RESOLUTION OF CONTRADICTIONS IN OTSM-TRIZ

(material for teachers)

A.V. Korzun

N.N. Khomenko

A.A. Nesterenko

Adapted ARIZ

Basic ARIZ notions

How does a problem occur?
(What is available? What do I want to have? What is an obstacle?)

I want ……………..., to …………….......(subjective wish)
I cannot ………., because…………(objective obstacle)

I want a kid to accurately shade within a contour and to draw by cells.

I cannot achieve this purpose because the coordination of fine motor skills of a preschooler is imperfect and a kid's hand gets tired easily.

The problem occurs due to a conflict between our wishes and objective causes, which prevents the realization of our wishes.

Basic ARIZ notions

In TRIZ, "<u>technical contradiction</u>" is a contradiction which occurs while trying to apply a standard solution to a problem.

If <**Standard solution**>, then (+)
                                                      but (-)

If the hand training time increases, then (+) the writing quality will
                                                                   improve,
                                                                   but (-) disgust of writing will also
                                                                   increase.

If the training time is reduced,   then (+) there will be no disgust of
                                                                   writing
                                                                   but (-) the quality will be low.

An inventive solution ensures (+) without (-)

IFR: A kid gladly draws and shades much by themselves.

Basic ARIZ notions

Methods of dealing with contradictions

1). Extremist - increase (+), do not pay attention to (-)

2) Compromise: reduce (+) to reduce (-)

3) Inventive (+) (-).

Inventive solution ensures (+) without (-)

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Basic ARIZ notions

Contradiction and ideal final result (IFR)

Problem model and result model

PROBLEM MODEL

The task **should be large** → to increase the performancce time and, consequently, the number of exercises.

and

it should be small ← not to cause disgust.

IFR – RESULT MODEL

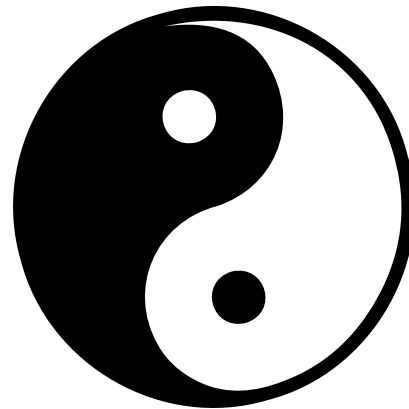Unknown resource by itself, without expenses makes the task

large and

small.

Adapted algorithm of inventive problem solving (T.A. Sidorchuk, N.N. Khomenko)

1. **Preliminary description of a problem situation**
2. **Identifying a specific problem in the problem situation.**
3. **Building an abstract model of the specific problem.**
4. **Building an abstract model of a result, presenting an IFR (ideal final result).**
5. **Identifying resources and finding a specific solution.**
6. **Formulating sub-problems to be solved for implementing a proposed solution.**
7. **Repeating the reasoning chain for solving the identified sub-problems starting from step №3.**
8. **Reflection.**

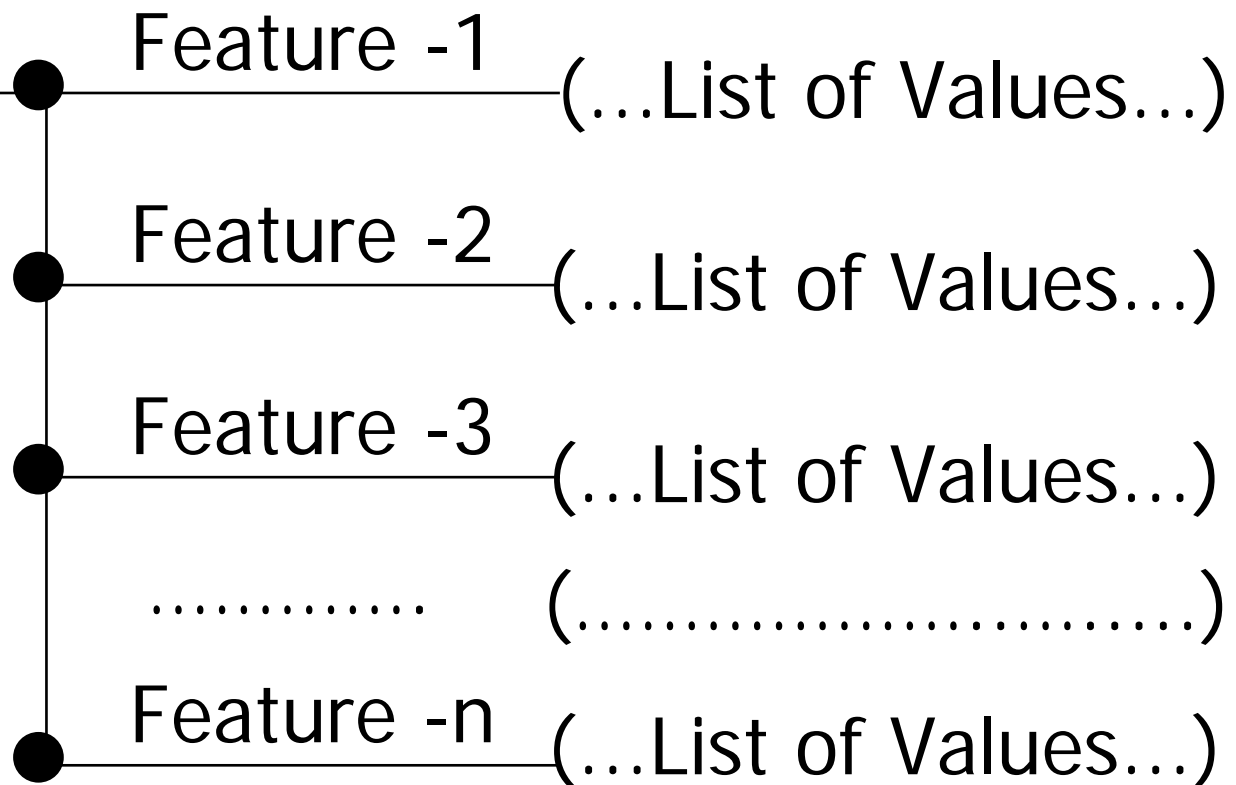For more details: **www_trizminsk.org/e/260023.htm#02**, **www_trizminsk.org/e/prs/231012.htm#04**

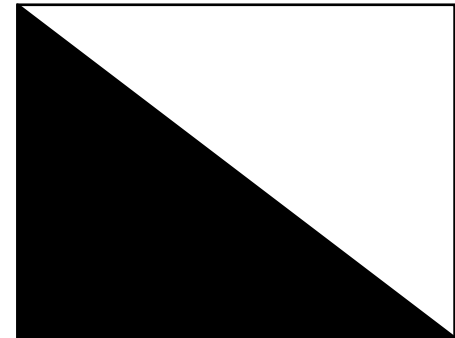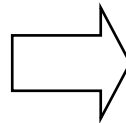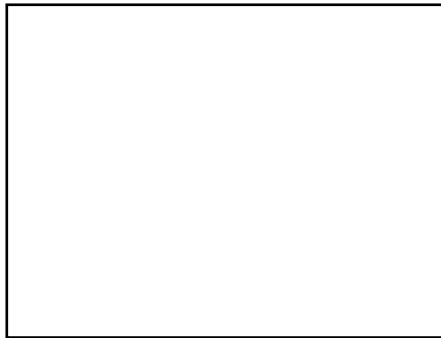# *Combination of opposite demands*

Combination of opposite demands

Element level

Element

Feature -1 — (...List of Values...)

Feature -2 — (...List of Values...)

Feature -3 — (...List of Values...)

.... — (............................)

Feature -n — (...List of Values...)

Combination of opposite demands element level

Combining contradictions in an element (system) itself at a MACROLEVEL

Combination of opposite demands – element level

In time (first one feature value appears and then the other one)

Problem

Alexandria beacon on the coast of the Mediterranean Sea is one of the seven wonders of the ancient world. Historians are still not sure whether it was 56, 100 or 550 m high.

When the beacon construction was coming to an end, the Emperor called the beacon architect and ordered him to cut his, Emperor's, name on the stone. The architect could forfeit his life for not obeying the ruler's order. Yet immortalizing the Emperor's name on his work was unjust and offending. The architect's name is known to us: it was Sostratos of Cnidus, son of Dexiphanes. How do you think he coped with the problem?

Combination of opposite demands – element level

In changing the state of aggregation (a feature has one value in one state of aggregation and an opposite value in the other state)

Problem

How are liqueur chocolates made? First a chocolate bottle is formed and then it is filled with syrup. For a chocolate to be strong, syrup should be thick. But thick syrup is difficult to bottle. It is possible to warm up syrup to make it thinner, but warm syrup causes chocolate to melt. What is to be done?

Combination of opposite demands – element level

In space (one part has one feature value and the other part has a different feature value)
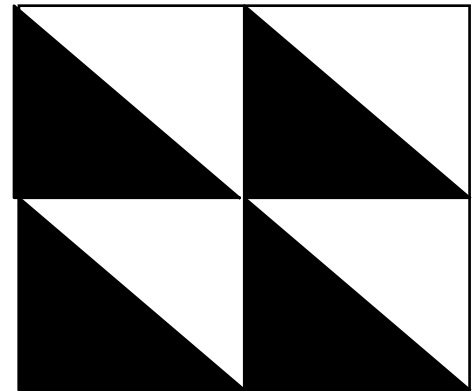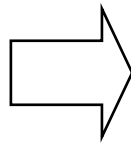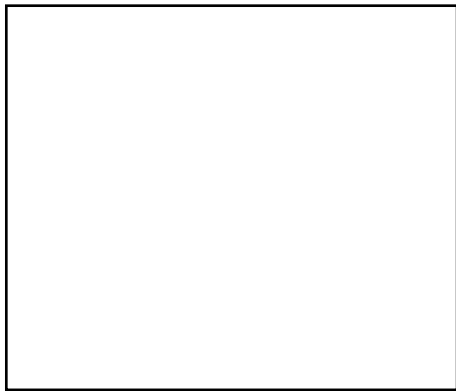
Problem

Once elf Vasya went yachting. The day was shiny, Vasya put on a white satin suit, white shoes and a white Panama hat. While sailing past a village, Vasya noticed his friends on shore. He waved his arms but they did not notice him against the background of the white sail. Next time Vasya decided to put a black suit on, but on that day there was a nasty turn in the weather and the sky was cloudy. Vasya was not seen against the dark background. Vasya was lost in thought: what was do be done? (As a result of modeling, preschoolers usually propose to make a suit composed of two halves – light and dark).

Combination of opposite demands element level

Combining contradictions in an element (system) itself

at a microlevel

Combination of opposite demands – element level

The feature value is changed at the level of microparticles (small pieces, molecular level)

Problem

To travel by a bus or tram, it is necessary to date (punch) a ticket. The pieces punched out of the ticket litter the passenger compartment.

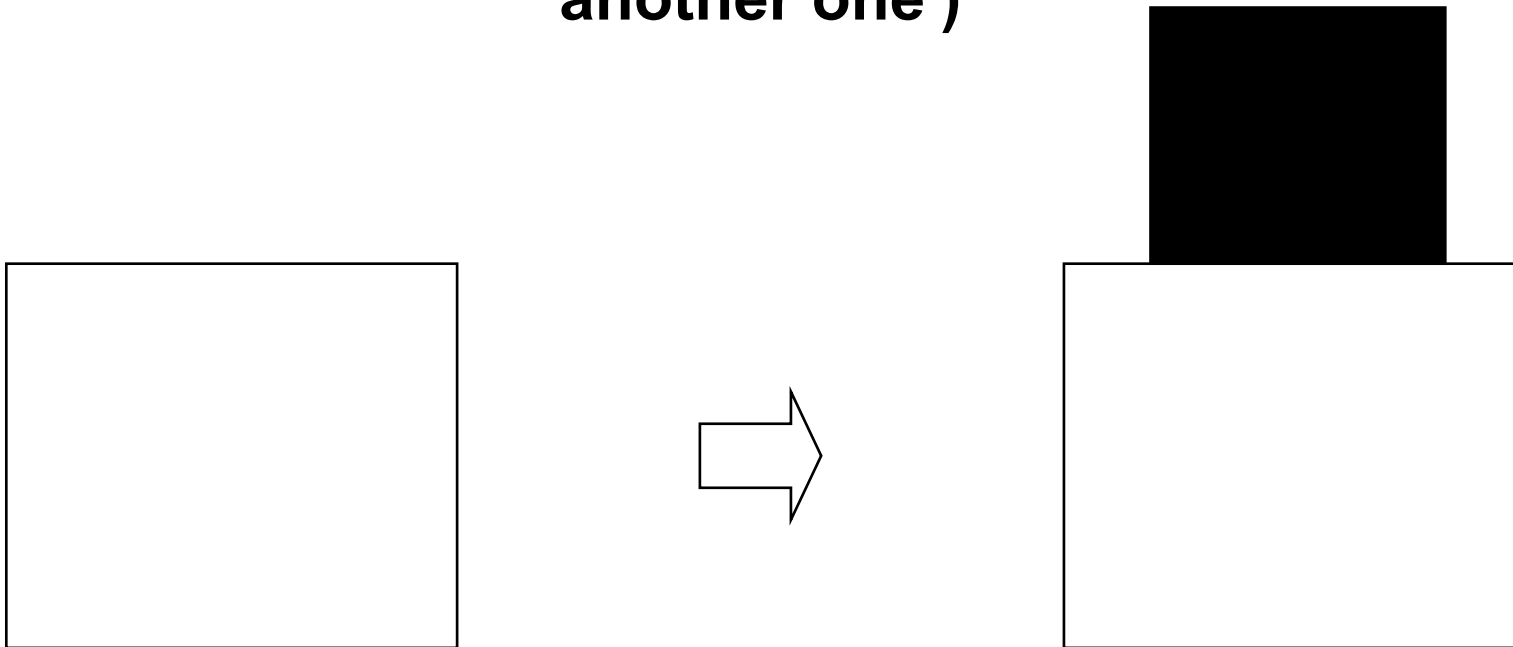# Combination of opposite demands – element level

Problem

Old-pattern blackboards become slippery and chalk does not leave a distinct trace on them (detaching pieces of chalk do not adhere to the blackboard surface). What method of obtaining a distinct trace on a blackboard has been long used by teachers?

Combination of opposite demands element level

Combining with other systems (element itself has one feature value, but combined with something else has another one)

Combination of opposite demands – element level

Combining with other systems (element itself has one feature value, but combined with something else has another one)

"But suddenly a noisy sound was heard…" This is how Pushkin described the Head's voice in his poem "Ruslan and Lyudmila". In Glinka's opera of the same name, it was also necessary to feature that "noisy" voice. What is to be done?

Combination of opposite demands – element level

Combining with an antisystem

Problem

A desk lamp is designed for illuminating a desk surface while working. But bright light can disturb other people who are in the same room. What is to be done?

Combination of opposite demands

Explain what problems have been solved in the following systems?

Combination of opposite demands

Feature name level

Element ———●——— Feature -1 ——————— (...List of Values...)

———●——— Feature -2 ——————— (...List of Values...)

———●——— Feature -3 ——————— (...List of Values...)

.... (........................)

———●——— Feature -n ——————— (...List of Values...)

Combination of opposite demands
feature name level

By «splitting a feature» (one of "sub-features" has one value and the other sub-feature has an opposite value)
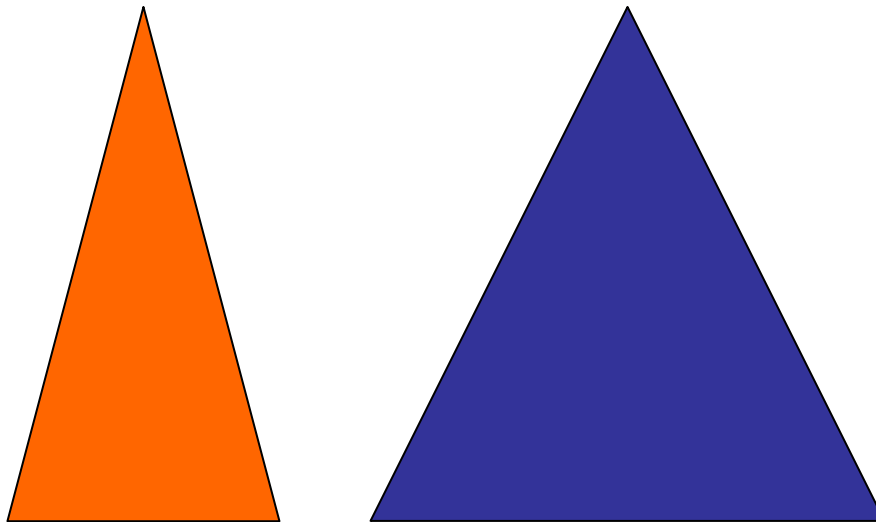
high but narrow

Combination of opposite demands
feature name level

By «splitting a feature» (one of "sub-features" has one value and the other sub-feature has an opposite value)

FEATURE

Size

Large or small?

SUB-FEATURES

height
width
area
volume
length
depth….

Combination of opposite demands – feature name level

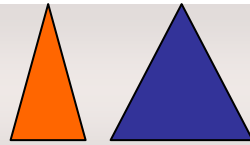**By «splitting a feature» (one of "sub-features" has one value and the other sub-feature has an opposite value)**

While preparing for the taking of Kazan, Ivan the Terrible took a decision to build a small support fortress in the vicinity of the town. He bought a plot of land on the bank of the Volga River where it met the Sviyaga River. According to the agreement, that plot could not exceed the area which could be covered by one bullock skin. The area of the fortress built by Ivan the Terrible was several hundred square meters, but the deal terms were not violated. How did he succeed?

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Combination of opposite demands

feature name level

By reducing the number of feature values (replacement of an object with a model which comprises contradictory values of features)

Combination of opposite demands – feature name level

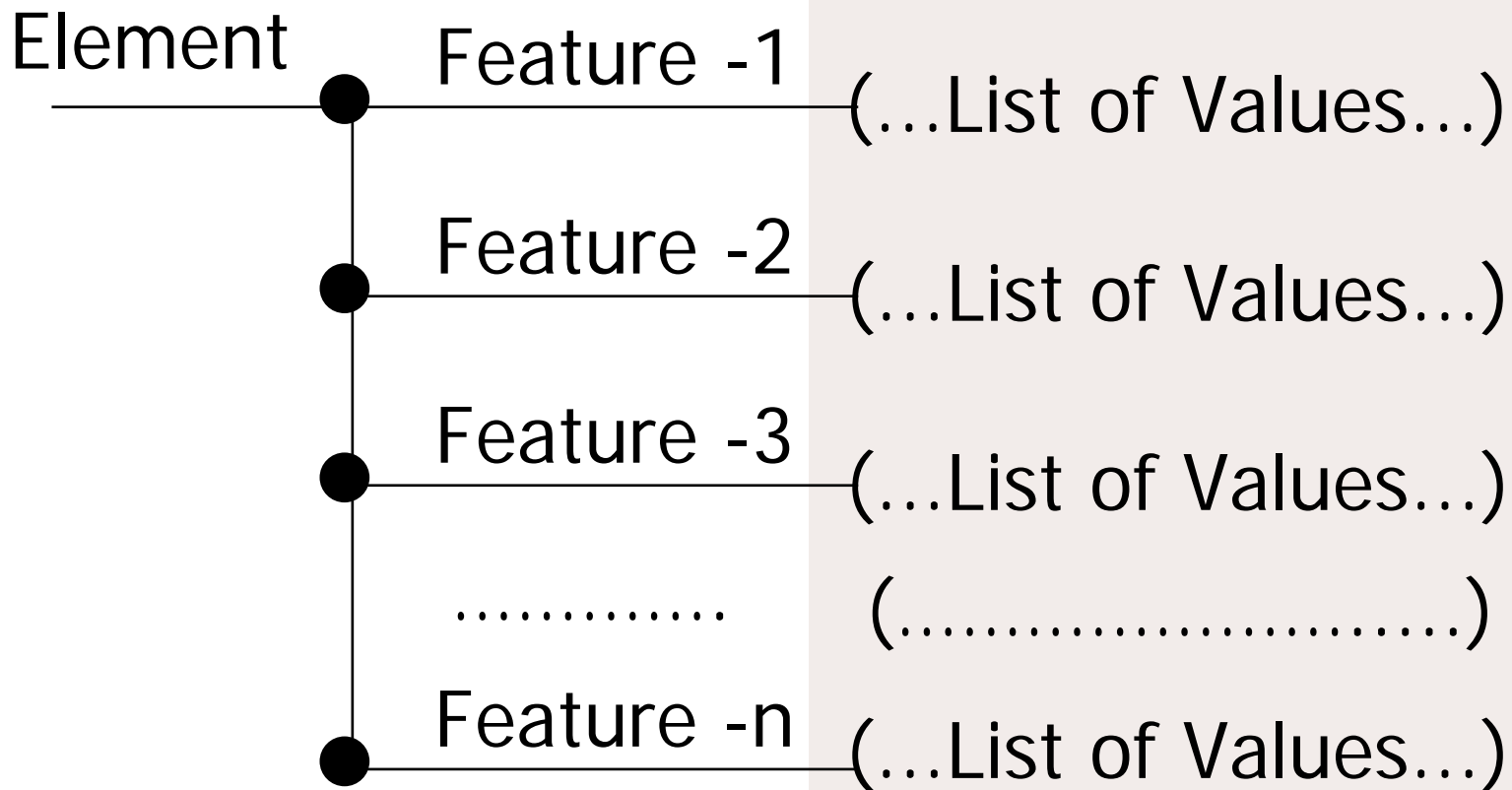# Replacing an object with a model (the opposite value of a feature is situated within the object model)

Problem

To attract buyers, it is necessary that as many buyers as possible have "the product in their hands" so that they could make sure that the new model is better than previous ones. But giving manufactured goods free is too expensive. What did the owner of a large car-manufacturing company invent to increase demand for new car models?

Combination of opposite demands

Feature value level

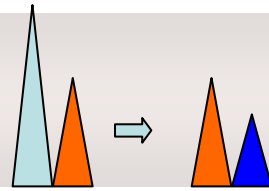| Element	Feature -1	(…List of Values…)
	Feature -2	(…List of Values…)
	Feature -3	(…List of Values…)
	…………	(……………………)
	Feature -n	(…List of Values…)

Contradiction combining methods
feature value level

Changing the reference point (the opposite value of one feature manifests itself in comparison with the other value)

low → high
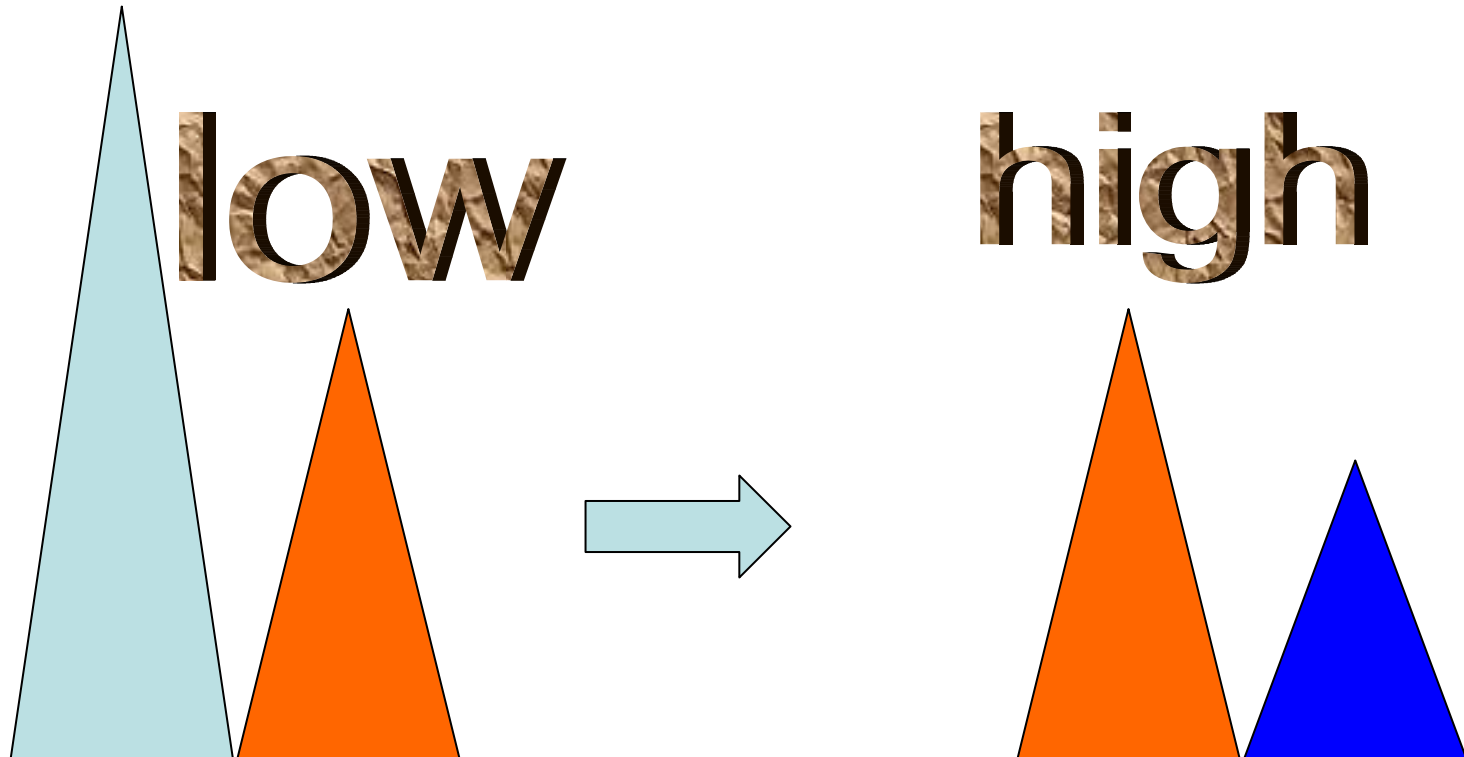
Combination of opposite demands – feature value level

Changing a reference point (the opposite value of one feature manifests itself in comparison with another value).

Problem

Students of a theatre school were preparing for a dance exam. One of the students did well in all subjects except choreography, which was due to his heaviness of movement. The choreographer promised assistance in "constructing" the dance with account of this feature. As a result, the student got an excellent mark. How did they manage to obtain success?

Adapted ARIZ

KEY WORDS	SUPPORTS
1. Situation	
2. Problem	**If …, then (+) …, but (-) …**
3. Problem model (CONTRADICTION)	**… must be →, to (+)** **… must be ←, not to (-)**
4. Solution model (IFR, contradiction resolution):	**… by itself, without expenses provides →/←**
5. Specific solution (RESOURCES)	**RESOURCES:**
6. Sub-problems	• **cheap, nickel-and-dime;**
	• **internal (п-С, С);**
7. Sub-problem solving	• **extrasystemic (н-С);**
	• **external (н-н-С).**
8. Reflection	**PROBLEM – (ПP-IFR-PEC – SOLUTION)**