For the *ith* agent we define the distances between the agent located at coordinates and its *jth* neighbor located at coordinates as –

.

Using these distances, we find the effects of the n nearest neighbors on the *i*th agent, in terms of avoidance, attraction and alignment.

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,  
.

Where is the orientation of the *ith* agent and is the orientation of its *jth* neighbor.

Similarly, for the *kth* discrete point on the obstacle, located at coordinates , we define the distance between the point and the *i*th agent as –

.

We find the effect of the discrete obstacle points on the *i*th agent as –

.

Where is the orientation of a vector directed from the *ith* agent to the *kth* discrete point on the obstacle. All terms , , , and are 0 when not explicitly defined.

Finally, we use a weighted combination of all of these effects to determine the desired change in orientation of the *ith* agent*.* This change in orientation is limited by the turn rate of the agent –

Here, is the orientation of a vector directed from the agent to the destination, and the weight is 1 for informed agents and 0 for uninformed agents. In addition, when any point of the obstacle is within the *ith* agent’s obstacle detection radius, for that agent is set to 0. Formally, we write this as –

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For the continuous model, the calculations are slightly different.

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The quantities , termed forces, are calculated as –

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The change in orientation calculation remains unchanged.