Finding Waldo and whom he is talking to.
A rotational approach to find social interaction groups.

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1. Introduction

In our daily life people encounter many social interactions, for example in the supermarket, at work and in schools. Currently the most reliable way to find social interactions in groups, is to manually annotate the data. However, this takes a lot of time.

Earlier this year Dikker [1] researched the performance of Received Signal Strength Indicator (RSSI) of Bluetooth Low Energy (BLE). The RSSI approach simply looks at who is close to each other in a given time interval. This can cause false positives.

Here orientation data was not used. Therefore the goal of this report is to research the performance of including orientation data for finding F-formations in the social interaction data from the Conflab data set and comparing the results with the proximity-based data as the baseline.

2. Method

- Dikker [1] affinity matrix as input
- Check where it says that two people have a close affinity
- Create for both a view frustrum around the absolute orientation.
- Flip one of the view frustrums
- Check if the view frustrums overlap
- If they overlap, keep the current affinity otherwise overwriting it.
- Return the new affinity matrix back to Dikker [1] his code.

4. Conclusion

- Given the absolute orientation it can be calculated if two people have a possibility for an orientation in which they can face each other.
- When this is impossible, the probability of having affinity between these people is low.
- For the experiment a view frustum (cone shape) was used to identify when two people are facing each other.
- From the results it can be concluded that a small cone will remove too many true positives, rather than false positives.
- At an angle of 75 ◦ the F1 score is maximal and slightly better than the F1 score of the baseline.
- Going higher than 75 ◦ leads to a closer score to the baseline, as almost no value will be overwritten.
- In conclusion there is not a significant difference.

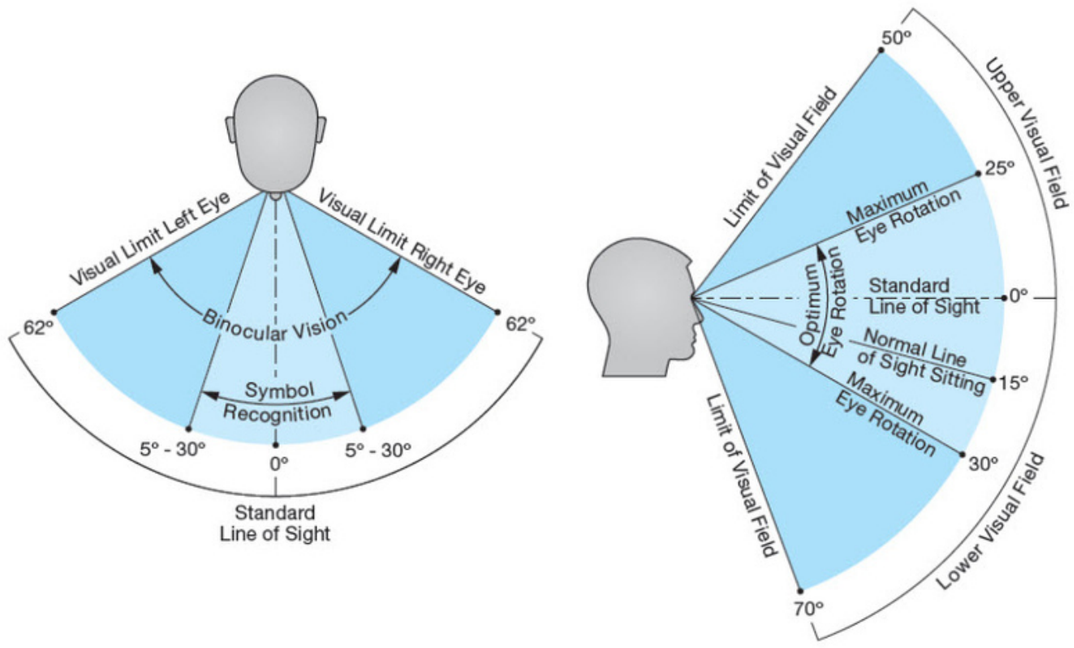

Figure 1: Field of vision and recommended head tilt and eye rotation angles [2]

3. Results

The results show that when the angle of the cone is small, the precision and F1 score will be very low. On the other hand when the angle is very big, it comes closer to the baseline values. When the angles is 91 ◦ , which will cause that the angle is big enough that there always will be overlap, the F1 Score and precision are very close to the baseline. As the rotation data will have no influence on the true or false positives. The F1 score is maximal at an angle of 75 ◦ and the precision is maximal at the same angle.

ϕ	F1 Score	Precision	Recall
baseline	0.613614831	0.690084067	0.552402313
10°	0.177108703	0.257907989	0.134859074
15°	0.225018224	0.295565945	0.181658677
20°	0.256230892	0.319662213	0.213805055
25°	0.288835441	0.350259441	0.245740611
30°	0.345672503	0.408656313	0.299510673
35°	0.410922931	0.477805406	0.360465516
40°	0.475396523	0.542073174	0.423326121
45°	0.510465832	0.57503357	0.458934316
50°	0.541863393	0.610615441	0.487026771
60°	0.601400083	0.676681468	0.541192015
63°	0.611099105	0.684090816	0.552181924
65°	0.617870481	0.69094506	0.558774323
70°	0.62044782	0.696065039	0.559650078
75°	**0.622020091**	**0.696782798**	**0.561746387**
80°	0.616634675	0.692464973	0.55577319
85°	0.617112723	0.693874938	0.555642886
90°	0.613513099	0.693725773	0.549927259
91°	0.618257125	0.694434675	0.557140377

5. References

[1] Bram Dikker. “Finding f-formations using dominant sets in the Bluetooth proximity data of the Conflab data set”. In: (2022).

[2] Environmental Considerations and Human Factors for Videowall Design. URL: https://www.extron.com/article/environconhumanfact.