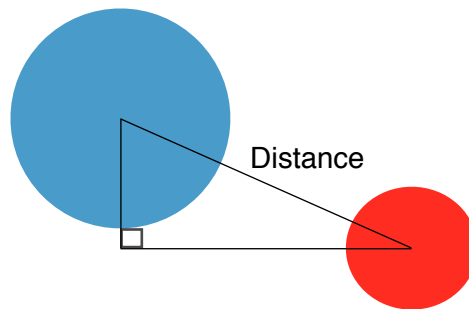


Each entity in the game has parameters of :

x coordinate (of the centre of the object)  
y coordinate (of the centre of the object)  
size (diameter)  
id  
baseColor

Various functions are used to calculate the relative positions of entities, their velocities, and interactions. There follow a description of the math employed in these functions:

getDistanceFromEntityCenter: Since the system uses orthogonal x,y coordinates, the distance between the centre points of two entities can be calculated by first finding the distance between the x coordinates, and the y coordinates, and then using Pythagoras' theorem to find the resultant distance between the two centres, i.e. distance = square root((difference in x coords)squared + (difference in y coords)squared))



isEntityPositonIntersected: This function determines if the two entities intersect. This is achieved by first finding the distance between the centres of the entities (using “getDistanceFromEntityCenter”), then subtracting the combined radii of the entities. If the result is negative, then the entities intersect, and the boolean is set true.

isEntityPositonInternal: This function checks if the the entity(self) has contains another entity. This is achieved by finding if the radius of the entity(self) is greater than the distance between the entities plus the radius of the second entity.

addVolume: This adds the volume of an entity that has been ‘engulfed’ to the entity(self). Since the volume is proportional to the diameter squared-

$$(\text{new diameter})^2 = (\text{old diameter})^2 + (\text{diameter of entity engulfed})^2$$

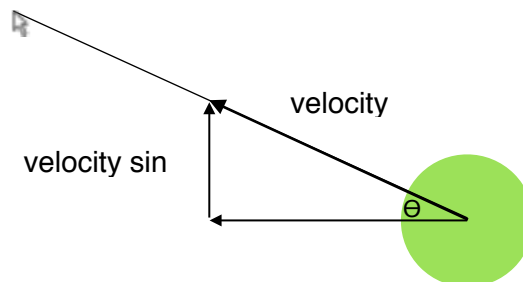
and

$$\text{new diameter} = \text{square route}((\text{old diameter})^2 + (\text{diameter of entity engulfed})^2)$$

updateVelocity: The entities velocity is proportional to the distance between the entity’s centre and the cursor. It is inversely proportional to the entities diameter. Hence

$$\text{speed} = (\text{distance between entity and cursor})/(\text{diameter of entity}) \times \text{default speed}$$

The direction of the entity’s velocity is directed along the line which joins its centre to the cursor.



The x component of the velocity = velocity x cosΘ  
The y component of the velocity = velocity x sinΘ