Sequential Pattern Mining & Association Rule analysis in multi-perspective Gaze data

Motivation

The gaze data records the ID of 'region of interest' or 'object of fixation' and the 'time duration' in which the interest is maintained, for eye gaze and in hand possession, for both child and the parent. This project tries to find patterns and association rules in this data.

The pattern should be able to tell frequently occurring 'gaze' behaviour patterns in relation to child & parent.

Method

The 'region of interest' is renamed to suit the data it represents e.g. 'A1' represents 'region of interest' with ID value of 1, in relation to child's eye gaze.

The following method is used to rename the 'region of interest' or 'object of fixation' values:
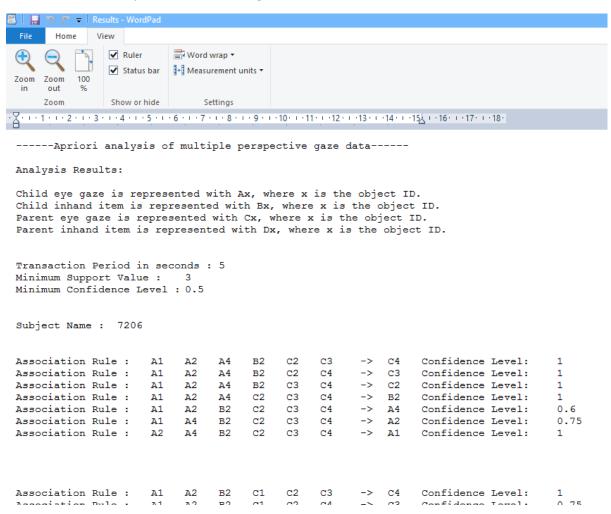
- Child gaze fixation is referred as 'Ax' where x is the object ID.
- Child held object is referred as 'Bx' where x is the object ID.
- Parent gaze fixation is referred as 'Cx' where x is the object ID.
- Parent held object is referred as 'Dx' where x is the object ID.

Then a duration is specified to form transactions from the data. All the unique 'region of interest' values observed in that specified time duration amount to one transaction. Each transaction tries to take a snapshot of the environment to record the individual perspectives of child and parent, during that short time period.

A-priori algorithm is then applied on this transaction data. Association analysis of up to 7 frequent item-set is performed on the data.

Results

The result of the analysis is in the following format:

Interpretation

Taking the example of following association rule for subject 7206:

Association Rule:	A1	A2	A4	B2	C2	C3	->	C4
Confidence Level:	1							

When the Child eye gaze shifts from object 1, 2 and 4 in one transaction,
and the object in hand of the child is 2,
the Parent's eye gaze shifts from object 2 & 3 to object 4.

This association has a confidence level of 1 or 100%. Which means child and parent experience shared attention in the transactional time duration with both item 2 (in child's hand) and 4 (child's eye gaze fixation).

Association Rule:	A2	A4	C1	C2	C4	D1	->	A1
Confidence Level:	0.83333							

When child's eye gaze shifts from object 2 & 4 in one transaction duration,
And parent's eye gaze shift from object 1 & 2 in same time,
with the parent holding item 1,
the child's eye gaze falls on object 1 too.

This association has confidence of 0.83, or 83% chance of occurring (as calculated through the observed transactions).