Project Deliverable C

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# Introduction

In the previous deliverable our team focussed on assessing the information gathered from the client, and created interpreted needs of the client. In this deliverable we outline the functional and non functional design criteria, and use these design criteria to benchmark other products against each other. Once the benchmarking is complete, then the team can determine target specifications from the benchmarking process. The goal of this deliverable is to understand what the target specifications of our product will be.

# Design Criteria

Functional: F, Non Functional: NF

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Need | | Design Criteria | F/NF |
| 1 | The product connects molecular and macroscopic. | | # of comparisons (scenarios) | F |
| 2 | The product is interactive. | | # of objects that can interact | F |
| 3 | The product is scientifically accurate. | | Reputable sources | F |
| 4 | The product follows chemistry colour schemes. | | Aesthetics | NF |
| 5 | The product shows feedback on what the user has learned. | | Time between feedback (min) | F |
| 6 | The product represents molecules as dynamic. | | # of degrees of motion | F |
| 7 | The product evaluates the user’s understanding. | | # of Questions/Levels | F |
| 8 | The product is simple to use. | | User Friendliness | F |
| 9 | The product can move between 2D and 3D representations. | | # of Viewpoints | F |
| 10 | The product conveys the probability in collisions. | | Percentage of probability (%)  # of Collisions | F |
| 11 | The product emphasizes the relationship between size and time. | | Relative Size (m)  Dimension (m3)  Relative Time (s) | F |
| 12 | The product contains elements of gamification. | | Aesthetics | NF |

## Functional, Non-Functional Requirements and Constraints

Functional requirements are a section of the design criteria, affecting the function of our program. An essential functional requirement is the relative size of the particles and objects mentioned in the video. It is important to provide real life size comparisons to effectively convey the monumental difference in sizes of particles versus other objects. Another criteria is the number of collisions we deem sufficient to teach the students about the probability of reactions occuring in the right orientations. We can ensure interactivity through a number of interactive objects showing how macroscopic reactions affect microscopic movements. It was important for our client that the molecules themselves are portrayed in 3D and naturally dynamic as they are in reality. User-friendliness is important, and we can evaluate the user's understanding using an adequate number of questions about the topic. We can quantify the user’s knowledge through individual feedback offered between certain time periods. In order to ensure the material in this program is scientifically accurate, the data will be allocated from reputable sources.

Non-functional requirements that do not affect the functionality of this program include the aesthetic portion of this program. An important non-functional requirement would be the chemistry colour-scheme that should be followed as indicated by our client. By creating realistic portrayals using accurate objects and environments we can enhance the user experience.

Since this product is being produced on a smaller scale, one of the major constraints include money and time. We have a budget of $100 for all project related purchases restricting the programs we can spend on. This project is on a time schedule, we have different derivables to submit and therefore need to manage our time, restricting the time we can use to further develop the program. The size of the file should be reasonable as it should be easily installed and ready for the students. We should also pay attention to the time and level of difficulty of the program since the students using it have a shorter attention span and should be engaged throughout the lesson.

# Benchmarking

Green = 3, Yellow = 2, Red = 1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # | Metric | Units | Weight | Odyssey | HoloLAB Champions | MEL Chemistry VR Lessons |
| 1 | # of scenarios | # | 5 | 1000 < | 16 | 30 < |
| 2 | User friendliness | 1-5 | 4 | 4 | 5 | 5 |
| 3 | # of Collisions | # | 3 | 100 < | N/A | N/A |
| 4 | # of objects that can interact | # | 5 | 2 < | 10 | 2 |
| 5 | # of viewpoints (2D,3D) | # | 2 | 2 | 1 | 2 |
| 6 | # of degrees of motions  (bending/vibrating/moving/  spinning) | # | 5 | 4 < | 3 | 4 |
| 7 | # of questions/levels | # | 5 | 1100 < | 16 | 30< |
| 8 | Time between feedback | min | 4 | 0 | ⅙ | Depends |
|  | Total |  |  | 88 | 58 | 59 |

## Target Specifications

Scale from 1-5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Metric | Associated Need | Metric/Constraint | Unit | Ideal Value | Acceptable Value | Verification Method |
| Functional Specifications | | | | | | |
| 1 | 1 | Amount of scenarios | # | 1000 < | 5 < | Test |
| 2 | 8 | User friendliness | 1-5 | 5 | 3 < | Observations |
| 3 | 10 | Amount of Collisions | # | 100 < | 1 < | Test |
| 4 | 2 | # of interacting objects | # | 10 | 2 < | Test |
| 5 | 9 | Number of viewpoints | # | 2 < | 1 < | Observations |
| 6 | 6 | # of degrees of motion | # | 4< | 3 | Test |
| 7 | 7 | # of Questions/Levels | # | 1100< | 10 | Test |
| 8 | 5 | Time b/w feedback | min | 0 | ⅙ < | Test |
| Non-Functional | | | | | | |
|  | 4 | Chemistry Color Schemes | yes | yes | yes | Analysis |
|  | 12 | Gamification | yes | yes | yes | Analysis |
| Constraints | | | | | | |
|  |  | Time | days | March 26> | March 26 |  |
|  |  | Money | $ | 100> | 100 | Estimate |
|  |  | Length for lesson | min | 10< | 7< |  |

# Reflect

Participating in the client meeting was crucial when developing our design criteria and establishing importance, since that helps our product adapt desirably to our client’s needs. We established the best specifications amongst various competitors in the industry and prioritized the interpreted needs of the customers using scale values. We did so using the specific notes given to us during the interview process with our client. For example, since our client emphasized the importance of the visible continuous motion of particles for this lesson, we ensured the degrees of motion in particles had top priority. We were able to differentiate our needs based on criteria such as; functional needs — needs that affect the functionality of an object, non-functional needs — other needs not necessarily affecting the function, and constraints — important considerations during the designing process. We decided that interactivity, degrees of motion, various scenarios and evaluating questions were amongst the top priorities required by our customer. The process of benchmarking allowed us to veer into industrial standards for each category. Using these values we established the ideal and acceptable values for different criteria included in our system. We note that we do not have access to a scale of time or money anywhere near our competitors, therefore we chose our target specifications based our capabilities. These constraints however, will allow our program to be more accessible to our target audience, compared to our competitors. This practice offered us clear visualizations of ideal scenarios and helped us get a better understanding of the outlines in this project. Due to this, in future group meetings we can base our focus on achieving those goals using our target specifications and satisfying our customer’s needs.

# Conclusions

In conclusion, we explored design criteria in this deliverable which were directly derived from the needs created in the past deliverable. The design criteria was split into three groups; functional, non-functional, and constraints. We had the greatest amount of functional criteria, as there is a lot of functional requirements in this project. Next, we benchmarked with competitive products to see the standards our design has to meet and based on this made ideal and acceptable values to have within this market. Many products are more advanced with the selection offered than our time and money constraints will allow us to be, so that was reflected in our acceptable values. Using this information, we can start to make design concepts.