



26

Chain Reaction

12 points

Introduction

We want to implement a simulation of how subatomic particles behave when a chain reaction occurs. The first model is a very basic simplification, but it would help improve future versions.

The objective is to shoot a particle (the detonator) to space with particles (reactors) and figure out the final state of the reaction.

The reactors particles are represented as circles with the following parameters:

- x : integer, position in x-axis
- y : integer, position in y-axis
- r : integer >0 , particle radius
- e : integer ≥ 0 , reaction radius

The detonator particle is represented as reactors, but without radius of reaction.

The simulation will start shooting the detonator to a given position.

All reactors colliding with the detonator will be hit and start a chain reaction.

When a reactor is hit, they will explode and hit any other reactors in the reaction radius.

To implement this simulation, we can use the formula to know if two circles intersect or not.

Given 2 A and B circles with parameters (x_1, y_1, r_1) and (x_2, y_2, r_2) :

- Distance d between circles centers $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
- If $d \leq r_1 - r_2$: Circle B is inside A.
- If $d \leq r_2 - r_1$: Circle A is inside B.
- If $d < r_1 + r_2$: Circle intersects each other.
- If $d == r_1 + r_2$: Circle A and B are in touch with each other.
- Otherwise, Circles A and B do not overlap.

We will consider that a particle is hit even if they are touched.

Input

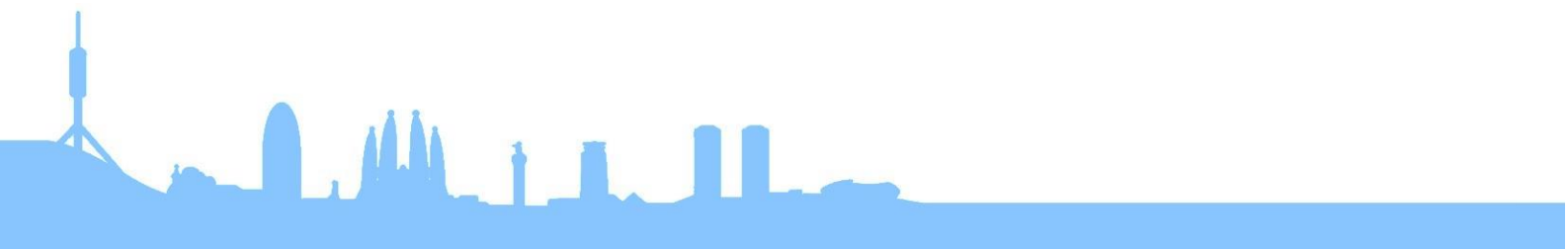
A line with detonator impact coordinates and its radius.

A line with the number of particles (≥ 0).

A line per particle, with coordinates, radius and reaction radius

Output

A list with all particles, in the same order of input, saying if they were hit or not





Example 1

Input

0 0 1

4

0 0 1 3

0 3 1 2

0 6 1 1

0 9 1 1

Output

(0, 0) HIT

(0, 3) HIT

(0, 6) HIT

(0, 9) NOT HIT

Example 2

Input

10 10 1

4

10 13 1 3

13 10 2 3

10 7 1 3

7 10 2 3

Output

(10, 13) NOT HIT

(13, 10) HIT

(10, 7) NOT HIT

(7, 10) HIT

