**Design of DNA within the Serotope game**

The game aims to teach players about Mendelian inheritance, in which the two main principles are:

1. Every individual possesses a pair of alleles for any particular trait and that each parent passes a randomly selected copy of only one of these alleles to its offspring.
2. The alleles that are inherited from each parent is independent of one another (i.e. the selection of one trait will not impact on the selection of another).

To show these principles in the game, whenever a creature dies, it leaves behind its DNA, which can then be picked up by the player, causing it to be combined with its own DNA, and spawning a child based on the results.

The DNA object in the game is supposed to be a basic representation of real world DNA, consisting of various genes, which each corresponds to a trait. These genes are represented as a pair of alleles, which can be either dominant or recessive.

The traits that are to be included in the game are the following:

* Health (Maximum health)
* Stamina (Rate at which health decreases)
* Shield
* Attack Speed
* Damage
* Shooting Type (e.g. multiple bullets)
* Speed
* Acceleration
* Handling (how easy it is to control the creature)

Each trait is represented in DNA as a ‘gene’, consisting of a pair of alleles. There are two possible alleles for each trait, with one being dominant, and the other recessive. It is the combination of two alleles in a gene that determine the final trait.

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| For example, the health gene consists of a recessive allele ‘healthy’, and the dominant allele ‘weak’. These can be represented as h and W respectively.  If a creature has a pair of alleles that are WW, Wh, or hW, they get the ‘weak’ trait.  If the creature has the pair of alleles hh, they get the ‘healthy’ trait, and have extra health. |

However, this poses a problem, in which a creature can either have high or low health, but no in between. To overcome this issue, there can be multiple genes for the same trait, which add their bonuses together.

**Java representation of DNA:**

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| DNA |
| health :(Boolean, Boolean)  stamina :(Boolean, Boolean)  shield :(Boolean, Boolean)  attackSpeed :(Boolean, Boolean)  damage :(Boolean, Boolean)  shooting:(Boolean, Boolean)  speed :(Boolean, Boolean)  acceleration :(Boolean, Boolean)  handling :(Boolean, Boolean) |

The DNA class consists of an attribute for each of the traits in the game. These are in the form of a tuple of two Booleans. The tuple represents a pair of alleles, one from each of its parent’s DNA. The two possible alleles in a gene are “has the trait” and “doesn’t have the trait”, in which “has the trait” is always recessive and represented by true (whereas “doesn’t have the trait”, is always dominant and represented by false).