

# TULIP Algorithm Multilateration

## TULIP Algorithm

--To be filled

### Improvements in the Algorithm

We noticed some problems in the initial algorithm, the algorithm appeared to behaving abnormally when we multilaterate and circle inscribe another circle. This happens cause the equation of the circles could not be solved. We need a stratigy to resolve this issue.

There are two parts to resolve this issue.

- How to identify that landmark area is inscribed in another landmarks area
- Find a remedy to resolve this issue

### Identification Process

To identify the corelation between landmarks we will use the following mathematical model

- Let us assume two points  $P_0$  and  $P_1$  represent two points (landmarks) needs to be tested.
- Distance  $d$  between these landmarks in form of points.  $d = ||P_1 - P_0||$ .
- Radius  $R_0$  and  $R_1$  represent the radius of landmarks 1 and 2 calculated from multiplying alpha and rtt
  - If  $d > r_0 + r_1$  then there are no solutions, the circles are separate.
  - If  $d < |r_0 - r_1|$  then there are no solutions because one circle is contained within the other.
  - If  $d = 0$  and  $r_0 = r_1$  then the circles are coincident and there are an infinite number of solutions.