Exponential Growth Report

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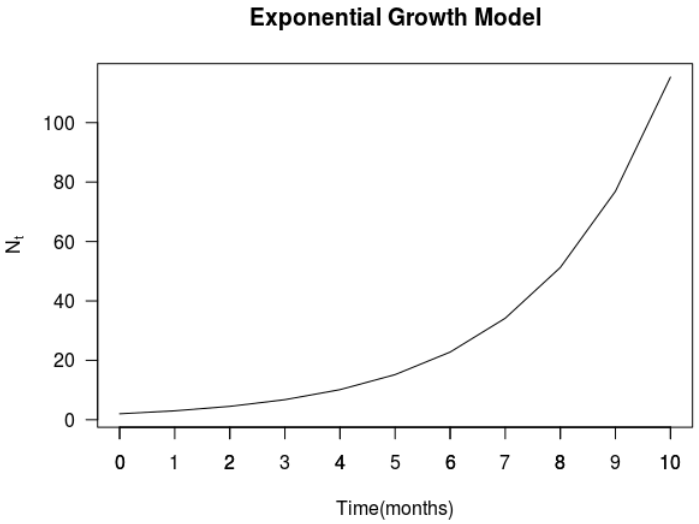
1 A Brief Introduction

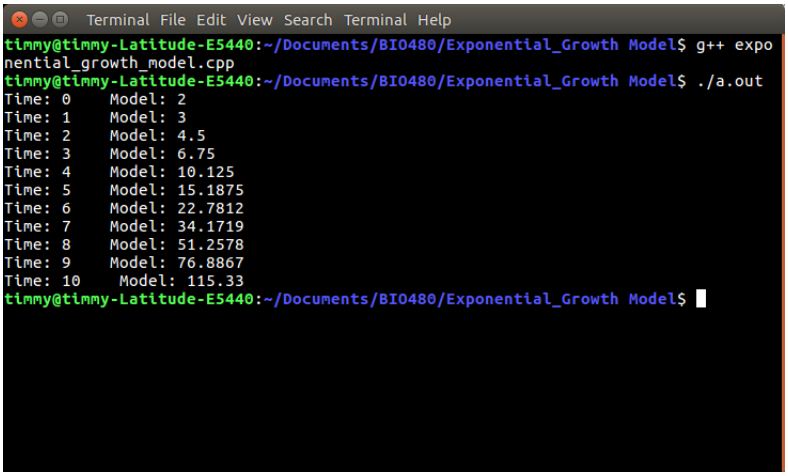
An exponential growth model observed was represented by the equation $N_{t+1} = N_t + rN_t$; where N_t represents population , r represents growth rate and t represents time. In this lab, the equation represents the rate at which the population produces their offspring is dependendent on the total population size. The case for this lab, the initial reproduction rate of the rodents is set to 50% per month.

2 Results

2.0.1 Graph



2.0.2 Console



3 Conclusion

From the graph above, we can clearly see the exponential growth. The graph shows an upward trend over a period of 10 months. The population grows at a rate depending on the proportion of the current size. This model does not take age and geographical considerations. As such, this is an example of a density independent model.

4 Appendix

4.0.1 C++ Code for Exponential Growth Model

```
1  // Name: Timmy Nguyen
2  // Date: 1-30-2016
3  // Assignment 1: Exponential Growth Model
4  // Biol 480 Spring 2016
5
6  #include <iostream>
7  #include <iomanip>
8  #include <string>
9  // For output file writing.
10 #include <fstream>
11 using namespace std;
12
13 // # of Months: 10
14 const int length = 10;
15
16 // Spacing function for formatting
17 string spacing()
18 {
19   string spacing_ = "     ";
20   return spacing_;
21 }
22
23 int main()
24 {
25   // Given reproductive rate
26   double r = 0.5;
27
28   // Initial time
29   double t = 0.0;
30
31   // Initial Population
32   double *N_array;
33   N_array = new double[length];
34   N_array[0] = 2;
35
36   /**
37    * @brief Exponential Growth Equation
38    * @details Output prediction observation values
39    * @return prediction data
40    */
41   for (int i = 0; i < 11; ++i)
```

```
42    {
43        N_array[i + 1] = N_array[i] + r * N_array[i];
44    }
45
46    /**
47     * @brief Output file
48     * @details write to a separate file
49     * @return written data.
50     */
51    ofstream outFile;
52    outFile.open("input.txt");
53
54    for (int i = 0; i < 11; ++i)
55    {
56      outFile << t << spacing() << N_array[i] << endl;
57      t++;
58    }
59
60    outFile.close();
61    delete [] N_array;
62
63    return 0;
64
65
66 }
```

4.0.2 R Code for Generating Graph

```
1 mydata = read.table(file.choose())
2 colnames(mydata)<-c("Time(months)", "Model")
3
4 plot(mydata[,1:2], type="l",main="Exponential Growth Model"
5       ,xlab="Time(months)",ylab =expression("N"[t]), las=1)
6 axis(side=1, at=c(0:10))
```