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**A Message To Our Client**

Dear Monika Szoke,

TriHelix Solutions is incredibly humbled to have been selected by you as the programming team in charge of bringing this Richard Dawkins’ project to life. We hope you will be pleased with the outcome of our application, bioMorph, and with the full experience of our services. We will stay in contact with you as we approach the developing stages of our application. As well feel free to contact us if in need of further assistance.

We look forward to working with you!

Sincerely,  
The TriHelix Solutions Team

**Introduction**

Our company, TriHelix Solutions, is comprised of savvy computer science programmers: Thomas Lien, Nam Nguyen, and Ana Vila. With our three years of experience in the field of computer programming, we hope you will be pleased with our final application. bioMorph will be carefully designed to act as a Simulation of Natural Selection, satisfying the needs of yourself, our prized client and school biology teacher, Monika Szoke.

Based on *The Blind Watchmaker* by Richard Dawkins, bioMorph will perform similar functions and resemble the original genes displayed in the text, with our own twist throw into the mix to create unique and more intricate organisms with increasingly different genetic makeups.

**Application Overview**

As mentioned above, our application will loosely mimic the concept of natural selection found in any given ecosystem, whereby an organism reproduces and creates a child with a slightly modified genetic makeup. The survival of this new organism, as well as any of its offspring, will be entirely in the hands of the user of the application. The interactive nature of bioMorph ironically allows for an almost “artificial” natural selection, in which the user-desired organism will survive, and the others will not.

The following list highlights the main components included in the application, as well as a few extra enhancing functions that will be included if time permits. In the following section of this report, you will find a detailed explanation of each of the listed functions and their purpose and utility within the application.

Main Components:

* Interactive Selection
* Drawing of the Organisms
* Saving/Loading Organisms
* Displaying Succession Tree

Extra Add-Ons (Time-Permitting):

* Redo Function
* Print Copy

The above components will shape the bulk of our application, however bioMorph will also include a multitude of user-guiding and user-friendly features to ease yourself (our client), as well any other user, through the process of using and understanding our application and its capabilities.

**Main Components**

Interactive Selection

bioMorph will be designed to create organisms with varying gene modifications. The reproduction of these organisms will lead to children with slightly different genetic makeups. From these children, the user will be able to select which one they wish to survive and pass on its modified genes. This interactive component allows the user to somewhat manipulate and “guide” the aesthetics of the new organisms that will be formed as a result of their selection, however, the slight variance in genes will be controlled by the computer and produced at random.

Drawing of the Organisms

The main goal of bioMorph will be to graphically display the intricate changes in appearance of the organisms, and explore their endless genetic possibilities. The organisms will mutate at random, but only one of their genes will change. bioMorph will draw the parent and its children with the randomly mutated genes to the screen, and once the child to survive is selected, it will become the new parent and its new children will be drawn (and so on…). As a result of these drawings and the gene modifications, bioMorph will be able to display incredibly elaborate patterns with its organisms.

Saving/Loading Organisms

A key feature of bioMorph will be the saving and loading of organisms. The application will allow the user to save any organisms of their choice, give them a name, and then be able to load them back into the program to view them provided they enter the correct name. The application will do this by storing the organism’s exact genetic makeup, and drawing it onto the screen once it is loaded. This is a very useful feature, as Dawkins himself discovered, for it will allow the user to save particularly interesting organisms and display them at will.

Displaying Succession Tree

The function of displaying the succession tree of an organism, meaning all of the parent organisms before it, will be a very valuable component of bioMorph. It will allow the user a look into an organism’s past generations and changing genes. Dawkins incorporated a similar feature into his computer application that allowed him to view the evolution of a given organism, proving very useful when attempting to recreate certain organisms. A basic idea of what this function of the application would perform and display would be Figure 4 in *The Blind Watchmaker.*

**Extra Add-Ons**

Redo Function

As described earlier, bioMorph allows its user to select the organism they wish to survive in a given generation. A redo function would simply allow the user to, after having selected an organism, go back and select another to survive instead. This would allow the user to investigate many unique evolutionary paths that the organisms might have taken, had the user selected differently.

Print Copy

The purpose of this add-on would be to physically print a copy of the organism and/or its succession tree. This bonus feature would allow you, our client, to bring to life your favourite organisms.

**Responsibility Break-Down**

Thomas - Interactive Selection, Saving/Loading Organisms

Thomas Lien will be responsible for the above described function of interactive selection; developing the coded procedure that will enable the application’s user to select the surviving organisms. As well, Thomas will be in charge of the saving/loading aspect, a crucial component of bioMorph. He will undertake the task of storing (writing) the selected organism’s specific genetic data into files for future loading (reading) reference.

Ana - Drawing of the Organisms, Application Aesthetics

Ana Vila will be in charge of planning the visual effect of each gene on a given organism and displaying these changing effects effectively and pleasingly onto the screen. Once a decision on the specific visual impact of each gene has been reached, her task will be to reflect this through the evolving organisms created by bioMorph. A second task will be to design the overall aesthetics of the application; planning the layout and format of information on the screen, as well as ensuring a user-friendly and aesthetically-pleasing presentation.

Nam - Displaying Succession Tree

Nam Nguyen will work on the challenging task of displaying the succession tree of any given organism within the application. He will be in charge of making sure the data represented through an organism’s succession tree is stored and then presented in its correct order, with the correct genetic makeup of each generation before the selected organism. As well, he will be in charge of the format of the succession tree, and any user interaction with it.

Provided that time and resources permit, our team will be able to include some or all of the add-ons. In the event that this happens, you will be updated with a responsibility break-down for those specific components, in which (similarly to the break-down above) a detailed description of all of the member’s tasks will be outlined.

**Computer Science Comparison**

The purpose of bioMorph, as Dawkins envisioned it, will be to display the evolution of unique organisms through slight variances in specific genes. From parents to children, we will watch these organisms morph, and evolve far from their ancestors. The field of gene expression programming, although on a far broader and more encompassing basis, also seeks to use computer science and its programming and algorithmic capabilities to explore and understand genetic and evolutionary processes found in nature. Our application certainly fits into this area of computer science, albeit on a much smaller scale. bioMorph incorporates many of the basic genetic concepts modelled by gene expression programming, such as tree structures representing generations, mutations in genetic makeup and the inheritance of genes and traits from ancestral organisms.

Similar to bioMorph, other applications exist that attempt to recreate the process of natural selection and evolution. These electronic applications, for example: The Evolution Experience, generally incorporate environmental and predatory threats to the organism that result in evolutionary changes and mutations in order to increase its chances of survival. bioMorph on the other hand, seeks to simply display the evolution of an organism with slight modifications to its genes. It will not simulate the organism’s environment or its tribulations, but will instead allow the user to select the surviving organism. This, although a less accurate depiction of natural selection, will arguably constitute a more interesting method of visualizing the results of evolution through mutations.

**Ethical Issues**

TriHelix Solutions is committed to enforcing and practicing a strong code of ethics in regards to the programming aspects of bioMorph.

Societal Well-Being and Avoiding Harm - bioMorph will be designed with the utmost commitment to respecting its user. The application will not prompt any health or safety concerns for its user or its user’s computer. bioMorph will not be affiliated with any malicious software. TriHelix Solutions abides by this strict ethical policy in order to ensure total and absolute safety for its user, their computer and their information.

Intellectual Property - TriHelix Solutions acknowledges and fully gives credit to Richard Dawkins and any contributing parties to his book: *The Bling Watchmaker* for the idea and concept behind this application. Our goal is simply to recreate Dawkins’ computer program with a few minor changes unique to our application (for example: some of the genes and their effects). TriHelix Solutions is committed to reserving the intellectual property rights to their rightful owners and as such we here cite the book authored by Dawkins from which the idea behind bioMorph arose.

Dawkins, Richard. *The Blind Watchmaker*. New York: Norton, 1986. Print.

This application is not intended to accurately represent the effects of natural selection, and TriHelix Solutions understands that the implications and/or controversial messages of bioMoprh may conflict with some individuals’ personal and/or religious beliefs. We advise this be taken under consideration before usage of our application.