Knowledge based system ETS (Expertise Transfer System)

(Boose, J.H., 1986)

- Program system that acquires knowledge by means of managed consultation with expert,
- Program manages operations: *dialog with expert, filling of knowledge base, modifications of knowledge base, consultation.*

Theory of personal constructs (Kelly, G.A.: The Psychology of Personal Constructs. Vol.1, Norton, New York, 1955.)

Basic idea: Man „describes and remember the world“ by means of special psychological patterns (constructs) by which he covers acquired experience and on the contrary by composition (unconscious synthesis) is able to form the figure of the world (and to understand and interpret it).

Knowledge are formalized by means of so called Repertory grid (Constructs (rows), Objects (columns).

Semantic content:

Constructs – properties, relations,

Objects – representatives of some fragment of modeled world,

	A	**B**	**C**	**D**	**E**
p	100	100	-100	50	-50
q	100	-100	100	-100	50
r	50	-100	-100	100	-100

Fields in tables we read (yellow field): „Object **A** fulfills construct p for 100 %“ or „Construct **p** is contented in object **A** for 100 %“.

Example: „ The component **A** weight is more than 10 kg . (**p** = To have weight larger then 10 kg.)

Note: Software ETS enables to set up values of fulfillment of constructs with the sensitivity „1“ in the interval ⟨-100, 100⟩.

Examples of constructs:

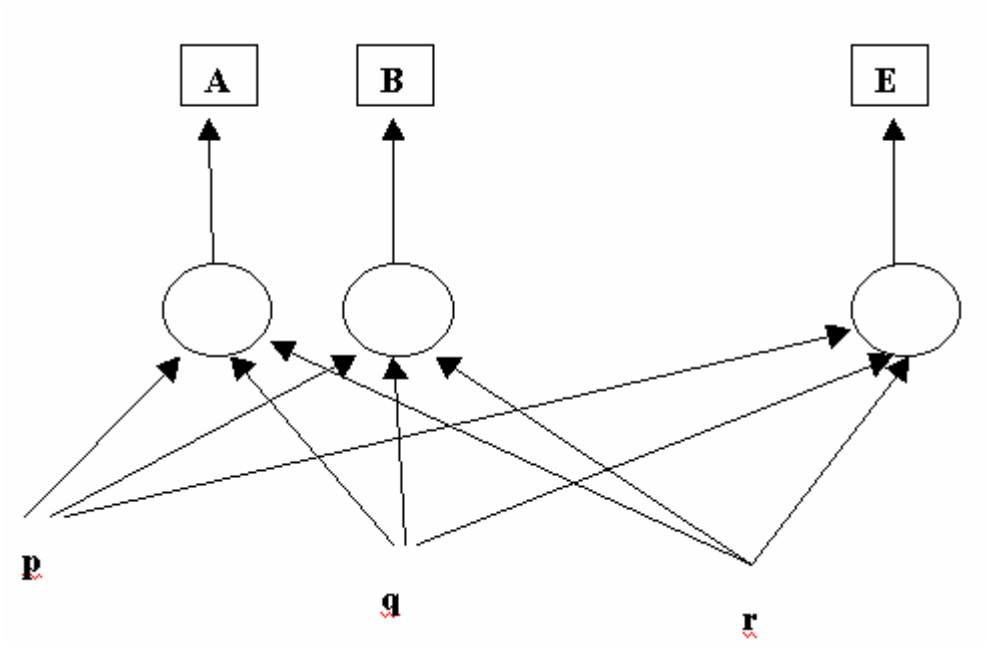
a) Attributes (properties). „To be yellow“, „To be excited“, „To have the velocity 2 m/s“.
b) Relations: „To move in curve c1 with acceleration $a = kt^2$.“
c) Statements: „IF the value of P1 attains the quantity H1 THEN starts stiffing of the paste“.
d) Instrumentals: „In temperature T1 = 400 °C switch of heating circle !“.
e) General knowledge: „The temperature (T) and the moisture (V) are bonded by the function T = K/V“.

Examples of objects:

- Technological systems (valves, pumps, sensors, engines, …),
- Socio-economic subjects (enterprises, firms, hypermarkets, …),
- Goods (cars, ski, spa, …),
- Points in an experimental space.

Examples show that within to ETS is possible to translate even complicated tasks. It depends only on the level of conceptualization and on the translation into constructs and objects.

The form of knowledge base:



Procedures and operations with ETS:

Filling of knowledge base.

Modification of knowledge base.

Correction of similarity of objects and constructs.

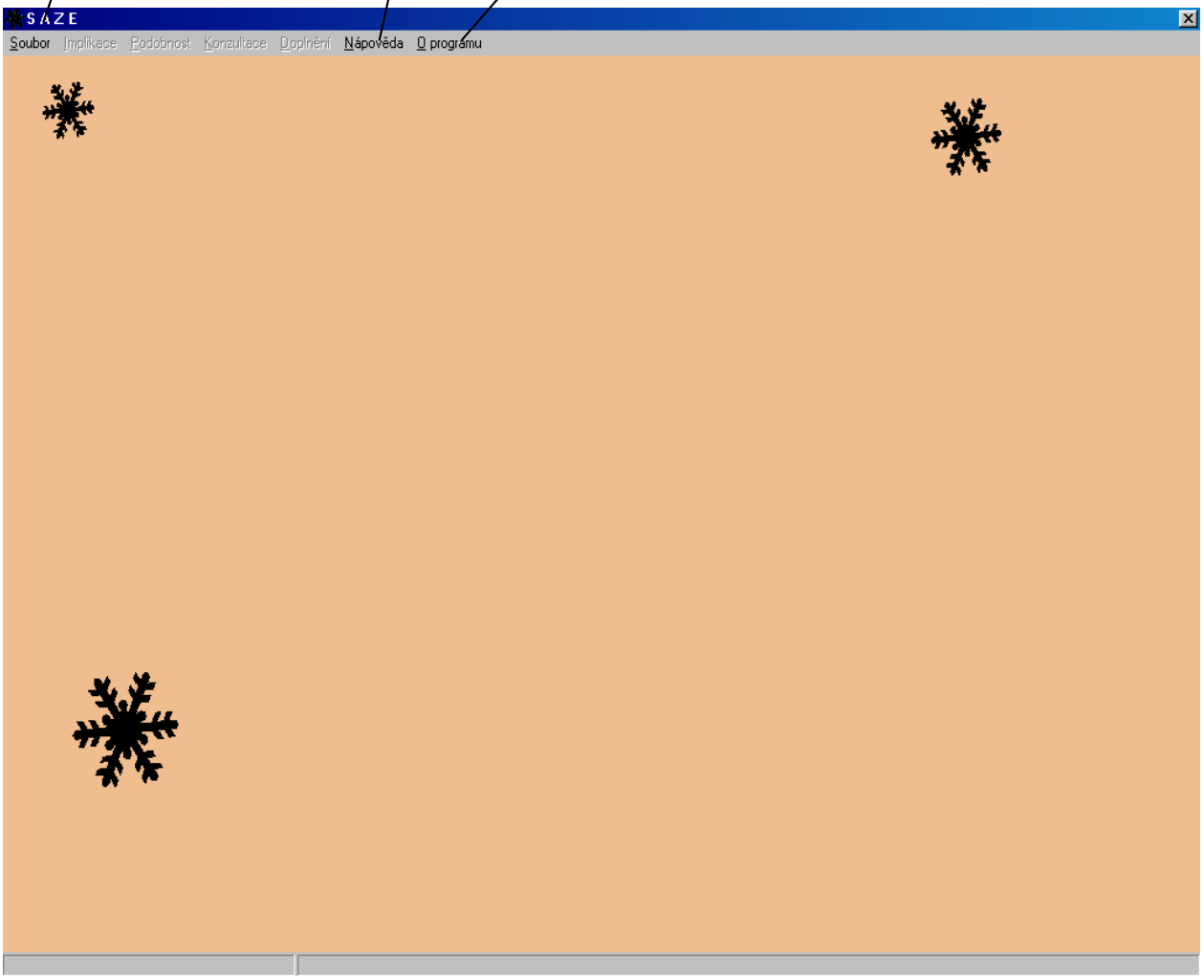
Secondary dependencies between objects and constructs.

Consultation:

„Find, please, object X, that fulfills construct p from 30 %, construct q from 50 % and construct r from 98 %.“

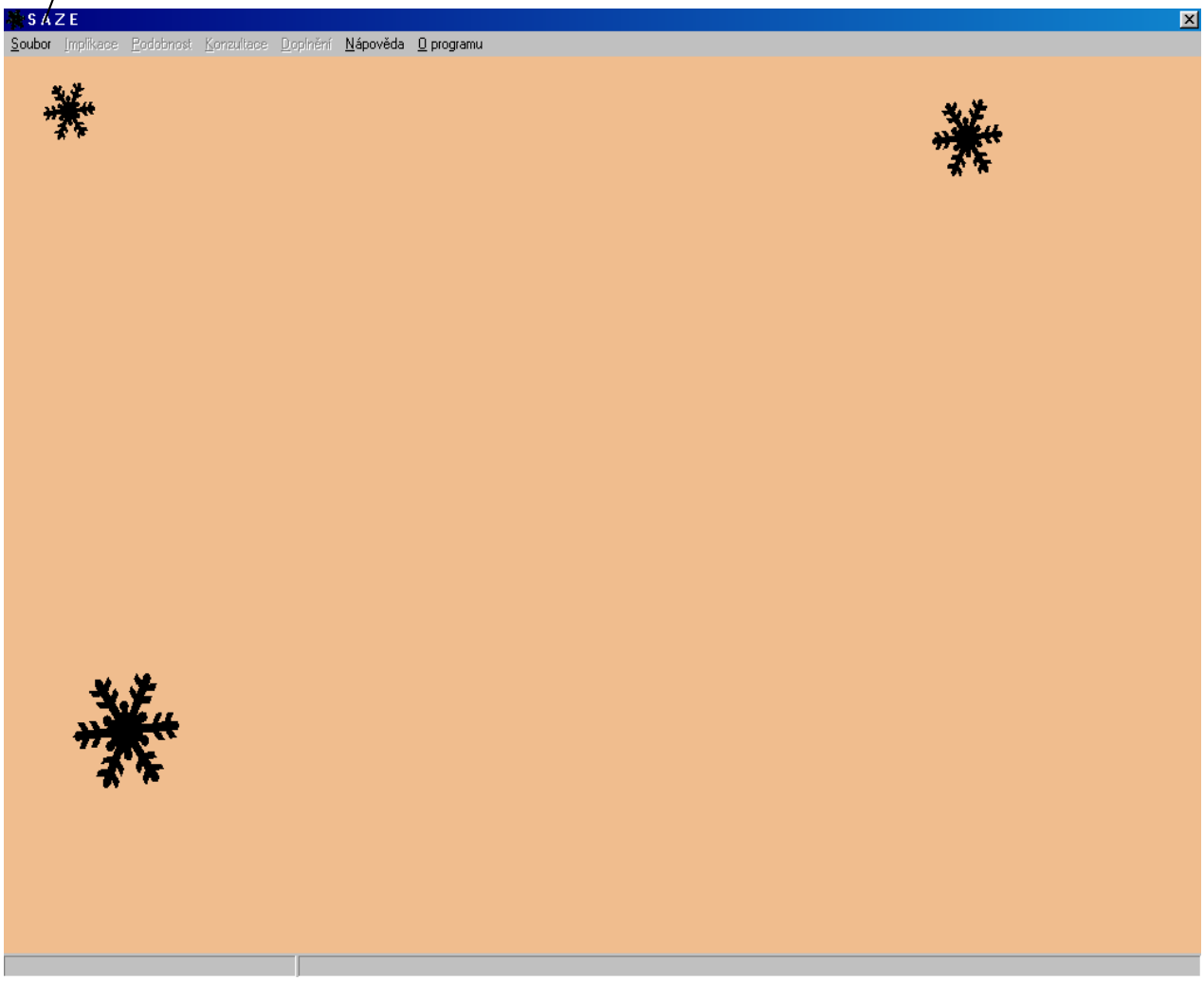
Response of ETS: A (95%), B (40%), C (45%), …

FILE **PROMPT** **PROGRAM DESCRIPTION**

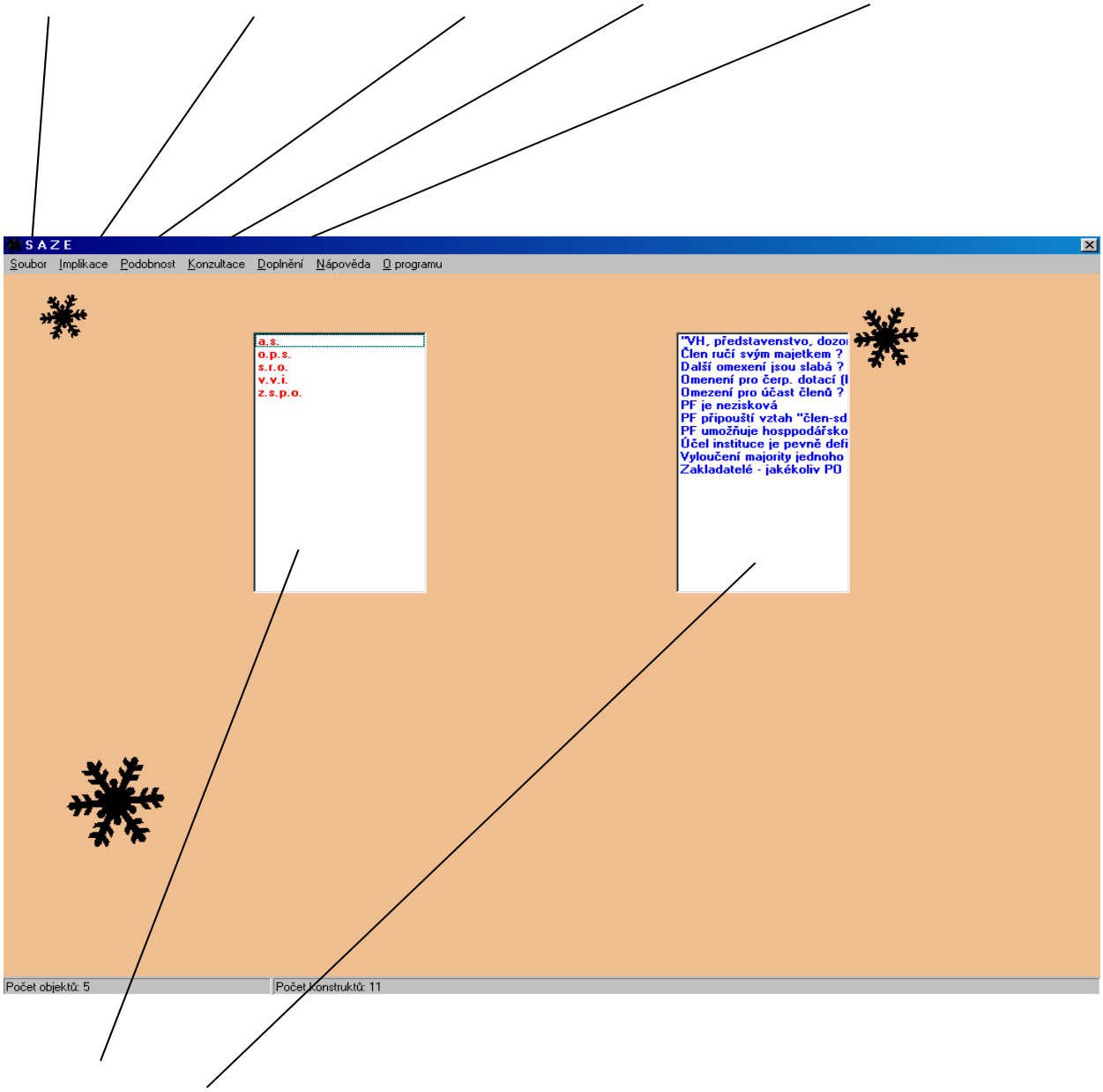


Technical description of the program

NEW FILE
OPEN FILE
END



FILE END IMPLICATION SIMILARITY CONSULTATION CHANGE OF KB



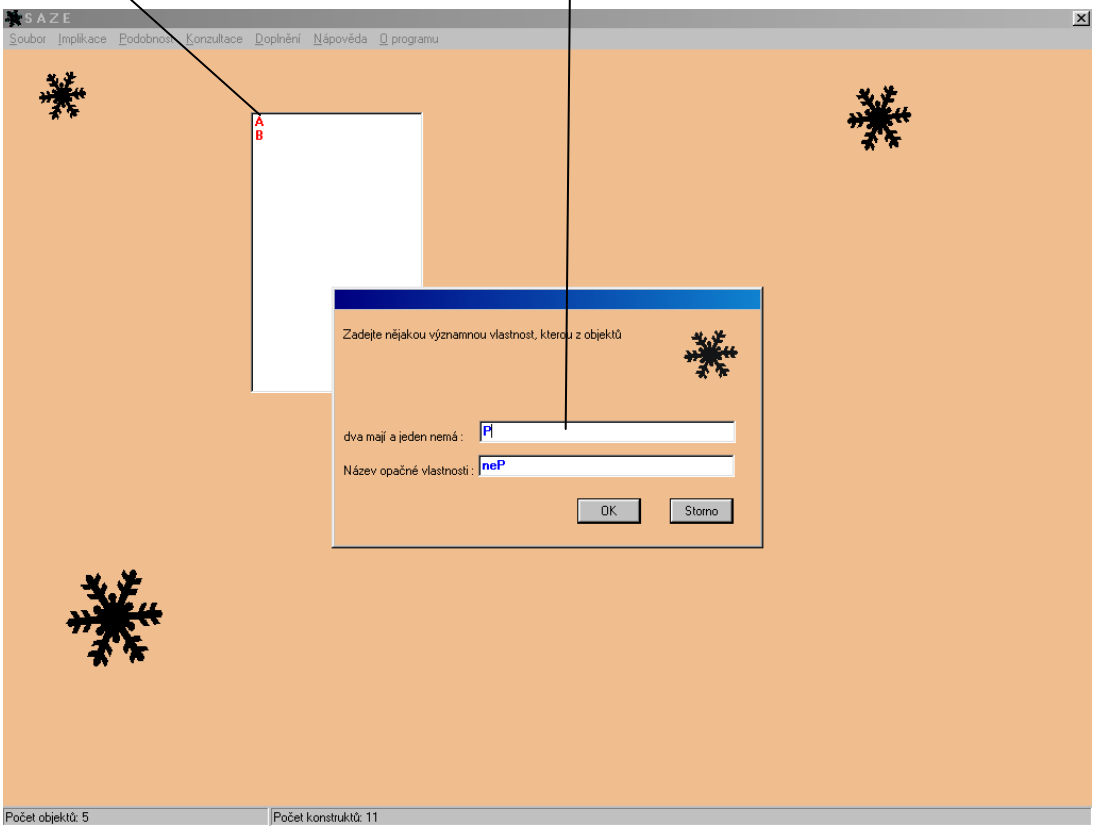
OBJECTS CONSTRUCTS

How program works:

Filling the knowledge base:

1. Form a new knowledge base (New).
2. Insert in the knowledge base **Objects** (A, B, C. …)
3. Insert in the knowledge base first **Construct** (p).
4. In dialog regime response questions of the type: ”Object A (B, C…) fulfils construct “p” in “x %”?”
5. Continue with further constructs.
6. After the last construct **Save** knowledge base.

OBJECTS **CONSTRUCTS**



Consultation:

(i) Describe (in % of constructs) the properties of searched object.
(ii) Execute consultation.