnose and cancer in the us population. The age – adjusted death rates (number of death per 100,000 population) for many from of cancer have sign efficiently changed over the years. Many of the long term temporal comparisons are noteworthy [12]. Throughout the western world the commonest sites of malignant disease are the lung, large bowel and breast. over the past 25 year the incidence of lung cancer in men has increased by 125%, and even more significantly in women concomitant with their increased consumption of cigarette, The incidence of colonic, prostatic and bladder cancer has also shown an increase but during the past decade there has been decrease in the incidence of carcinomas arising in the stomach, uterus, rectum and esophagus[7] .

4. THE MODELING

4.1 Introducing: To define the phrase Mathematical modeling, we first define the term model the word mixed is used frequently in everyday language. We talk about model airplanes, model houses, models on a runway, and so on. What does the term model mean in a mathematical sense?

I uses (5, 1999) define a model as a simpler realization or idealization of some more complex reality ". The real is a very world is a very complex place. To better understand it. We need to try to simplify it to reasonable degree, describe the simplification in ways we can understand and work with, and then study the simplification. This is what we call modeling.

A mathematical model then can be defined as a model constructed using mathematical terms, symbols and ideas. Giordano (54, 2003) defines a mathematical model as a mathematical construct designed to study a particular real_ world system or phenomenon. Mathematical models can talk many different forms. They may involve equations .in equations differential equations, matrices, logic, or any other type of mathematical idea.The Rey idea is that we use mathematics to describe a portion of the real world.Therefore a very simple but general definition of the process of mathematical modeling is a definition(5.1.1) mathematical modeling is the application of mathematics to real _world problems[3]

4.2 Modeling Basics:

If we were to ask several people for example of models, we world get a variety of responses which might indeed mathematical equations, toy trains, prototype cars, or fashion model.What these very different objects have in common is that they are representation of reeling .The equation may represent the growth of a population ,the toy train is representation of a real train ,the prototype is a representation of a future car ,and a fashion model is representation of how clothes will look when worn and may be other things that one has to live in the world of fashion to appreciate .A model is then ,a representation of reality. This however is not a sufficient definition. How can one evaluate different methods? A fashion model and a toy train are both representation of reality, but so vastly different that they are incomparable. A street map of a city a road map of the whole United States are representation of reality which are similar, but neither can substitute for the other. Intrinsic in a model is a sense of purpose. We define a model to be a purposeful representation of reality. A Street map misrepresentation of reality for the purpose of navigating streets in a particular city. It is useless for driving a cross country or even for location traffic jams or constructing within a city but that does not make it a bad model. Other models are needed for those purposes. A successful fashion model serves the purpose of selling clothes, perhaps by creating some fantasy about what people will look like. An artist model serves a different purpose. For this purpose, perhaps someone who is less glamorous, but with more idiosyncrasies might be a better model. There are different types of toy train, some are for young children, some are for older children, and others are for a adults. Again different purposes result in different models. [3]

4. 3 The importance of Mathematical Modeling :

We attempt to give equal emphasis to all three aspects. One cannot underestimate the importance of good experiments in developing mathematical models. However, mathematical models are important in their own right, aside from an attempt

to mimic nature. This occurs because the real world consists of many interacting processes. It may be impossible in an experiment to entirely eliminate certain undesirable effects. Furthermore one is never sure which effects may be negligible in nature. A mathematical model has an advantage in that we are able to consider only certain effects, the object being to see which effects account for given observation and which effects are immaterial. The process of applying mathematic never ends. As experiments or observations are made, the mathematical model is continually revised and improved. To illustrate this we first study some problem from physics involving mechanical vibrations [16].

4. 4 Modeling Change:

A powerful paradigm to use in modeling change is

Future value = present value + change

Often, we wish to predict the future on what we know now, in the present, and add the change that has been carefully observed. In such cases, we begin by studying the change itself according to the formula

$$\text{Change} = \text{Future value} - \text{present value}$$

By collecting data over a period of time and plotting that date, we often can discern patterns to model that capture the trend of the change. If the behavior is taking place over discrete time periods, the preceding construct leads to a difference [8].

4.5 Modeling Change with Difference Equations:

We build mathematical models to describe change in an observed behavior . When we observe change, we are often interested in understanding why the change occur in the way it does, perhaps to analyze the effects of different conditions on the behavior or to predict what will happen in the future. A mathematical model helps us better understand a behavior while allowing use to experiment mathematically with different conditions affecting it [8].

5. MATHEMATICAL MODELING AND DISCUSSION:

We illustrate the process of mathematical modeling with an example of bacteria in Petri dish as described section.

i. State the Question to be answered:

In many situation, this step is almost trivial, in other, it is the most difficult part the process. The question should be narrow enough to make the problem managed not too narrow so that the problem is trivial. Initially we may want to focus on Paros question and then use the knowledge gained to broaden the question at a later time. The question should also be stated in precise mathematical terms so it can easily be translate into mathematical notation [4].

ii. Select the Modeling Approach:

We determine the form of the model. In some situations this is ever to do other we may have several reasonable choice. Making the right choice re quince at less some knowledge of all the possibilities. It also depends on the nature of the assumptions being made. Often this step begins with we some simple observations. Note that we started with 500 bacteria. After 1 day, the number increased by 25, which is 5% of 500. After a scone day, it increased by 26, which is approximately 5% of 525, the growth rate or change per day appears to be relatively constant. This suggests a simple relationship between the populations on consecutive days.

Population on one day = Population on the previous day + 5%

This relationship indicates that we may be able to derive a simple equation to model the population (2).

iii. Define Variables and Parameters:

Variables are quantities that could change within a problem. Parameters are quantities that are constant within a problem, but could change between problems of the type. The first part of this step is to determine what variables and parameters are involved. This may be simple and obvious, or very complicated. Often times there are potentially hundreds of quantities involved. To make the model manageable, we need to make assumptions as to which are the most important and which can be ignored. At a later time we can add additional variables and parameters to refine the model [2].

iv. Simulation Modelling:

In many situation a modeler is unable to construct an analytic (symbolic) model adequately explaining the behavior being observed because of its complexity or the intractability of the proposed explicative model. Yet if it is necessary to make prediction about the behavior, the modeler may conduct experiments (or gather data) to investigate the relationship between the dependent variable(s) and selected values of the independent variable (s) within some range. We constructed empirical models based on collected data. To collect the data, the modeler many observe the behavior. In other instances, the behavior might be duplicated (possibly in a scaled – down version) under controlled conditions, as will be done when predicting the size. In some circumstances, it may not be feasible either to observe the behavior directly or to conduct experiments. For instance, consider the service provided by a system of elevators during morning rush hour. After indentifying an appropriate problem and defining what is by good service, we might suggest alternation delivery schemes, such as assigning elevators to even and odd floors or using express elevators [8].

V. COMPUTER SIMULATION:

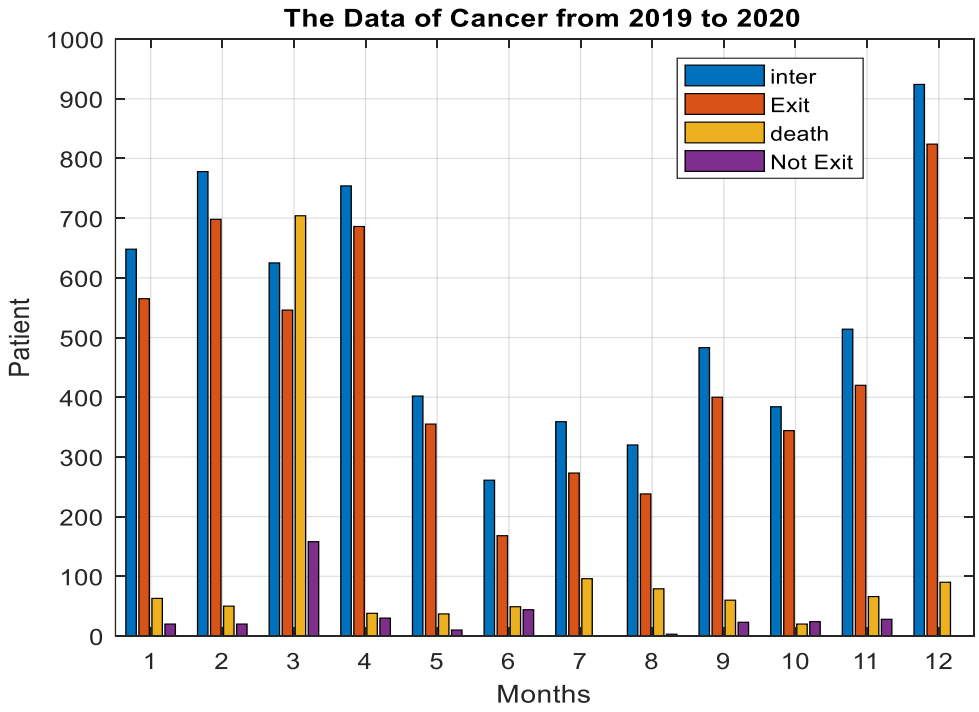
Regardless of the simulation language selected, several requirements for digital simulation must be fulfilled by the user. The first task is to describe the system to be simulation. This involves specifying the type of elements, or functional blocks, of which the system consists and describing how the elements are interconnected. This is accomplished by means of structure statements or command which include all the standard functional blocks of feedback control system, as well as provisions for writing equations to specify functional relations hips. The output of each block in terms of inputs and parameters must be specified. In most cases, all that is necessary is to select the appropriate function from a menu

and specify the input and parameters. The user can specify meaningful names for system variables and parameters to make the simulation output correspond to the quantities of the system being studied.

The second task is to provide values for system constant, parameters and initial conditions and to specify arbitrary function. These statements are usually called data definition or parameter commands. The third requirement for using a digital simulation program is the specification of start and run times, and other controls on the simulation process. Some simulation packages permit the user to specify the integration, interval, integration method and allowable integration error. Condition for halting simulation, changing parameters and restarting a simulation run can also include. These statements are generally referred to as control statements and provide considerable flexibility [13].

Table 1. The Data of Cancer from 2019 – 2020

Not Exit	Death	Get out	Enter	Month
20	63	565	648	1
20	50	698	778	2
158	74	546	625	3
30	38	686	754	4
10	37	355	402	5
44	49	168	261	6
10	76	273	359	7
3	79	238	320	8
23	60	400	483	9
24	20	344	384	10
28	66	420	514	11
5	95	824	924	12



The above figure describes a summary of the study that took place at the Corn Hospital in Khartoum State for cancer for the year 2019-2020 from January to December, where the study dealt with hospital admissions, discharge, deaths and non-discharge (i.e. stay in hospital) for each month separately.

And by collecting data from the Statistics Department in the hospital and representing them in the figure above, the lowest results for the four cases were recorded in June and July. The readings increased gradually in August, September, October and November by a very small percentage. As for the month of December, the highest reading was recorded, due to the fact that the months from June to November are rainy months, and this imposes two factors, the first factor: the patients' preoccupation with agriculture to save money and increase productivity to obtain living costs and treatment. The second factor: the difficulty of traffic from the country side to Khartoum to receive treatment at the Corn Hospital.

RESULTS

Sport modeling helps create a cancer simulator. The Tallabic is a model for a disease vector and has helped many in medicine and other fields. Cancer is one of the most dangerous diseases in the world, with the highest death rate due to this disease, and it has many types, including colon, breast and oral cancer. There are different ways to treat cancer, including chemotherapy, removing some parts of the body, and x-rays. And the most vulnerable to cancer are women. Mathematical modeling has contributed to determining the growth of cancerous tumors and following-up treatment methods, to reduce the spread of the disease and contribute to the treatment of serious cancer.

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