

KinderFinder

The KinderFinder Project

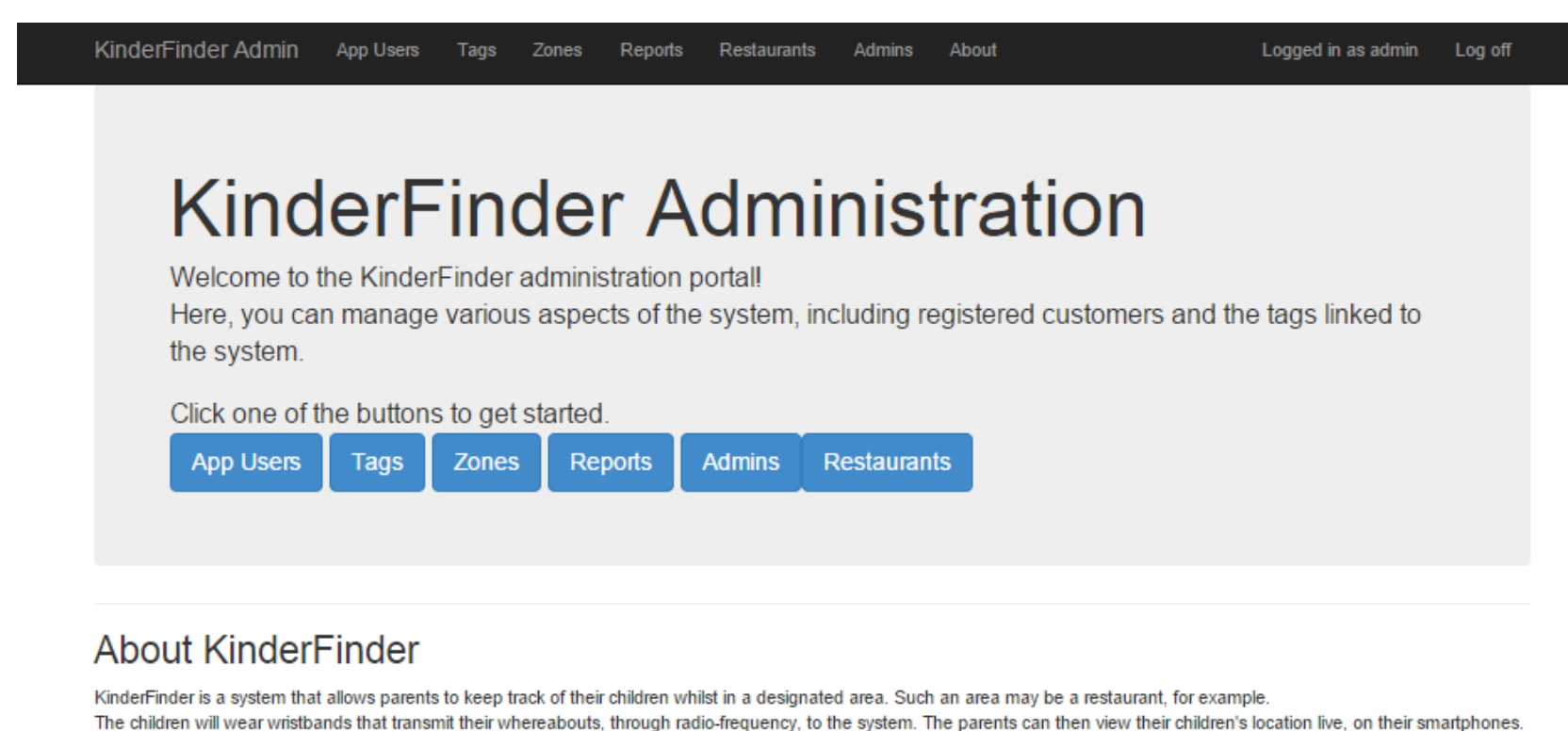
KinderFinder can be broken down into 3 separate aspects:

- The Web Admin Portal
- The Mobile Application
- The Trilateration Algorithm

The Web Admin Portal

Clients who purchase KinderFinder will have this as their central hub. Through the Admin Portal users can:

- Assign / remove tags for patrons (parents)
- View all zones and users currently active
- View reports

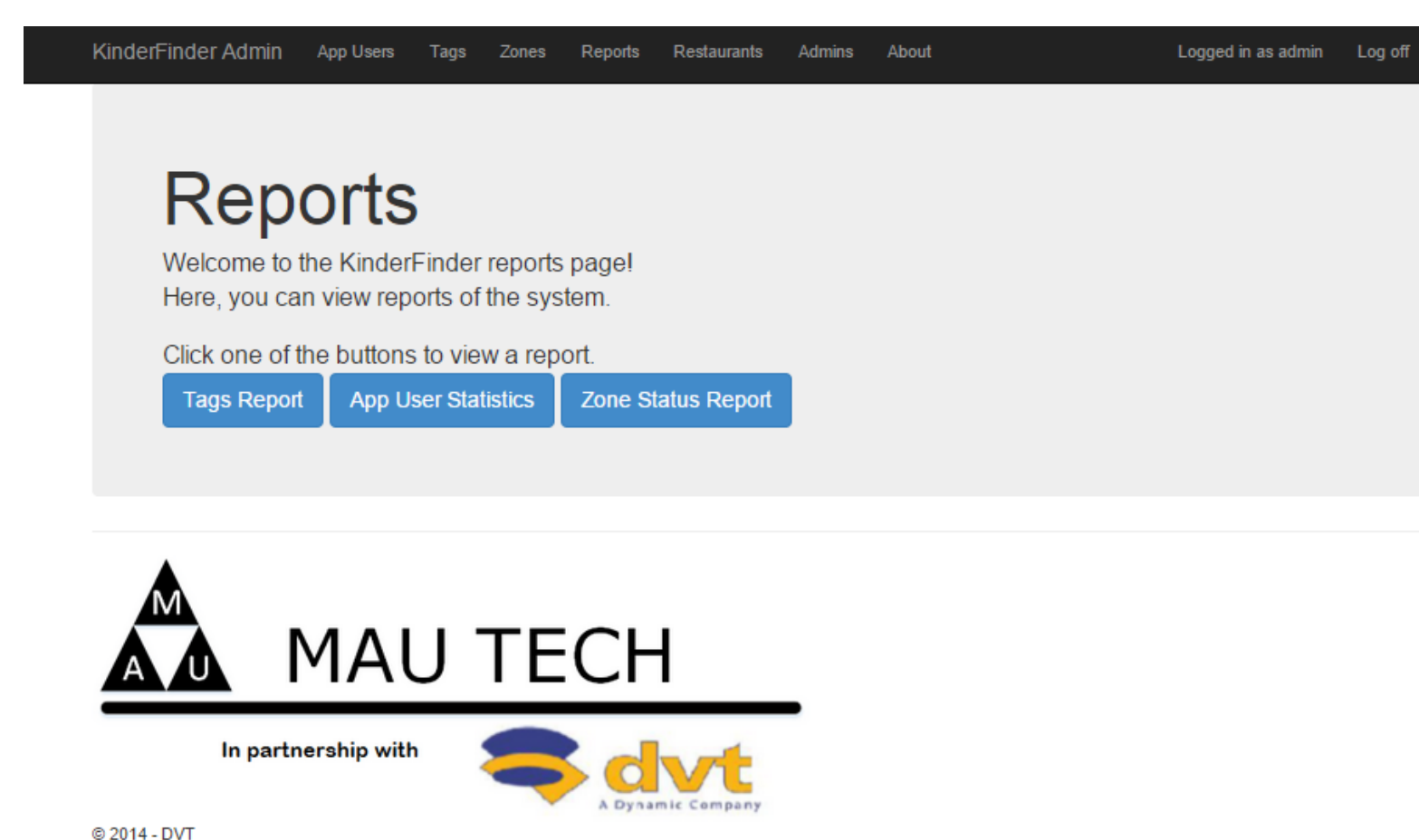


Reporting and Usage Statistics

Through the admin portal Reporting system, staff can view some basic reports of the system

- Tag reports
 - Information regarding user tags including tag availability and last date used.
- Application user statistics
 - Information about registered users including last visit to a particular restaurant, and number of visits.
- Zone reports
 - Information regarding restaurant zones for maintenance purposes. Statistics including but not limited to status of zones can be viewed.

Reports can be viewed online or as a downloadable PDF document for audit purposes.



Welcome to KinderFinder

The future in worry free dining experiences for parents

The project aims to provide a worry-free dining experience for parents at restaurants. Children will be provided with a wristband which tracks their position. Parents can then view their childrens' locations, over-layered on a map of the restaurant, on their Android smartphones.

The wristband contains a Bluetooth transmitter, which is pinged by receivers, which, in turn, send signal strengths to the server. These strengths are used to calculate the position of the child, which is over-layered onto the map.

Parents need not to worry about the confidentiality of their children's locations, as parents can only view their assigned transmitters on the app.

Technical Details

The system is made up of many modules, namely:

The Web Admin Portal

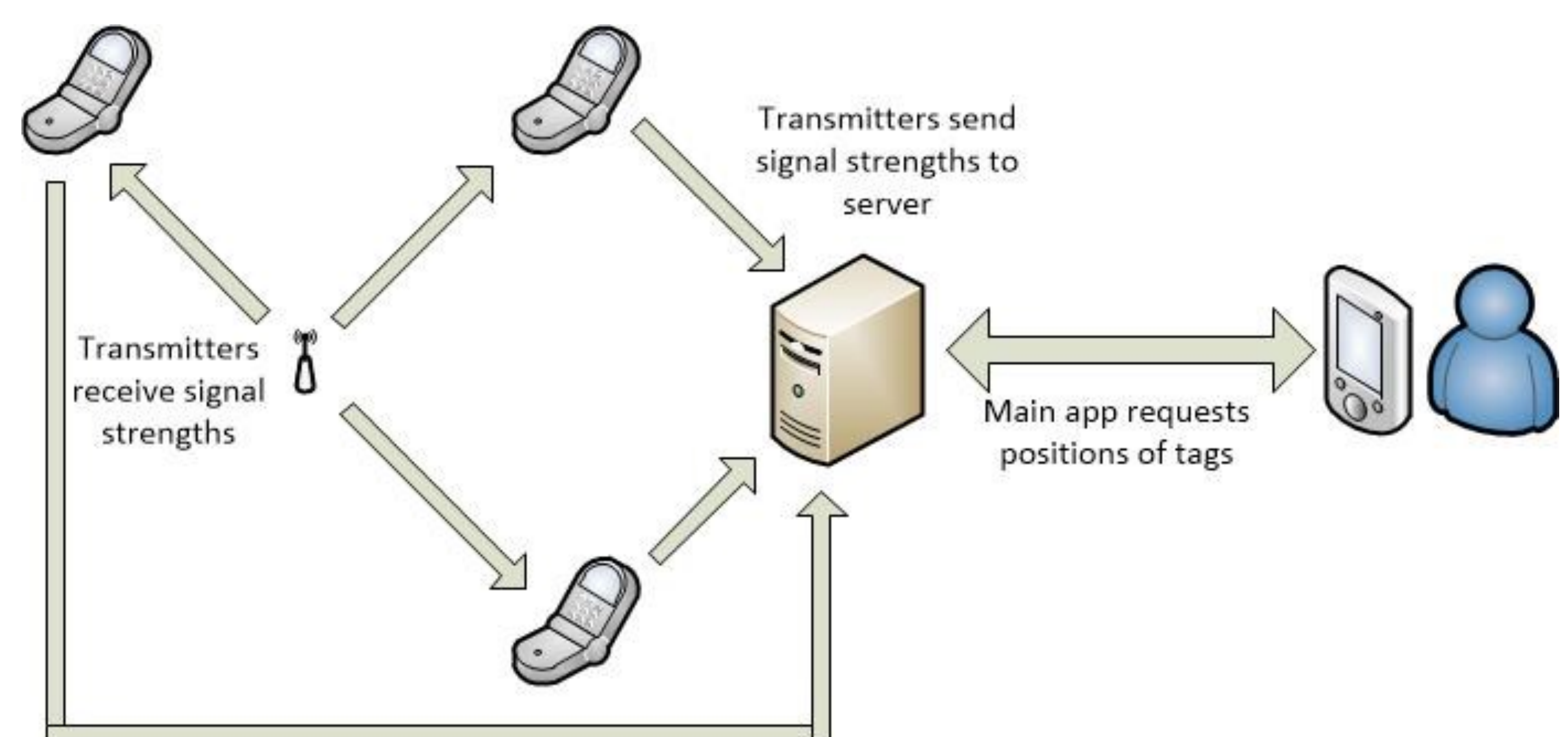
- A single server, running an ASP.NET program
- Provides the administration portal, for restaurants to manage the system
- Also fulfils requests from the transmitters and main Android application

Three transmitters for each restaurant area.

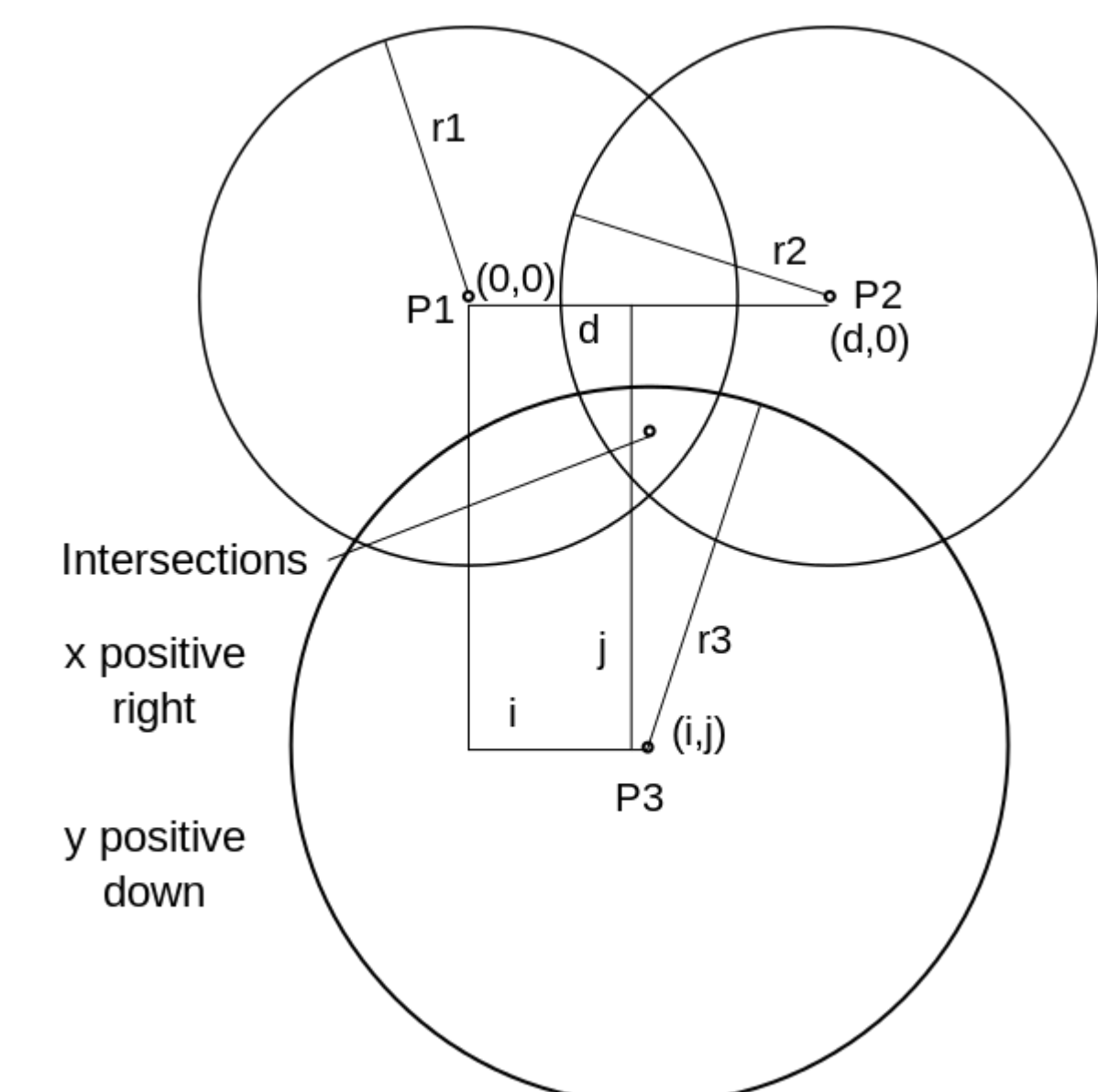
- Android smartphones (for proof of concept).
- Communicates with the Bluetooth transmitters.
- Sends the signal strengths to the server.

Main Android application.

- To be used by parents.
- Receives the positions of the children from the server.
- Overlays them onto a map of the restaurant.



Trilateration Algorithm



What is Trilateration?

Trilateration is the process of determining relative locations of points by measurement of distances, using the geometry of circles, spheres or triangles.

The intersections of the surfaces of three spheres is found by formulating the equations for the 3 sphere surfaces and then solving the three equations for the three unknowns, x, y, and z.

To simplify the calculations, the equations are formulated so that the centres of the spheres are on the z = 0 plane. Also, the formulation is such that one centre is at the origin, and one other is on the x-axis

Equations used in KinderFinder to detect a transmitter:

$$\begin{aligned} r_1^2 &= x^2 + y^2 + z^2 \\ r_2^2 &= (x - d)^2 + y^2 + z^2 \\ r_3^2 &= (x - i)^2 + (y - j)^2 + z^2 \end{aligned} \quad \begin{aligned} r_1^2 - r_2^2 &= x^2 - (x - d)^2 \\ r_1^2 - r_2^2 &= x^2 - (x^2 - 2xd + d^2) \\ r_1^2 - r_2^2 &= 2xd - d^2 \end{aligned}$$

$$x = \frac{r_1^2 - r_2^2 + d^2}{2d}, \quad y^2 + z^2 = r_1^2 - \frac{(r_1^2 - r_2^2 + d^2)^2}{4d^2}.$$

Once the algorithm calculates the relative coordinates, these coordinates are encapsulated and sent to the mobile application to display them on screen.

Why KinderFinder?

As a team we were looking for a project that would have real world applications and one that could possibly add a factor of safety to communities. We believe that this technology will do just that and could benefit parents worried about their children's safety

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