The Perception Model

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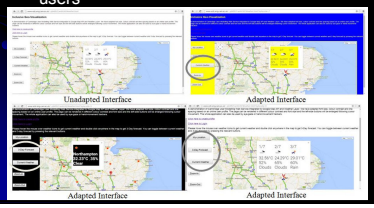
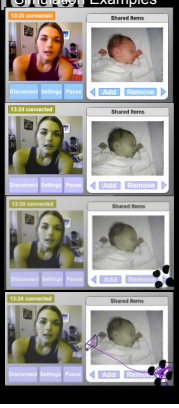
Inclusive User Model

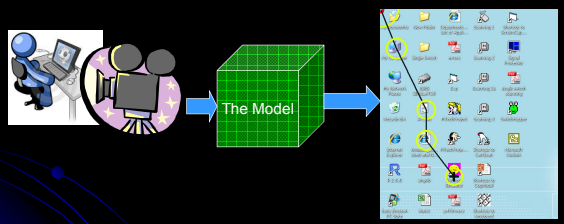
- Simulation of visual / auditory perception and eye gaze and cursor movement of users
- Developed a user model that is validated for a wider range of abilities of users than existing work
- Adaptation of electronic user interfaces based on preference and range of abilities of users



Simulation Examples



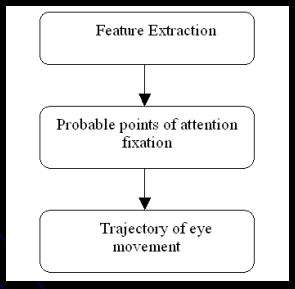
The Perception Model



Recording of users' interaction

Eye movement pattern

Working principle



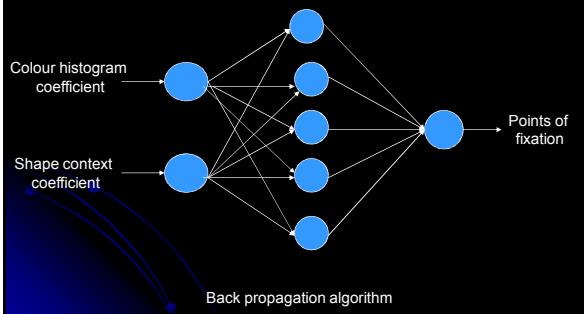
Spotlight metaphor of attention

Feature extraction

- Colour histogram matching algorithm
- Shape context matching algorithm

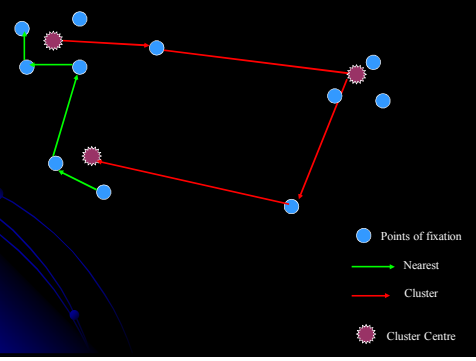
- Calculates image processing coefficients of a region in image
- Evaluates its similarity to the target region

Points of fixation



Back propagation algorithm

Eye Movement Strategies

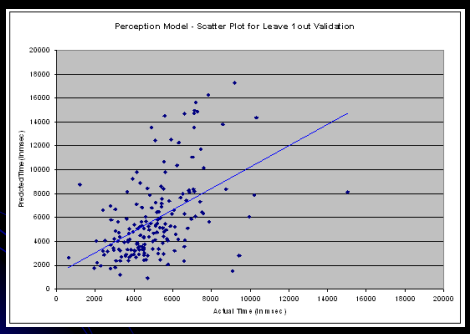


Modelling Visual Impairment

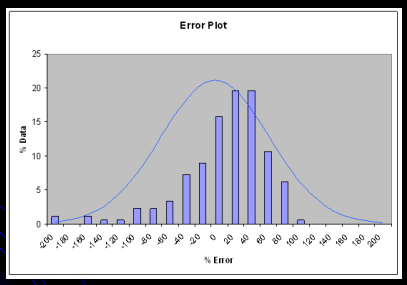
In three levels

- Diseases
- Visual functions
- Image processing algorithms

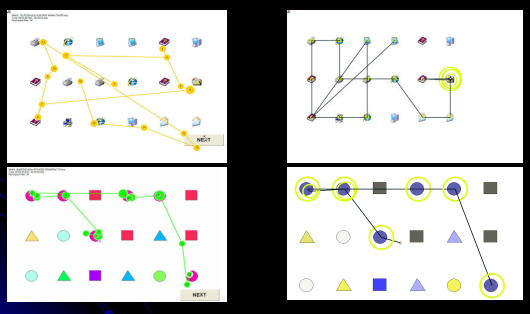
Results



Results



Eye Gaze Patterns



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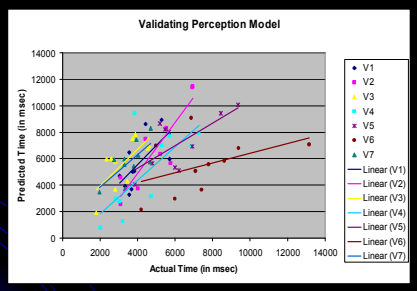
Results



Comparison

	ACT-R/PM or EPIC models	My Model	Advantages of my model
Storing Stimuli	Propositional Clauses	Spatial Array	Easy to use and Scalable
Extracting Features	Manually	Automatically using Image Processing algorithms	
Matching Features	Rules with binary outcome	Image processing algorithms that give the minimum squared error	More accurate
Modelling top down knowledge	Not relevant as applied to very specific domain.	Considers the type of target (e.g. button, icon, combo box etc.).	More detailed and practical
Shifting Attention	Systematic/ Random and Nearest strategy	Clustering/ Nearest /Random strategy	Not worse than previous, probably more accurate

Case Study

How and why your target brand can be confused with similar brands including people with visual impairment?

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Visual Impairment Simulations

Colour Blindness Simulation

Early stage of Wet Macular Degeneration Simulation

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Pair-wise Comparison

Used the neural network model shown in slide #6

No Visual Impairment			Colour Blindness			Macular Degeneration		
Colour	Shape	Matching Coefficient	Colour	Shape	Matching Coefficient	Colour	Shape	Matching Coefficient
0.91	0.71	102	0.89	0.72	92	0.87	0.4	117
0.91	0.71	102	0.89	0.72	92	0.88	0.41	117
0.80	**0.57**	**56**	**0.81**	**0.57**	**59**	**0.79**	**0.26**	**117**
0.79	**0.57**	**54**	**0.81**	**0.57**	**57**	**0.79**	**0.27**	**115**
0.91	0.71	98	0.88	0.72	89	0.87	0.39	116
0.91	0.71	101	0.89	0.72	91	0.87	0.4	113
0.92	0.71	103	0.90	0.72	94	0.88	0.4	120
0.82	**0.57**	**60**	**0.83**	**0.57**	**62**	**0.81**	**0.23**	**139**
0.96	**0.78**	**139**	**0.95**	**0.78**	**134**	**0.89**	**0.65**	**106**
0.91	0.71	102	0.89	0.72	92	0.88	0.4	118
0.91	0.71	98	0.88	0.72	89	0.87	0.38	118
0.91	0.71	98	0.88	0.72	89	0.88	0.38	126

Quantified design decision can be taken in terms of colour and shape similarity

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