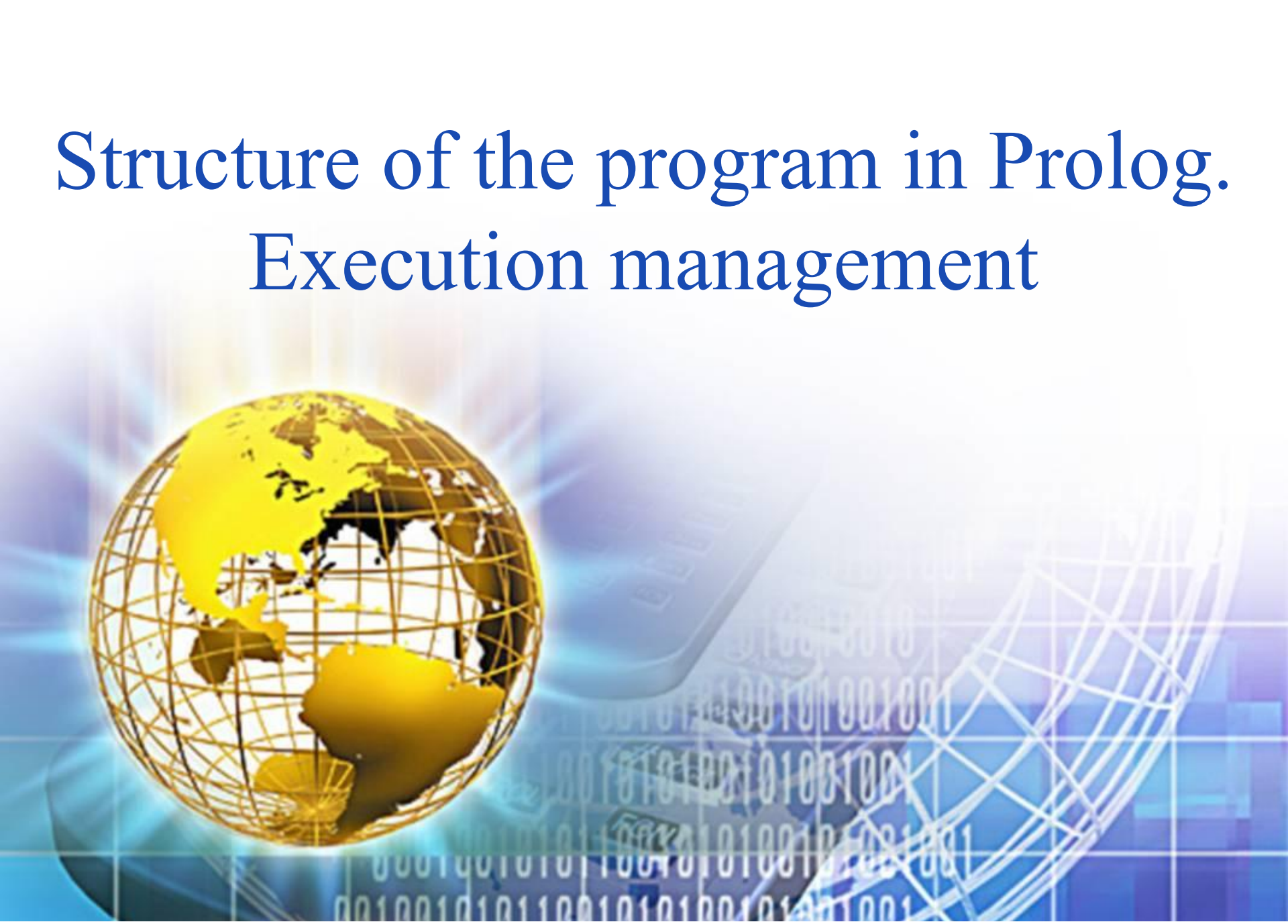
Structure of the program in Prolog. Execution management



Lecture 4

Peculiarities of Visual Prolog

- Visual Prolog is a compiled language
- Other versions have elements of interpretation of a code during the execution
- Strict data typing
- Rules are not data: you can't add or remove them during the execution
- You can't define new operations

Program sections

- compiler directives
- **CONSTANTS** – section of constants description
- **DOMAINS** – section of domains description
- **DATABASE** – section of description of internal database predicates
- **PREDICATES** – section of predicates description
- **CLAUSES** – section of clauses description
- **GOAL** – section of internal goal description

Peculiarities of Visual Prolog

- All sections can be in any order
- Predicates and domain must be defined before their usage
- Predicates declared in a section DATABASE can be added and removed from internal database while the execution

Program containing only the goal

GOAL

write("hello"), readchar(_).

Compiler directives

- trace – to trace the program
- nowarnings – to suppress the message that a variable occurs only once
- include – insertion of some file content
- check_determ – compulsory check of predicates determination

Peculiarities of Visual Prolog

- You can start tracing only for the definite predicate
- If there is a tracing the optimization of recursion is not working
- To establish non-determination of predicates by default: Options – Project – Compiler options – Warnings – Default predicate type – Nondeterm

Constants

```
CONSTANTS
pi=3.14
path="c:\\prolog\\bgi"
```

Domains

- integer – an integer number (-32768...32767)
- real – a float number ($\pm e^{-307}$...$\pm e^{308}$)
- char – a symbol in apostrophes
- string – a sequence of symbols in double quotation marks
- symbol – a symbolic constant (atom)
- file – a file

Description of your own domain

<name_domain> = <description_domain>

or

file = <symbolic file name$_1$>; ...;
<symbolic file name$_N$>

or

<name_list_domain> = <name_domain_of_list_elements>*

Examples:

DOMAINS

i=integer

list=i*

Description of a structured domain

<name_structure> = <name_functor>
(<name_domain_first_component>, ...,
<name_domain_last_component>) [;<name_functor>(...)]*

Examples:

flatpoint = p(integer, integer)

triangle = tr(point, point, point)

fullpoint = p(integer, integer); p(integer, integer, integer)

Description of predicates

<name_predicate> (<name_first_argument>, ..., <name_last_argument>).

Examples:

PREDICATES

mother(string,string).

member(integer,integer*).

member(real,real*).

member(char,char*).

member(string,string*).

One and the same predicate will work with different data of different domains

Standard predicates

- readln(_)
- readint(_)
- readreal(_)
- readchar(_)
- readterm(name_domain, term_domain)
- write([<variable / constant / value>,…])
- writef – format output
- nl
- upper_lower(_,_)
- str_int(_,_)
- str_real(_,_)
- str_char(_,_)
- char_int(_,_)
- true
- fail
- free(_)
- bound(_)

Standard predicates

- div()
- mod()
- trunc()
- round()
- random(_)
- random(<число>,_)

- All embedded predicates are determinated

Program “Relatives”

```
DOMAINS
s=string
PREDICATES
nondeterm mother(s,s)
nondeterm grandmother(s,s)
CLAUSES
mother("Наташа","Даша").
mother("Даша","Маша").
grandmother(X,Y):-
   mother(X,Z),
   mother(Z,Y).
```

Well-formed program:

1) Input an empty line between procedures
2) Start a body of a rule with an indent
3) Start each sub-goal from a new line with an indent

Print all grandmothers
Print all mothers
Print all mothers by pressing the button

Execution management

1. Method of a depth search (backtracking)
2. Method of a rollback after a failure
3. Cut and rollback
4. Method of a user-defined search

Backtracking

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
CLAUSES
mother(“Dasha",“Masha").
mother(“Natasha",”Dasha").
mother(“Natasha",”Glasha").
mother(“Dasha",”Sasha").
grandmother(X,Y):–
        mother(X,Z),
        mother(Z,Y).
```

```
GOAL
grandmother(B,V).
```

Method of a rollback after a failure

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
CLAUSES
mother("Dasha","Masha").
mother("Natasha","Dasha").
mother("Natasha","Glasha").
mother("Dasha","Sasha").
grandmother(X,Y):-
        mother(X,Z),
        mother(Z,Y).

GOAL
grandmother(B,V),
write("Grandmother's name - ",B),
write("Granddaughter's name - ",V).
```

Method of a rollback after a failure

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
CLAUSES
mother("Dasha","Masha").
mother("Natasha","Dasha").
mother("Natasha","Glasha").
mother("Dasha","Sasha").
grandmother(X,Y):–
        mother(X,Z),
        mother(Z,Y).
```

```
GOAL
grandmother(B,V),
write("Grandmother's name – ",B),
write("Granddaughter's name – ",V),
nl, fail.
```

Method of a rollback after a failure

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
show_names
CLAUSES
mother("Dasha","Masha").
mother("Natasha","Dasha").
mother("Natasha","Glasha").
mother("Dasha","Sasha").
grandmother(X,Y):–
        mother(X,Z),
        mother(Z,Y).
show_names:–
        mother(_,Name),
        write(" ", Name), nl,
        fail.
GOAL
write("Daughters' names: "),nl,
show_names.
```

Method of a rollback after a failure

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
show_names2(s)
CLAUSES
mother(“Dasha",“Masha").
mother(“Natasha",”Dasha").
mother(“Natasha",”Glasha").
mother(“Dasha",”Sasha").
grandmother(X,Y):–
        mother(X,Z),
        mother(Z,Y).
show_names2(Mother):–
        mother(M,Name),
        M=Mother,
        write(" ", Name), nl,
        fail.

GOAL
write(“Dasha’s daughters names:
    ”),nl,
show_names2(“Dasha”).
```

Cut and rollback

```
DOMAINS
s=string
PREDICATES
mother(s,s)
grandmother(s,s)
show_names3(s)
CLAUSES
mother("Dasha","Masha").
mother("Natasha","Dasha").
mother("Natasha","Glasha").
mother("Dasha","Sasha").
grandmother(X,Y):–
        mother(X,Z),
        mother(Z,Y).
show_names3(Daughter):–
        mother(_,Name),
        write(" ", Name), nl,
        Name=Daughter,
        write("We found her!"),!.

GOAL
write("All daughters up to Glasha: "),nl,
show_names3("Glasha").
```

Method of a user-defined search

```
repeat.
repeat:-
        repeat.
double_char:–
        repeat,
        readchar(C),
        write(C,C), nl,
        C=’.’,!,
        nl,write(“You entered a full stop. You finished.").

GOAL
write(“Enter symbols which you want to repeat. Full stop is to finish”),
nl,
double_char.
```