VISIBILITY-FEATURE BASED MATCHING OF HUMAN PERCEPTION

Mrinal Mishra   Ruchir Gupta

Experiment

- We have conducted two visibility based psychological Experiments on children from age group 8-15 .

- Experiments involved identifying objects position with respect to the container.

- The aim of the experiment was to get some idea of human perception of containment.

Experiment

- The experiment involved a trajector and container.
- One of the containers was regular while the other was abstract container having some random lines.
- In the first part of the experiment there were many trajectors which were present in the picture.
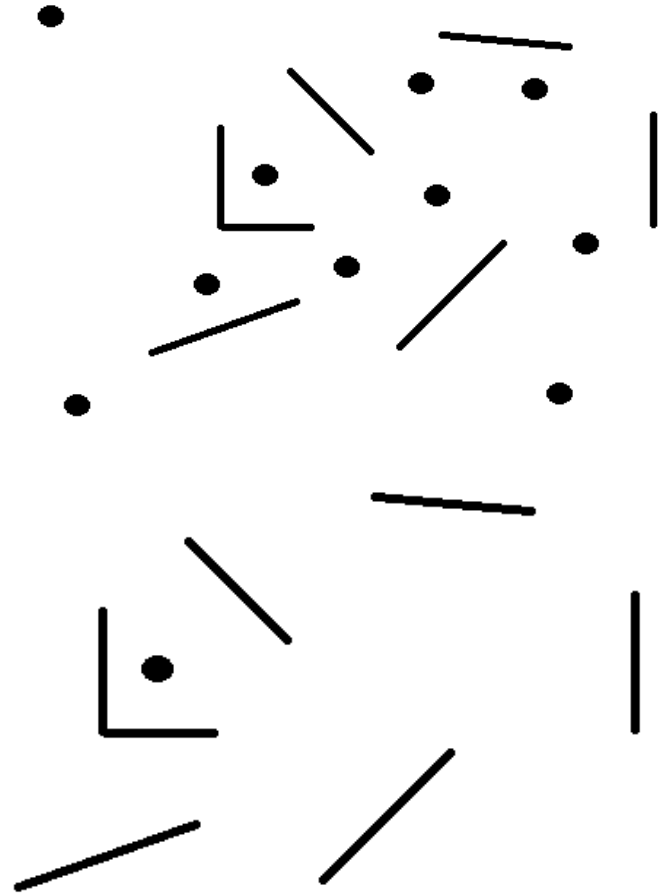- The task was to group the trajectors together.

Experiment 1
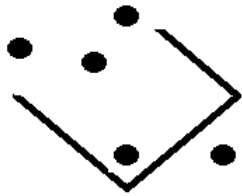
Test cases for the first part

An example of Test case in 2nd part

Experiment

- The second part of the experiments involved the human subjects to grade the trajectors on the basis of their degree of Inness(0-5) and degree of their Outness(0-5).

RESULT: The data obtained in the first and second part were very similar. That is the grouping of trajectors in the 1st experiment were done on the basis of containment. Another point which was noted is that the data was very consistent with most of the subjects in the case of the regular container but the data was distributed(variation in the grading was more) the case of the abstract container. Hence this data would be helpful while matching with our computational model.

Computational Model - Terminologies

- Closed Angle
- Open Angle
- Closing Factor
- Scaling factor – to normalize f(distance)
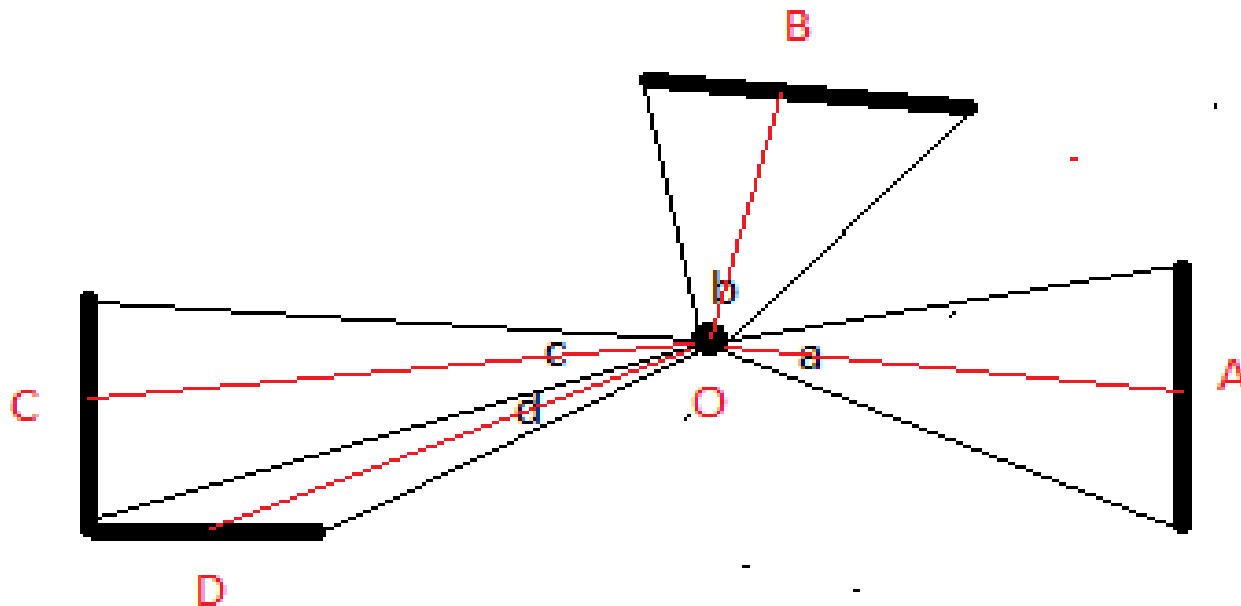
Containment

- Containment Ratio = Open Angle / Closing Factor

- Closed angle = $\Sigma\alpha_i$

- Open angle = $360° - \Sigma\alpha_i$

- Closing Factor = $\Sigma f(d_i)*\alpha_i$ / S.F.

- S.F. = $\Sigma f(d_i)$ / N

Model

- Image analysis – identification of linear boundaries of container w.r.t. trajector

- Calculation of Closing Factor

- Training of the model using human perception data to find f(distance)

  - f(distance) is plotted vs Open angle/Containment Ratio

  - Best fit curve method is used to find f(distance)

DATA – Exp 1

| Subjects	Set A	Set B
1	OOIIO	OOOIIIIIOO
2	OOIIO	OOIIOIIIO
3	OOIIO	OOOIIIIIOO
4	OOIIO	OOOIIIIIOO
5	OOIIO	OOIIIIOIOO
6	OOIIO	OOIIIIIIOO
7	OOIIO	OOIIOIIIO
8	OOOIO	OOOIIIIIOO
9	OOOIO	OOOIIIIIOO
10	OOIIO	OOIIIIIIIO
11	OOIIO	OOIIIIIIOO
12	OIIIO	OOOIIOIOOO
13	OOIIO	OOIIIIIIIO
14	OIIIO	OOIIOIIIOI
15	OIIIO	OOIIIIIIIO
16	OOOOO	OOOIIIIIOO
17	OOIIO	OOOIOIIIIO
18	OOIIO	OOOIIIIIOO
19	OOIIO	OOOIIOIIOO
20	OOIIO	OOOIIIIIIO

DATA – Exp 2

Images	IN0	IN1	IN2	IN3	IN4	IN5	OUT0	OUT1	OUT2	OUT3	OUT4	OUT5
A1			1			5	5					
A2			1	3		1			4	1	1	
A3					1	1			3	4	2	
A4		1							2	1	2	5
A5		1	3	4		1	1	1				
B1			2	1	1	2	2	3		1		1
B2			2	1	1		1		6	2		
B3						1	2	1	2	1	2	4
B4			1	1	5	6						
B5	4			1	4	2	2					
B6			2	1	6	3	1					
B7				1	5	3		1		3		
B8			2	5	4			1			1	
B9			1			1	1			4	1	5
B10										1	4	8

Representation of data
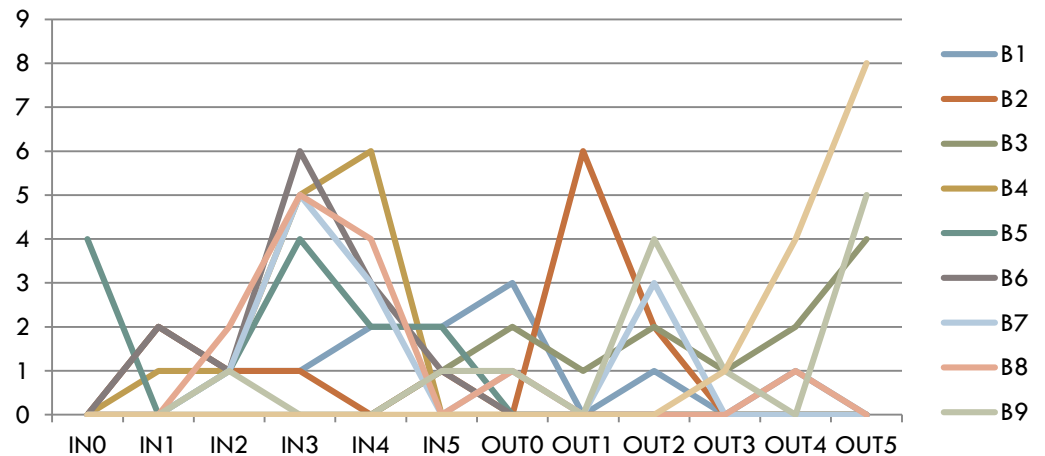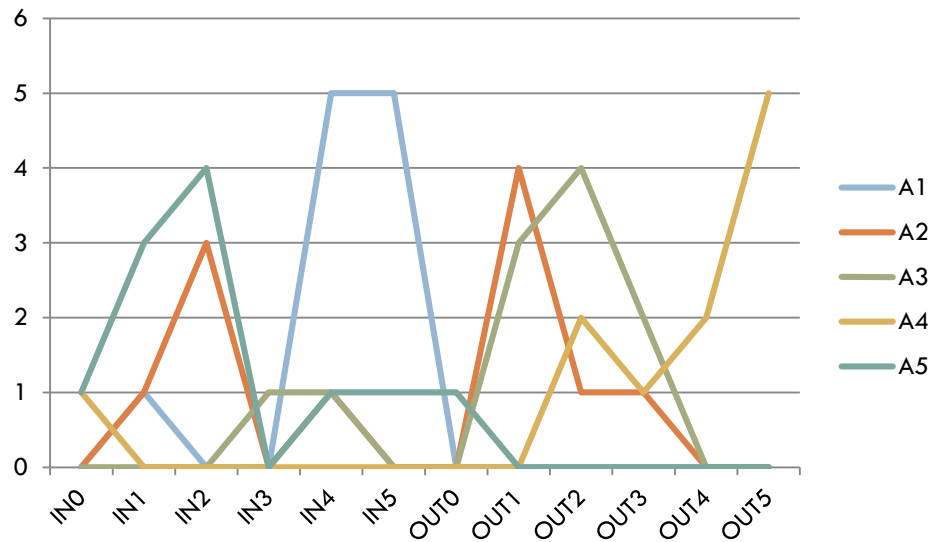
References

- Mukerjee A. et. al.; Grounded perceptual schemas: developmental acquisition of spatial concepts, ProceedingSC'06 Proceedings of the 2006 international conference on Spatial Cognition V: reasoning, action, interaction

- Kenny R. Coventry. 1999. Function, geometry and spatial prepositions: Three experiments. Spatial Cognition and Computation, 1:145–154.

- Wikipedia.org

THANK YOU