Particle color interaction explained

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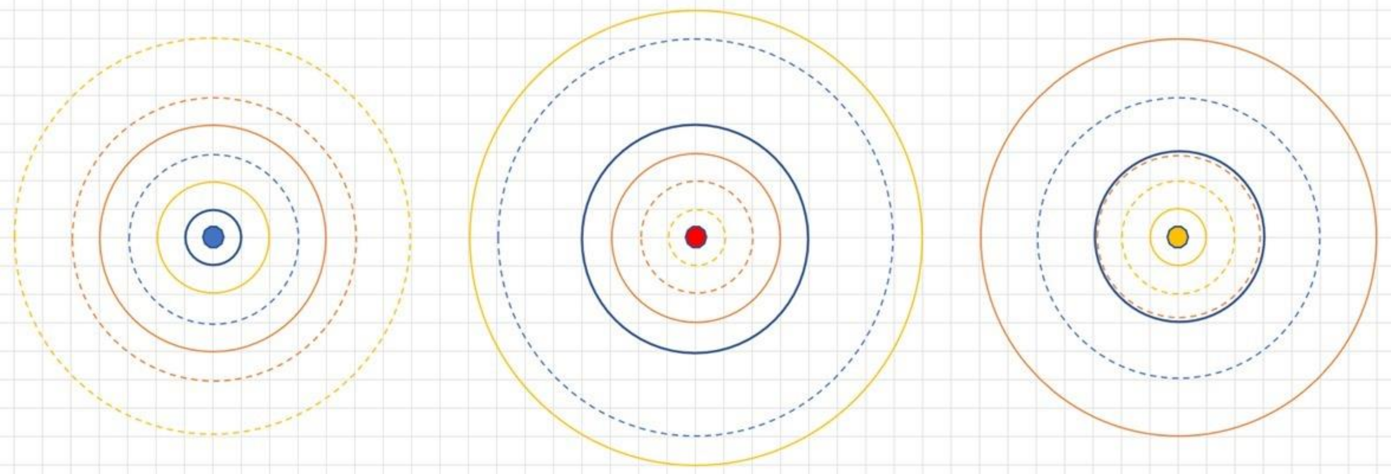
I want to simulate interactions between particles of "n" colors, with user-defined n, and each user-defined color by an RGB code. Depending on how many colors they are, each particle emits a colored force field of both attraction and repulsion. Thus, a particle of a certain color will react to colored fields corresponding to its color if it enters those colored fields.

To understand better, let us take an example. Consider n = 3, red, orange, and blue.

Red = 255, 0, 0
Orange = 255, 165, 0
Blue = 0, 0, 255

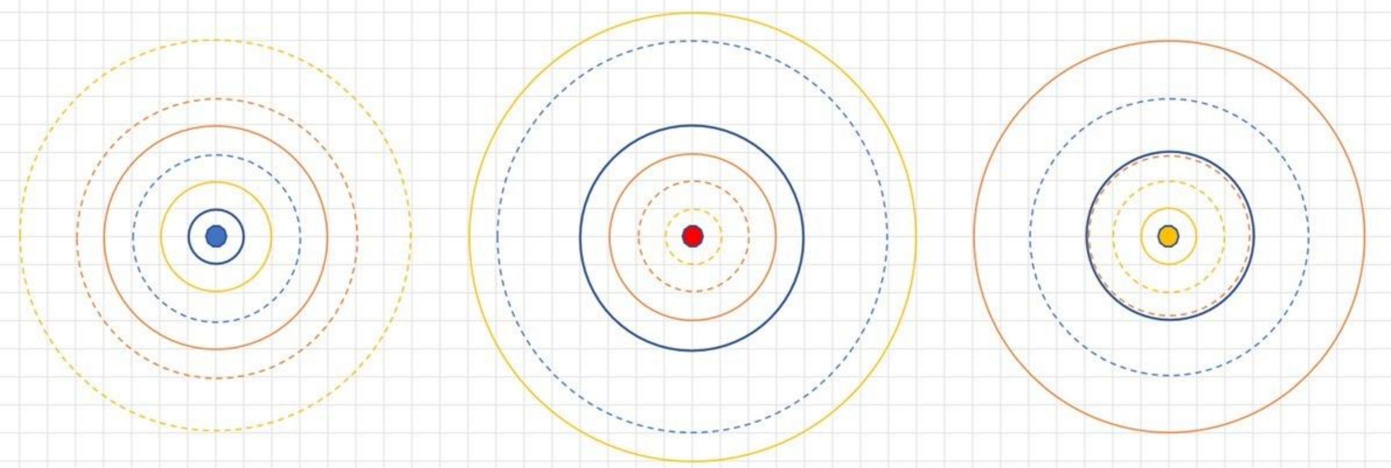


+	B	R	O
B	1	4	2
R	4	3	8
O	3	7	1

-	B	R	O
B	3	5	7
R	7	2	1
O	5	3	2

Each particle emits colored force fields over a certain distance. I have drawn the attractive force fields with solid circles. I have drawn the repulsive force fields with dashed circles.

I built the 2 matrices of the ranges of these forces, and then added the matrices of the intensities of the forces above.



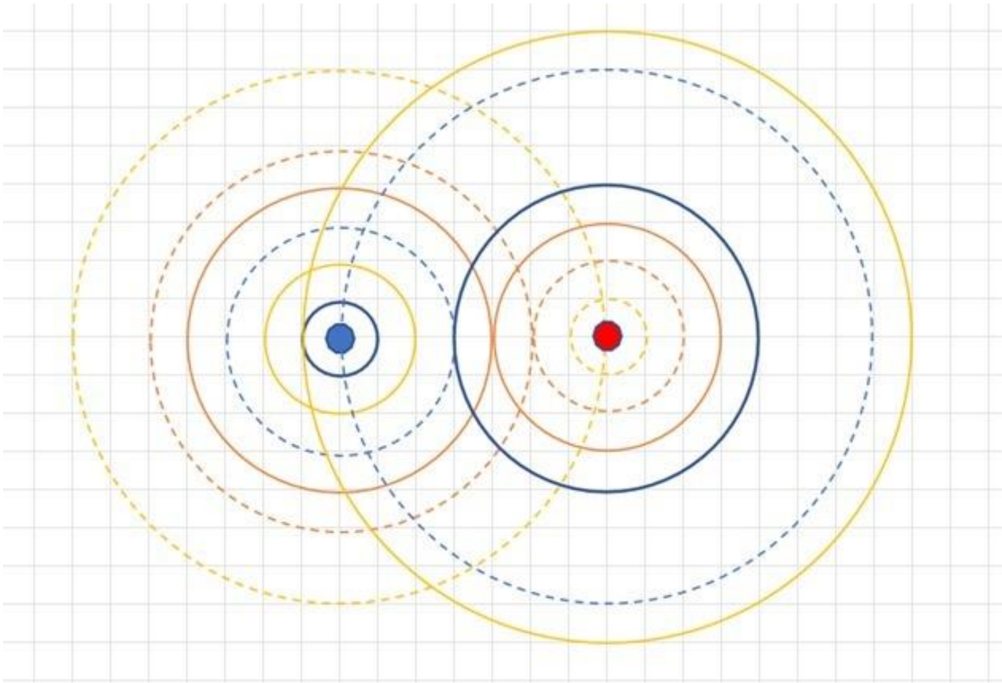
I+	B	R	O
B	4	7	3
R	5	2	6
O	1	8	9

R+	B	R	O
B	1	4	2
R	4	3	8
O	3	7	1

I-	B	R	O
B	6	2	9
R	1	7	5
O	4	8	3

R-	B	R	O
B	3	5	7
R	7	2	1
O	5	3	2

Suppose blue comes towards red, being pushed by orange.

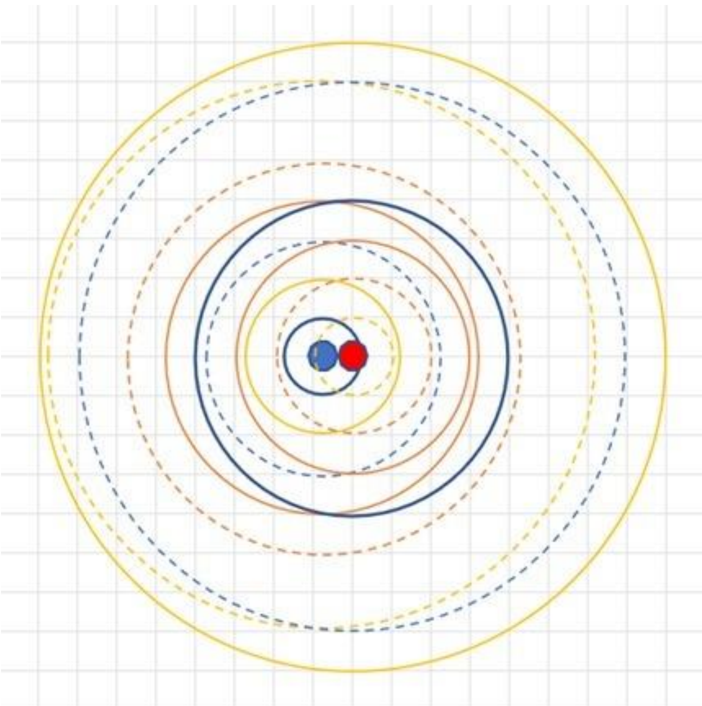


The two stops in this position, i.e., at a distance of 7 from each other. Why? Because red repels blue up to a range of 7 and the attraction between the two is less than 7 (4 and 4). Blue attracts red, but only up to a distance of 4 and with an intensity of 7, but it cannot approach red because red repels it and keeps it at a distance of 7 from it. All linear kinetic (motion) energy is converted into circular kinetic energy, i.e. blue will revolve around red by some time T. Why? Because each particle emits the force fields in a spiral, from the inside out for the repulsive forces and from the outside in for the attractive ones.

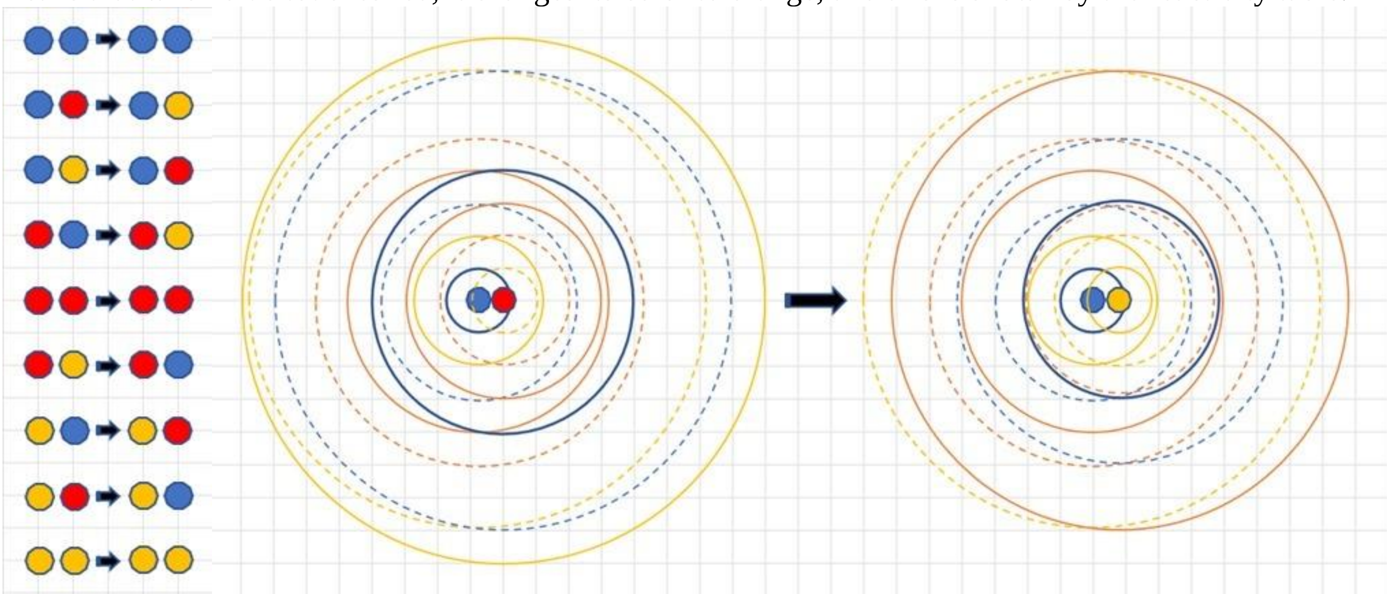
How long does this T last? Well, that depends on viscosity (frictional force). If we have a viscosity of 50%, then blue will lose 50% of its circular kinetic energy per time step. If blue had 100 initial kinetic energy at time step T0, at T1 it will have 50, at T2 it will have 25, at T3 it will have 12.5, at T4 it will have 6.25, and so on until the kinetic energy is equal to the minimum allowed energy of the system. If the system has a minimum kinetic energy of 1 defined, then in time step T7 the blue will stop. If the minimum kinetic energy is set to 0, then blue will never stop, but will slow down infinitely.

If it is pushed (bumped) by another particle and ends up closer to red (at a distance of 4), then red will attract blue and blue will attract red with a force calculated as: BR(+) + RB(+) - BR(-) - RB(-) = 7 + 5 - 2 - 1 = 12 - 3 = 9.

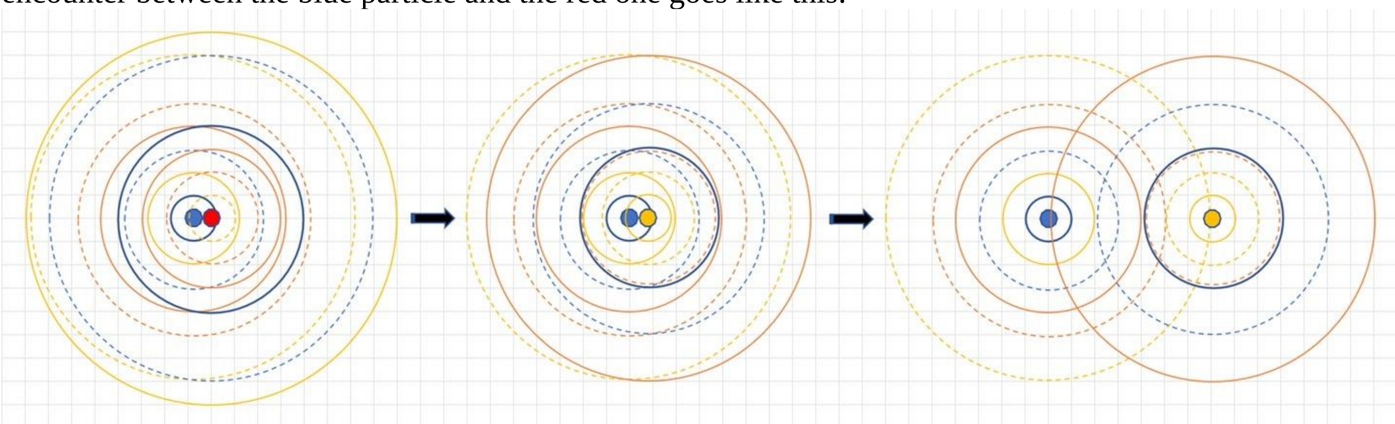
The link between blue and red at zero distance is therefore 9. It can only be broken if this group is hit by a force greater than nine.



When the two particles touch, there is a probability that they will react to this touch and recolor. This means that when blue touches red, it changes its color to orange, and this is shown by the reactivity table.



By changing its color, the force fields also change and thus the interactions between the two particles also change. Because if red becomes orange, the force fields of red are replaced by those of orange. So, the encounter between the blue particle and the red one goes like this:



That is, the particles approach, then touch, then react and transform, then change their fields and interactions with each other, and then move apart according to the new fields given by the matrices of interaction forces and their radii. Everything unfolds in a field of probabilities given by user-defined probability parameters.