I. EXTENDED ABSTRACT

1.1. BACKGROUND

Geometry (Stanislas Dehaene 2006) and non-perceptible Euclidean geometry (Veronique Izard 2011) constitute core set of intuitions understanding environments. Psychology researcher’s identified patterns of comparison and spatial inference in visual problem-solving (Andrew Lovett 2012) (Charles E. Bethel-Fox 1984) which could play key role in spatial perception and navigation. We propose to study how intuitive geometric constructs can enhance human environment interaction by capturing behaviourally relevant aspects. We start from (Peponis J 1997)’s space partitioning to axial lines, isovists, and (Turner A 2001)’s isovist of regular tessellation with grid centroids, defining visibility graphs (Batty 2010) to understand how humans can construct space syntax models describing features of spatial relations. Graph-based spatial-mental-representation explains way-finding behaviour, and methods in architecture have gained plausibility by complementing these cognitive methods (Gerald Franz 2005)

1.2. METHODOLOGY / PROCEDURE

A cohort (N=10) aged 19 years was studied through three experiments: (1) Participants choose given options that complies an outline shape previously shown, (2) Outline of geometric-freeform shapes are shown to construct shapes within, (3) Similar outline of complex geometric shapes are marked with two points blue (start-point) and green (end-point) and participants construct a path.

1.3. OUTCOME / DISCUSSION

Results in the first experiment analysis, mode of choice show overall performance of 62.9% (69%-55%; simple to complex), indicating derived-constructs (Intuitive) vary from constructs through geometric principles (determined-constructs). Subsequent experiment on relations of determined-constructs to derived-constructs shows negative correlation, participants using minimal derived-constructs while opting for determined-constructs and vice-versa. It appears that the participants perhaps divided shapes into parts using nodes, edge and mid-points. In the third experiment (way-finding) the ratio of determined-constructs used is 0.5 that of derived-constructs of which, significant 81% constructs are segments and resultant-references (fusion of derived & determined).

1.4. CONCLUSION

Spatial perception widely varies from simple to complex forms and during navigation features are convoluted. Derived-geometry dominate determined-constructs in simple forms with egocentric behaviour while in complex there seems to be shift towards allocentric, observed in second experiment participants. In third experiment, participants are dominated by egocentric behaviour constructing convoluted features maintaining allocentric using determined-constructs. We also find variation in intuitive geometric constructs of spatial perception through resultant-references during navigation.

Keywords: Intuitive geometric constructs, Human environment interaction, Navigation, Allocentric and Egocentric

2. REFERENCES

