A Feature-Integration Theory of Attention

A. Treisman and G. Gelade (1980)
Feature Integration Theory

objects --→ separable perception of features (e.g. color, shape, orientation etc.)

--→ combine / link features in objects

pre-attentive focused attention

perception

Friday, May 10, 13
Feature Integration Theory

9 experiments testing predictions based on the theory

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Feature Integration Theory

objects \rightarrow \text{separable perception of features (e.g. color, shape, orientation etc.)} \rightarrow \text{pre-attentive} \rightarrow \text{combine / link features in objects} \rightarrow \text{focused attention} \rightarrow \text{perception}
Feature Integration Theory

- Single features can be detected in parallel without attention limits.
- Conjunctions require focal attention of each object, resulting in serial search.

pre-attentive | focused attention
find the **S** or **blue**
Visual Search

feature
Visual Search
feature

find the S or blue
Visual Search
feature
Visual Search
conjunction

find the T
Visual Search

conjunction
Experiment 1

Distractors: \( \text{X, T} \)
Target: “\( \text{S or blue} \),” \( \text{T} \)

Feature

Conjunction

\( \text{S} \)

\( \text{blue} \)
Visual Search results

**Figure 1.** Search times in Experiment I.
Experiment 2

Condition: easy
Distractors: O, N
Target: O

Condition: difficult
Distractors: X, T
Target: T
FIG. 3. Search times in Experiment II.
Experiment 3

Distractors: , ,
Target: 

Distractors: , ,
Target: 

Distractors: , ,
Target: 

Fig. 4. Similarity relations between the stimuli in Experiments I and III.

conjunction

feature

feature
Experiment 4

\[ P + Q = \text{P} \quad = \text{R} \]

illusory “R”

\( (I + Z = \text{I} = T) \)

illusory “T”

**Distractors:** P, Q

**Target:** R

**Distractors:** P, B

**Target:** R

**Distractors:** P(Q,B)

**Target:** R

illusory conjunction

non-illusory conjunction

single feature
Fig. 6. Search times in Experiment IV.
Experiment 5

Task: sort by boundary (horizontal vs vertical)
Experiment 6

Task: sort by boundary (horizontal vs vertical)

disjunctive feature

conjunction

control
Experiment 7

boundary determined by non-intersecting pairs of
[P, R, E, F, O, Q, X, K]

interesting cases

“single feature”: (PO/RQ), (EO/FQ)
“conjunction”: (PQ/RO), (FK/EX)
Experiments 8/9

Distractors: 0, X
Target: H (H, X, O)

Distractors: 0, X
Target: X, O

disjunctive feature

conjunction
Applications to Graphics

encoding variables that represent individual features (e.g. color, orientation, intensity, movement) are good for search tasks

unique combinations of features do not create pop-out effects in the same way as unique features
Questions