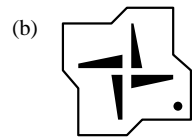
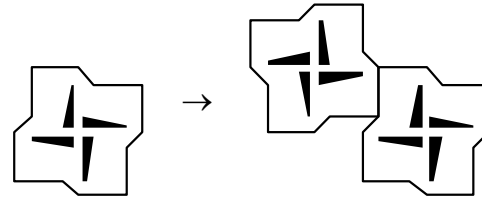
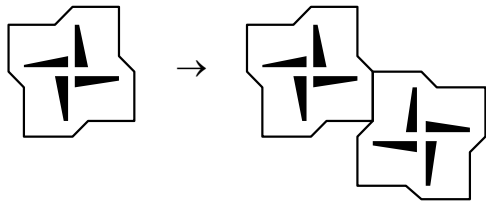


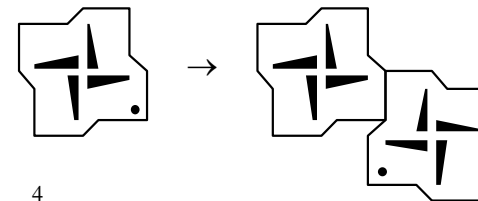
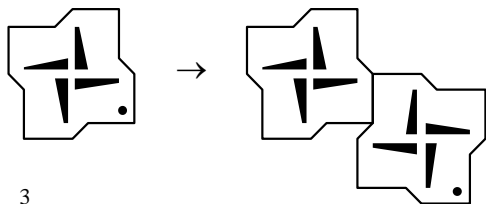
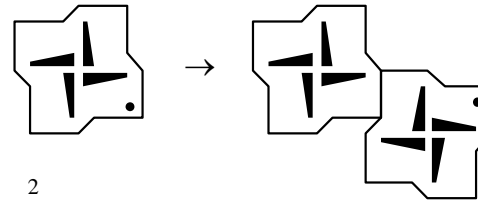
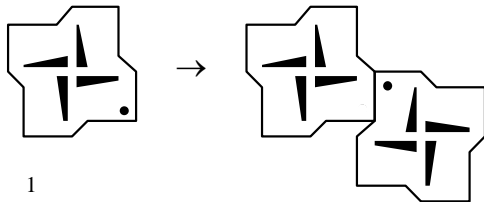
(a) Symmetry = 4



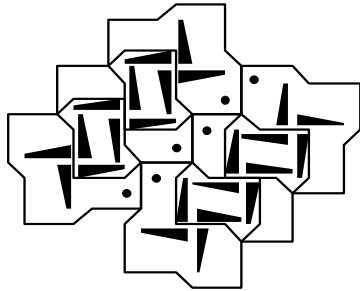
(c) Two addition rules



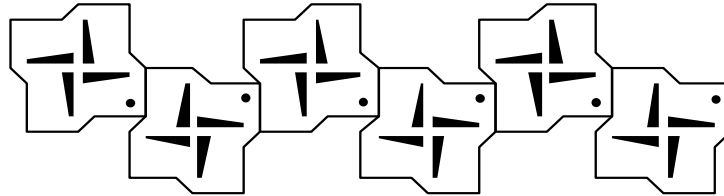
(d) Four basic (labeled) rules



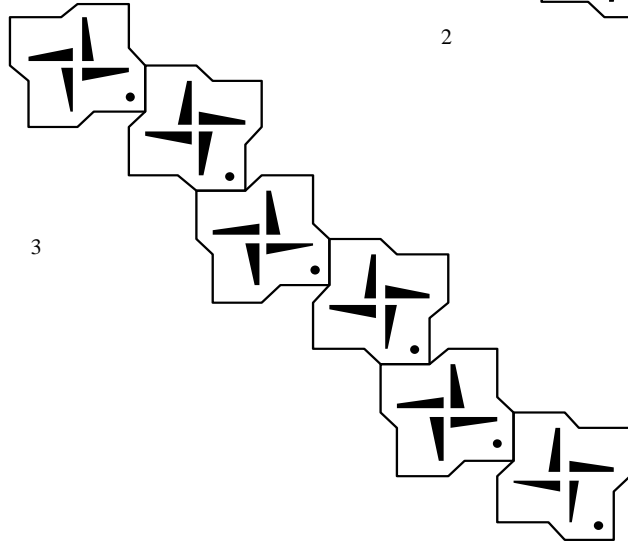
(e) Designs generated by the rules in(d)



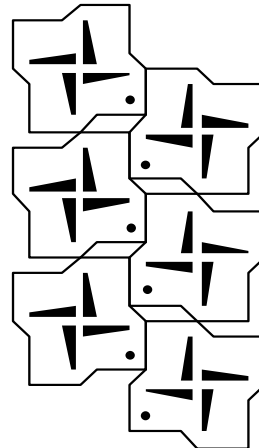
1



2



3



4

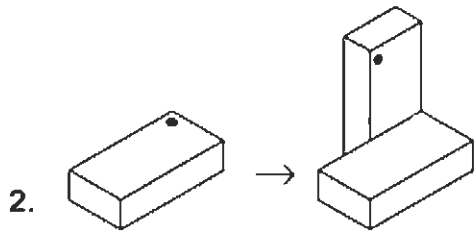
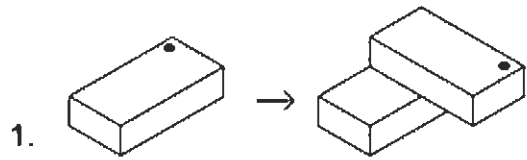
Hierarchy of shape grammars

basic grammars

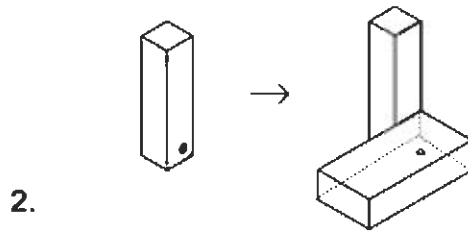
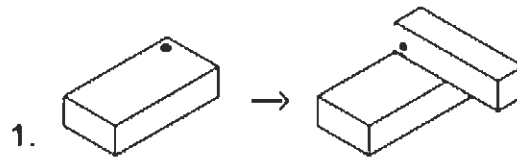
nondeterministic basic grammars

additive grammars

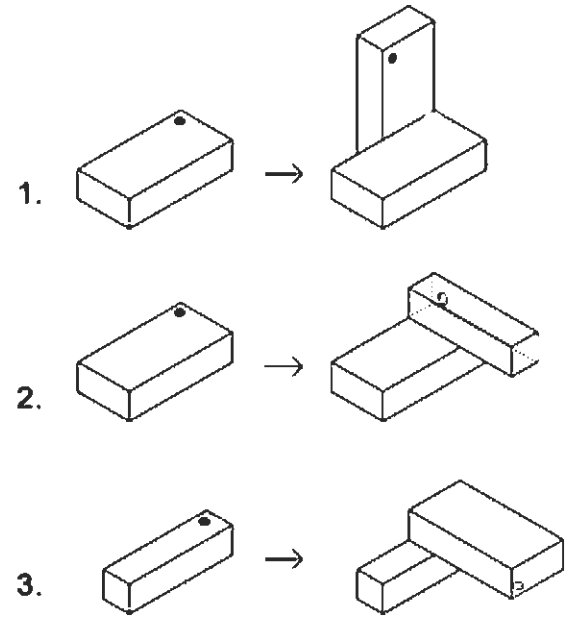
unrestricted grammars



basic grammar



basic grammar



basic grammar

BASIC GRAMMARS
different spatial relations

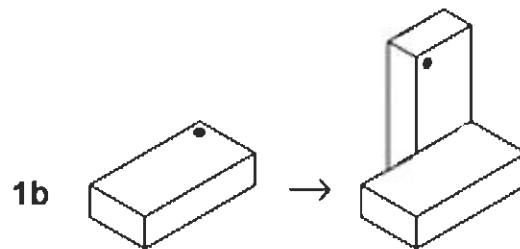
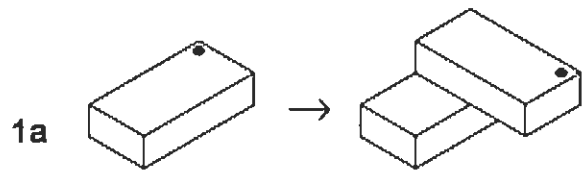
Hierarchy of shape grammars

basic grammars

❖ nondeterministic basic grammars

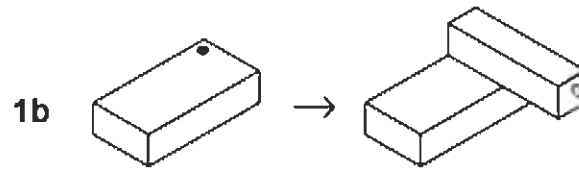
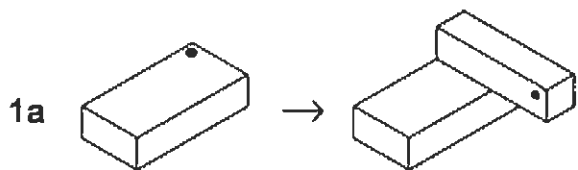
additive grammars

unrestricted grammars



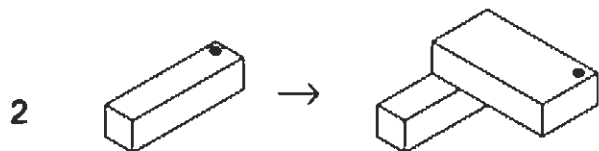
1a 1b

ND basic grammar



1a 1b

 2



ND basic grammar

NONDETERMINISTIC BASIC GRAMMARS

Hierarchy of shape grammars

basic grammars

nondeterministic basic grammars

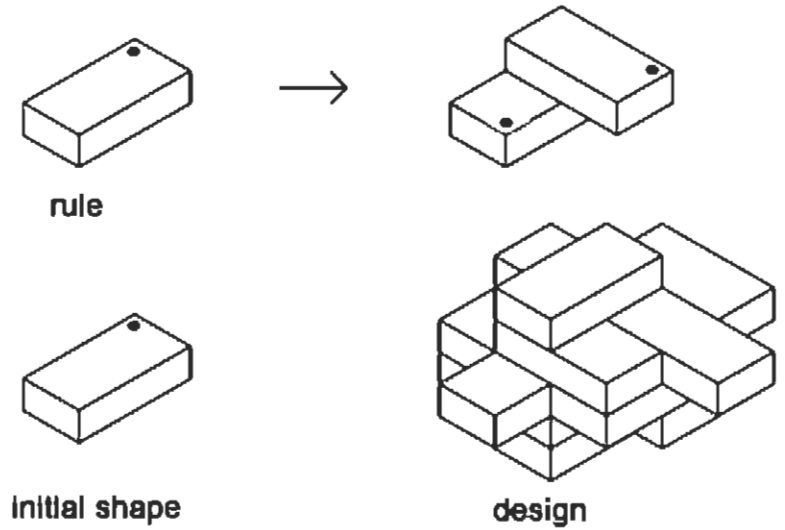
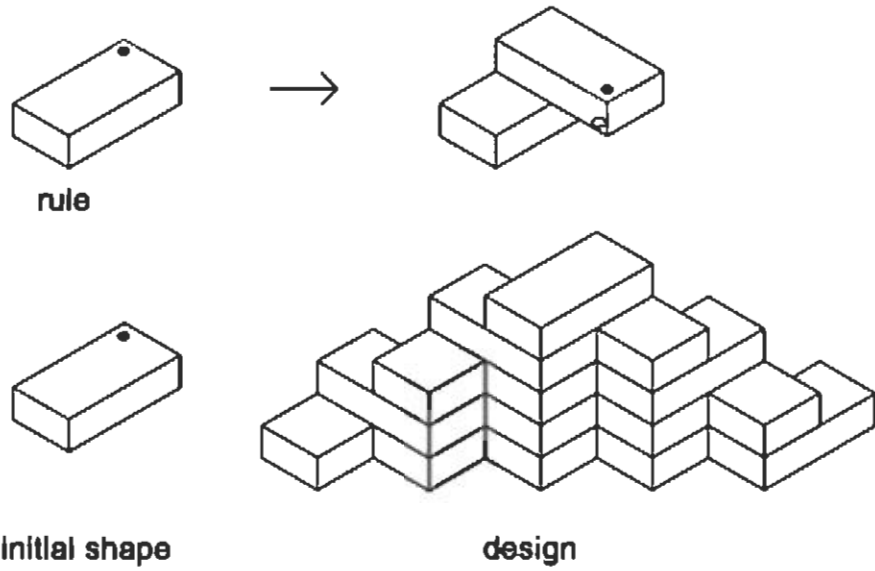
❖ additive grammars

unrestricted grammars

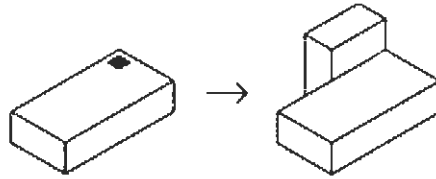
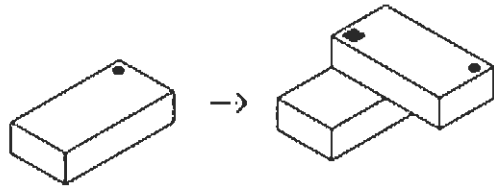
Additive grammar

A set of addition rules

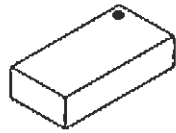
Initial shape: any shape labeled in any way



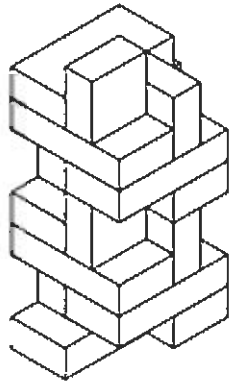
ADDITIVE GRAMMARS
rules with multiple labels



rules



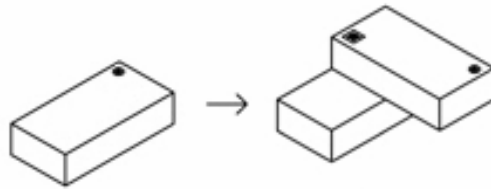
initial shape



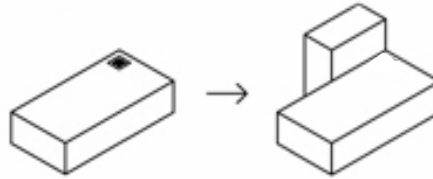
design

**ADDITIVE GRAMMAR
ornamentation rule**

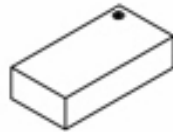
basic rule



ornament rule



rules

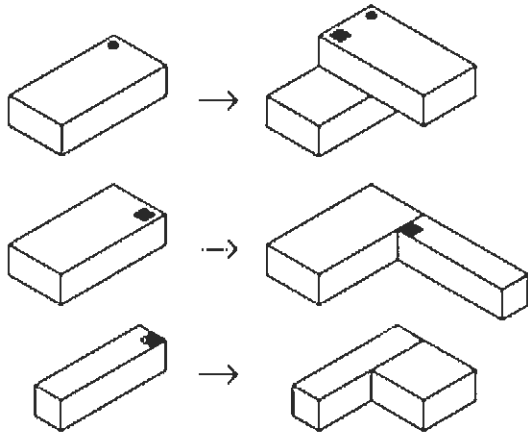


initial shape

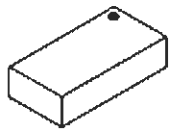


design

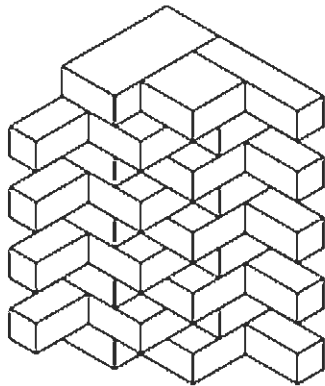
ADDITIVE GRAMMAR
ornamentation rule



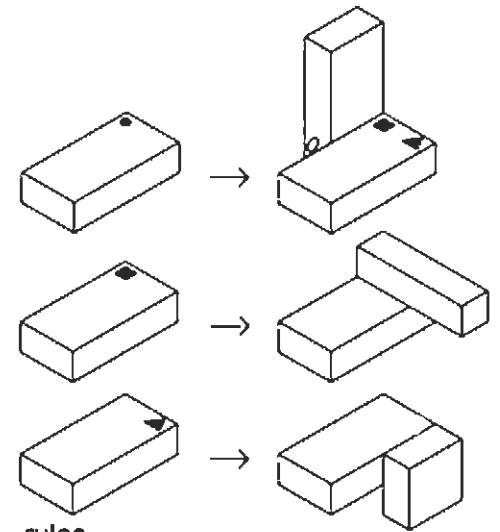
rules



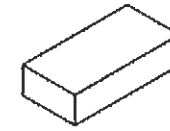
initial shape



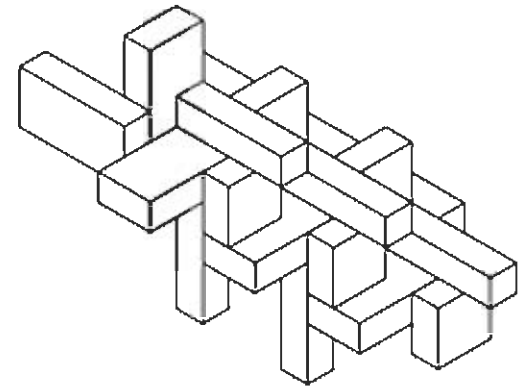
design



rules



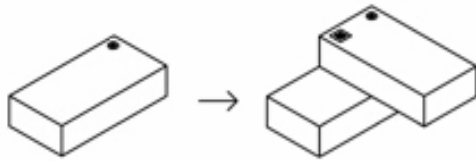
initial shape



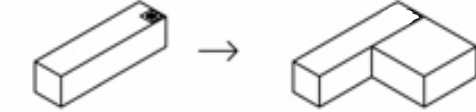
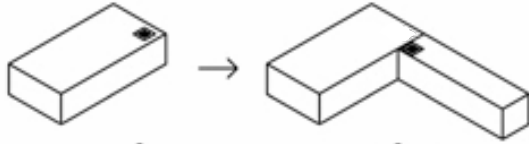
design

ADDITIVE GRAMMARS
ornamentation rules

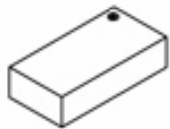
basic rule



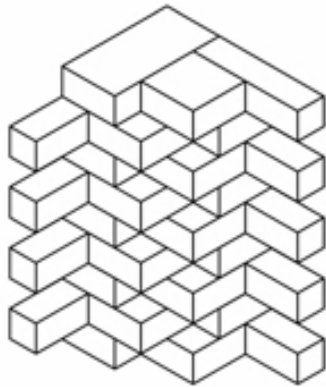
ornament rules



rules

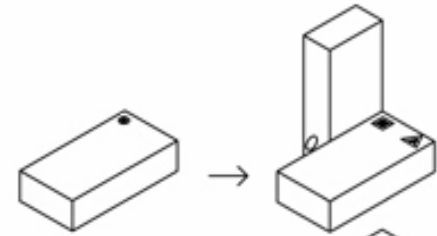


initial shape

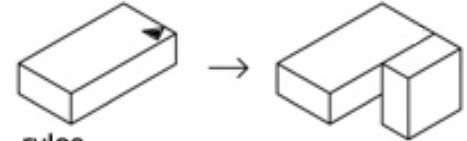
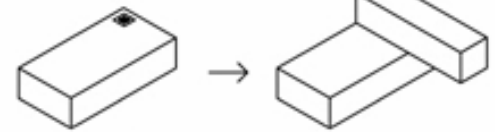


design

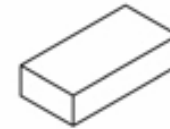
basic rule



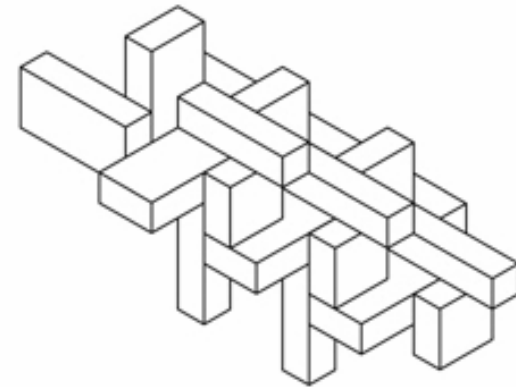
ornament rules



rules

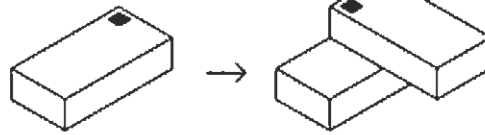
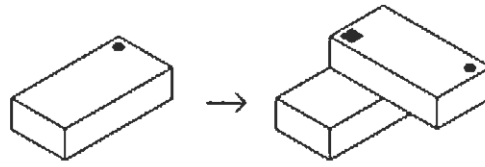


initial shape

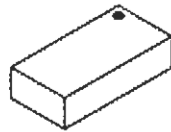


design

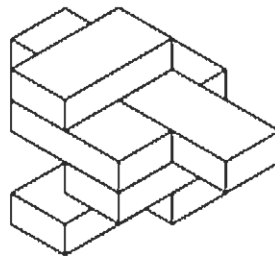
ADDITIVE GRAMMARS
ornamentation rules



rules

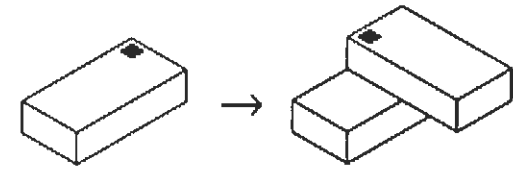
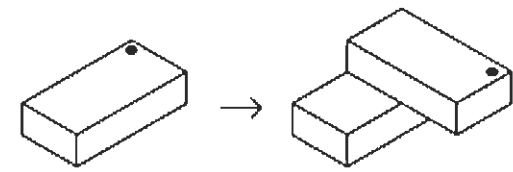
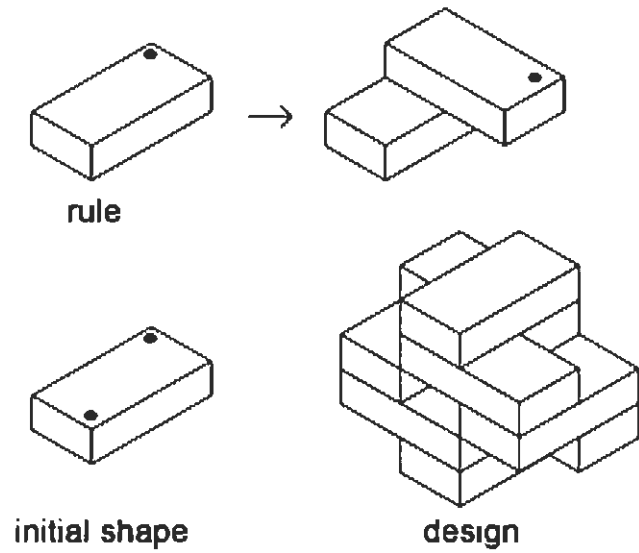


initial shape

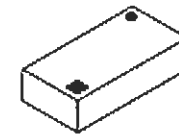


design

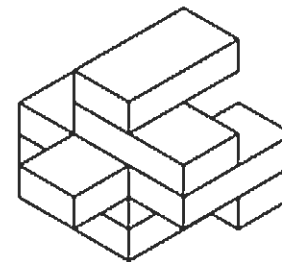
ADDITIVE GRAMMAR
recursive ornamentation rule



rules

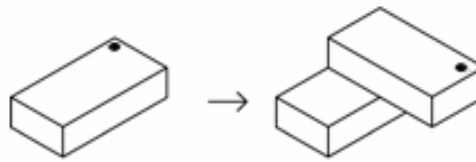


initial shape

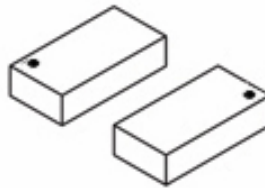


design

ADDITIVE GRAMMARS
initial shapes with multiple labels



rule



initial shape

?

design

ADDITIVE GRAMMARS

multiple initial shapes

Hierarchy of shape grammars

basic grammars

nondeterministic basic grammars

additive grammars

❖ unrestricted grammars

Unrestricted shape grammar

A set of addition rules, subtraction rules, and/or addition/subtraction rules labeled in any way

Initial shape: any shape labeled in any way