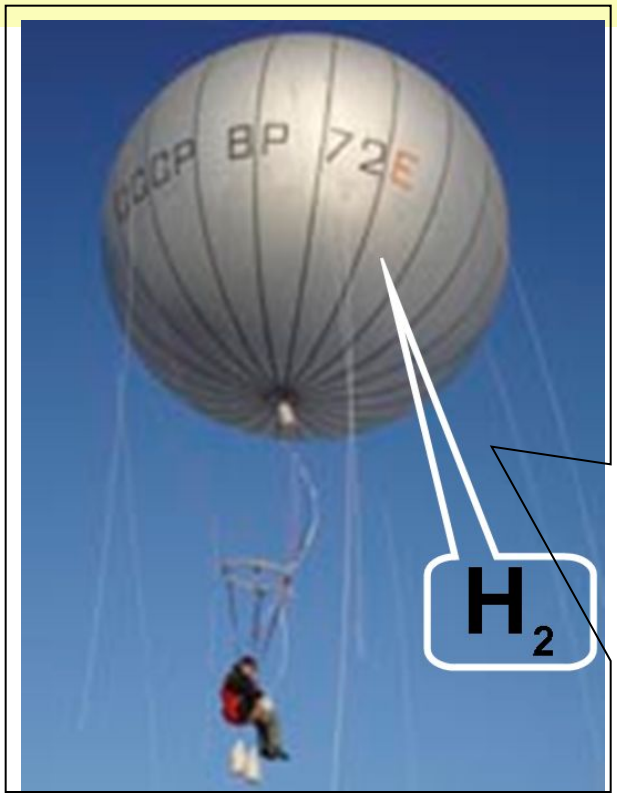
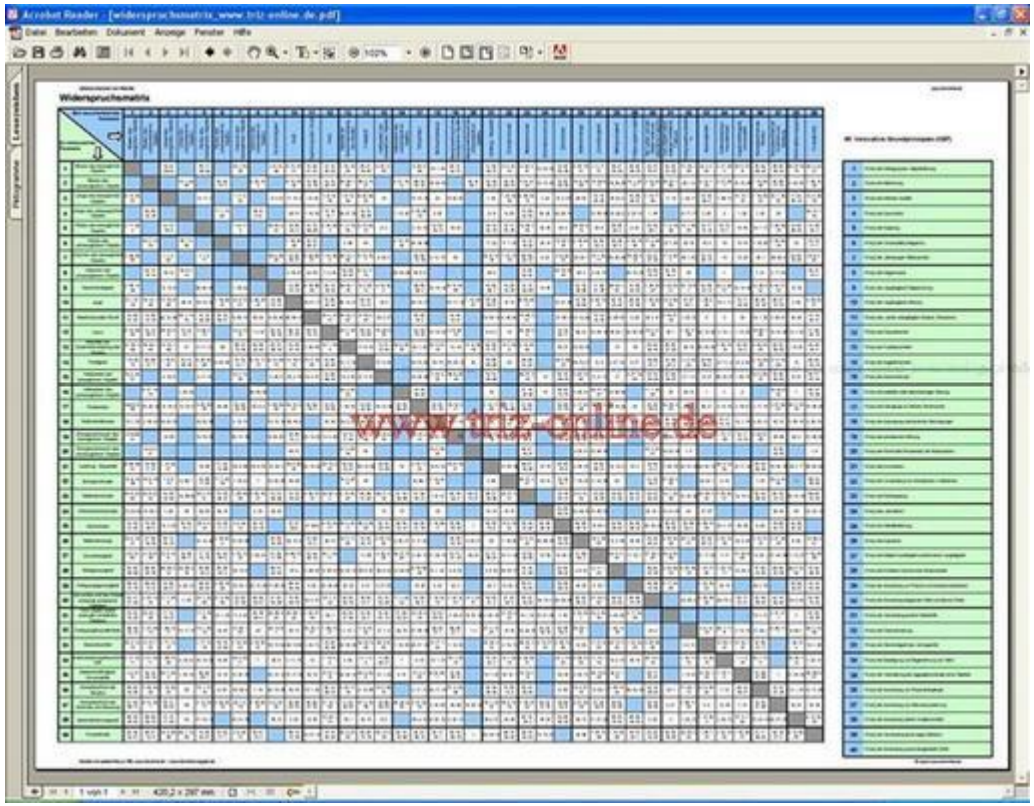
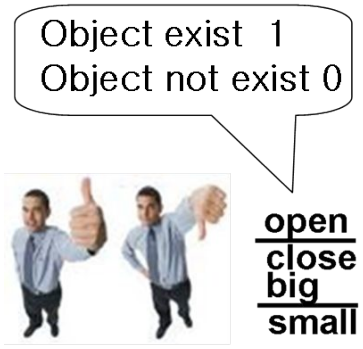
Diagonal elements = data base of PC

Y.Danilovsky © 2015 www.triz-solver.com



1.1 weight of movable object





Challenge:

We can try create electronic database for PC as additional option for Althuller's matrix.

Warning:

necessary modify and refresh the theory about PC. (PC correspond with IFR? IFR correspond with trimming…)

Necessary clarify some parameters from Althuller's matrix.

Содержание черновиков

- It is really not systematized preliminary materials about this topic
- Далее это просто «свалка» не систематизированных заметок заметок

Original text of Altshuller
http://www.altshuller.ru/triz/ariz85v-3.asp

Theory

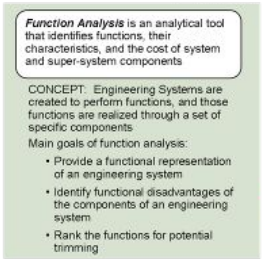
STEP 3.3. Write the formulation of a physical contradiction at the macro level:

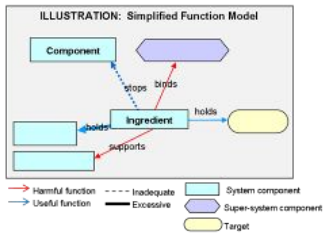
- STEP 3.3. Write the formulation of the physical contradiction at the macro-level:
- operational zone
- during the operational time
- should be (indicate physical macro-state, for example, “be hot”),
- in order to perform the action (indicate one of the conflicting actions),
- and should not be (indicate the opposite physical macro-state, for example, “be cool”),
- in order to perform the action (name another conflicting action or requirement).
- Notes
- 25. **A physical contradiction (PC) is understood as contradictory requirements to the physical state of the opertional zone.**
- 26. If the compiling of an exhaustive formulation of PC causes difficulties, one can compile a short formulation:
- component (or part of a component in the operational zone)
- should be…, in order to… (indicate),
- and should not be, in order to (indicate).

PC “of existence”

PC “as related to the parameter”

Enter to PC





Target:
full list of disadvantages

- 1.1. (вес подвижного объекта) не проблема: дирижабль, подводная лодка, автомобиль, самолёт, очки…
- 2.2 (вес неподвижного объекта), тоже не проблема: стол , стул, здание, дом, палатка, сваи для фундаментов на вечной мерзлоте, гараж…
- 15.15 (время действия подвижного объекта) – как это понять? Например эффективность ? Или долговечность ? Тогда будут корректными примеры: копьё – пуля или тетива лука и пороховой заряд или идея рекуперации электрической энергии в гибридных автомобилях, увеличение дальности пробега
- 16.16 (время действия неподвижного объекта) как это можно понять ? Неподвижного значит « не перемещаемого, не мобильного? Долговечность изделия ? Скорость производительность ? Время изготовления монет, сначала литьё – потом штамповка – потом крипто валюты «биткоин»

Physical Contradiction

open / close — warm / cold

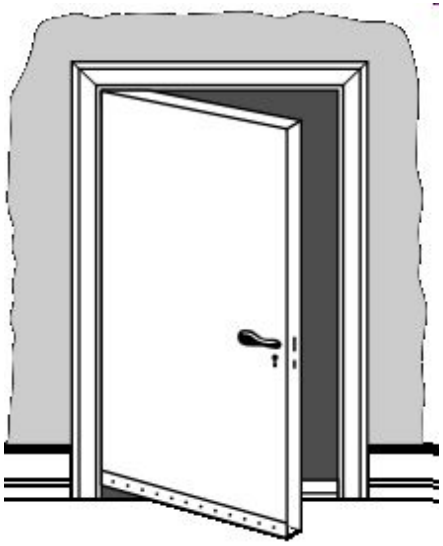
big / small — narrow / broad

Some parameter

Exist / Not exist

Special case according to Trimming approach

Theory



"Dynamicity Increase" Trend

As an Engineering System evolves, it and its components become more "dynamic."

"Scenario" from dynamicity Increase


Immobile system


Joint

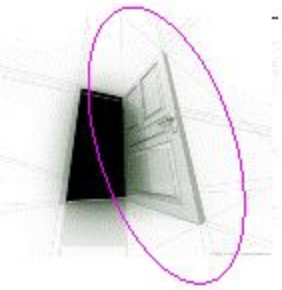

Many joints

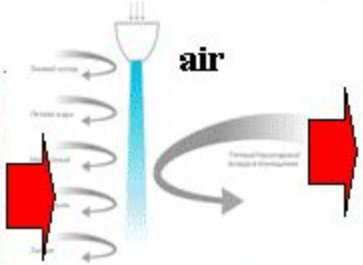

Completely elastic


Liquid, gas

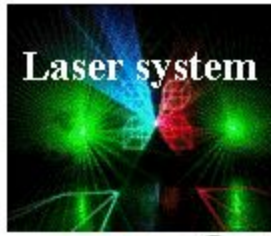
MATCHEM

Field

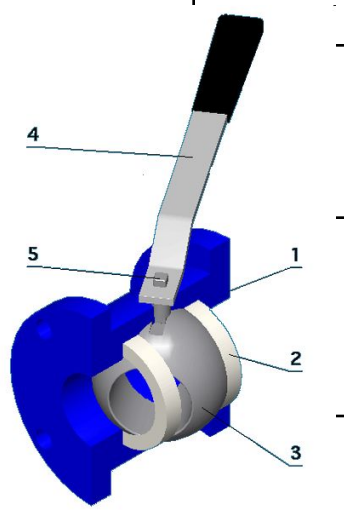
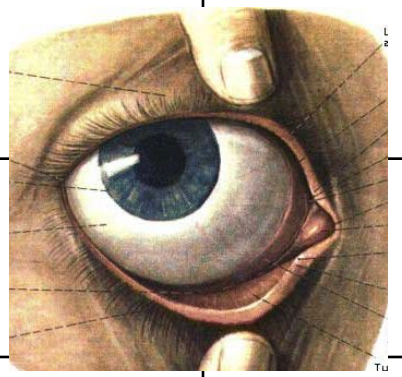
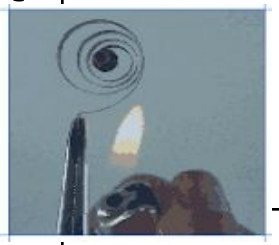
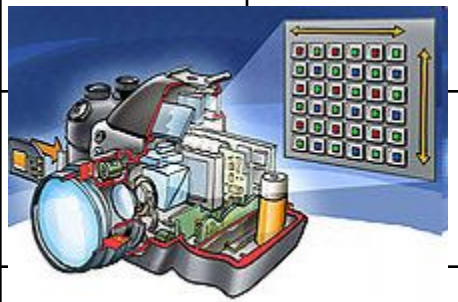
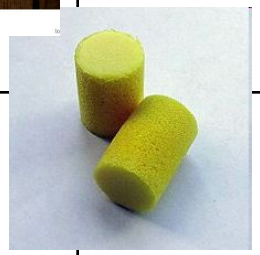




Electrical fence

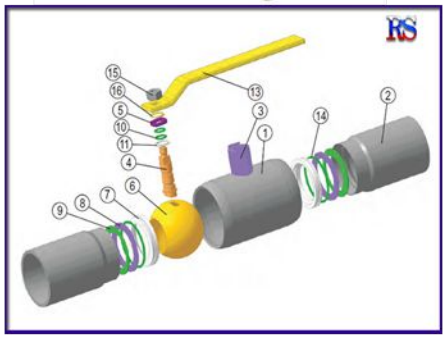


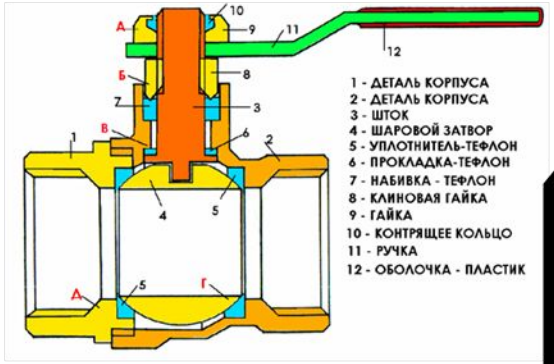
Theory

	MECHANICAL	ACUSTICAL	THERMAL	CHEMISTRY	ELECTRICAL	MAGNET
SOLID BODY						
LIQUID	Bleed screw					
PHASE (S ↔ L)						
GAS		귀마개	Bimetallic strip			
PHASE (L↔ G)						
PLASMA (IONS)						

Object exist 1
Object not exist 0

open
close
big
small





Pulse

Forward

reciprocating 왕복

Σ

Pendulum

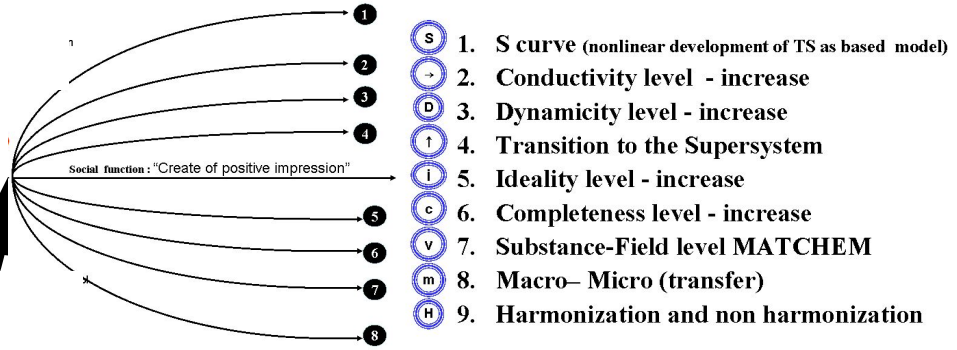
Rotary

Wave

온도조절기

Thermostat

Theory



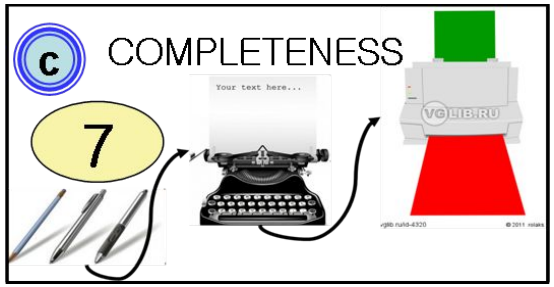
TESE and PC

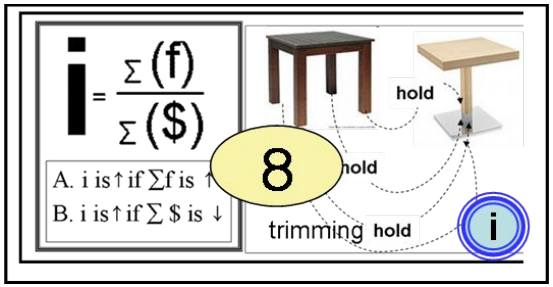
Solve in the TIME
Solve in the SPACE
Solve in SUBSTANCE LEV.
Solve in SYSTEM LEVEL
PC

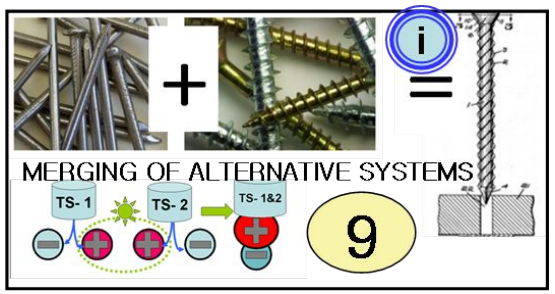
We can solve PC with 40 principles and with TESE also.

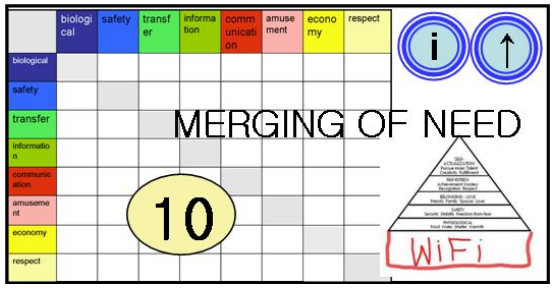
Theory

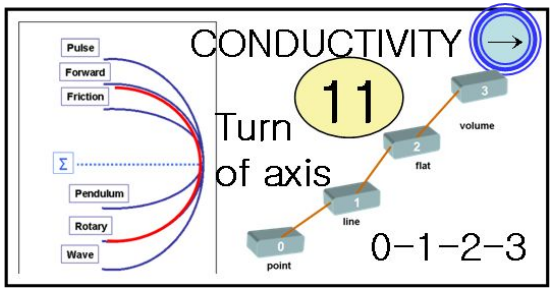
Theory

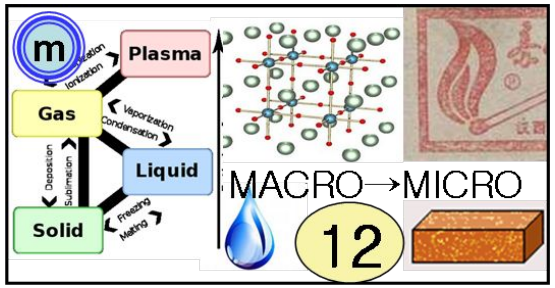

c
COMPLETENESS
7

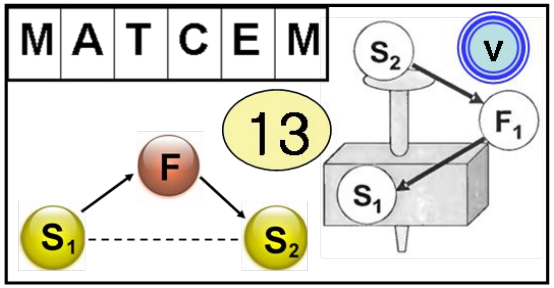

i = Σ(f) / Σ($)
A. i is↑ if Σf is ↑
B. i is↑ if Σ $ is ↓
8
hold
hold
trimming hold
i

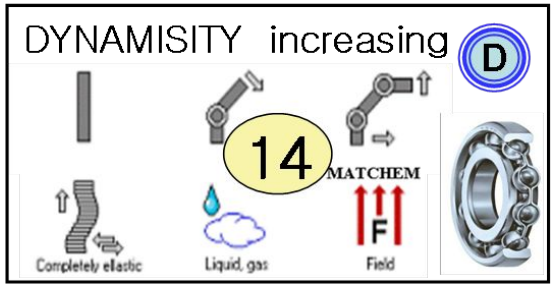

i
MERGING OF ALTERNATIVE SYSTEMS
TS- 1
TS- 2
TS- 1&2
9

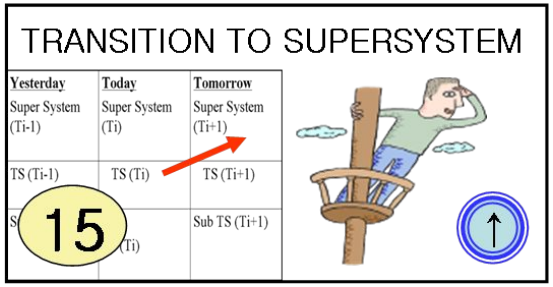

biological
safety
transfer
information
communication
amusement
economy
respect
i
MERGING OF NEED
10
WiFi

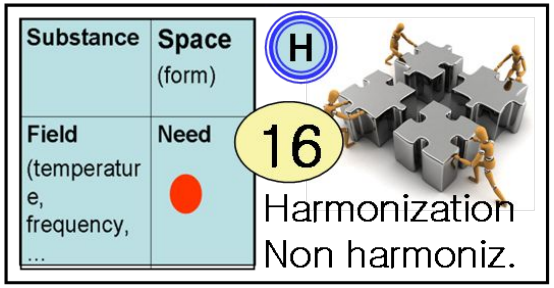

Pulse
Forward
Friction
Pendulum
Rotary
Wave
CONDUCTIVITY
11
Turn of axis
point
line
flat
volume
0–1–2–3

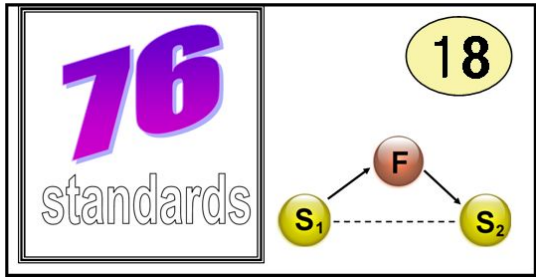

m
Plasma
Gas
Liquid
Solid
MACRO→MICRO
12


M A T C E M
v
S2
F1
13
F
S1
S2
S1


DYNAMISITY increasing
D
14
MATCHEM
F
Completely elastic
Liquid, gas
Field


TRANSITION TO SUPERSYSTEM
Yesterday
Today
Tomorrow
Super System (Ti-1)
Super System (Ti)
Super System (Ti+1)
TS (Ti-1)
TS (Ti)
TS (Ti+1)
Sub TS (Ti+1)
15


Substance
Space (form)
Field (temperature, frequency, …
Need
H
16
Harmonization
Non harmoniz.


76
standards
18
F
S1
S2


FOS
19
Function
Oriented
Search
http://www.adme.ru/kreativnyj-obzor/chego-tolko-ne-prodayut-194905/
prototype

- Remark for testing:
- Without opposing the definitions offered by the author of TRIZ, Physical contradiction implied contradictory requirements to the physical state of operation zone.
- The following practical definition could be offered. PC, (like EC) is one of the possible forms (methods) of thinking about the disadvantage of ES, the efficiency of which is provided for through:
- A) Identification of an important parameter, which has to be changed, in order to improve ES as a marketable goods ("PC with regard to parameter"). Parameter should be both Big and Small. This is a manifestation of Hegel's dialectics "unity and conflict of two opposed categories" and the principles of laws of preservation in physics).
- B) To implant in the subconscious the doubt to use one of the components of this engineering system (ES) in general ("PC of existence" or 1 and O _ there should be a certain element in ES and there should't be such element in ES. This format is directly associated with the ideas of decreasing the number of components in ES by transfer of function from one part of the system to another part of the system – "trimming".
- In its turn, the ideas of trimming are associated with one of the main heuristics of classical TRIZ, one of the forms of IFR – "there is no engineering system, while the function is performed". There is an aphorism "The best component of the tank is the one, which is missing – it cannot be broken".
- The conclusion is as follows – according to the definitions of GSA concerning PC, the user of the tools of classical TRIZ should be able to find with the engineering system both "PC with regard to parameter" and "PC of existence", since these habits define this or that level of creativity of the tested person as capacities for identification of a full or not very full set of disadvantages of analyzed and studied object. These considerations enable to develop a procedure for measuring creativity by comparing the results of the test yielded by the tested person with a reference answer. That is a "Creativity coefficient according to TRIZ"
- What is the way Technology 1 is associated with the methodological tradition of ARIZ 85 B "from identified EC to formulation of PC".
- There is some interesting interpretation of IFR model. According to modern vision IFR can be applicable with idea of TRIMMING and PC, because according to definition of G. Altsuller there is two types of physical contradictions: 1) parameter must be bigg and small and 2) some object mist be exist and not exist (1 or 0)

Theory

3 categories of PC

subject → action → object

1 existing

2 Direction of process

3 parameter

	subject	action	object
Parameters: Time, sec, meter, meter2, meter3, temperature, velocity, power, … 1	fast – slowly big – small Short - long	Increase parameter Decrease parameter *Open – close, move – fix, broken – assembling, ionization – recombination,*	fast – slowly big – small Short - long
Direction of process 2		Increase parameter Decrease parameter *Open – close, move – fix, broken – assembling, ionization – recombination,* …	
existing 3 0 / 1	Exist – not exist	Exist – not exist Increase parameter Decrease parameter *Open – close, move – fix, broken – assembling, ionization – recombination,*	Exist – not exist 0 / 1

PRIMITIVE STRUCTURE

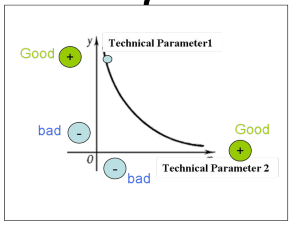
Solve in the TIME
Solve in the SPACE
Solve in SUBSTANCE LEV.
Solve in SYSTEM LEVEL
PC

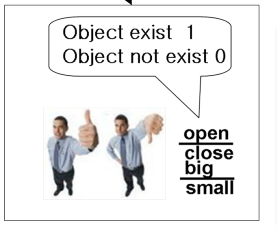
open / close
big / small
warm / cold
narrow / broad

Trimming direction 1/0

exist / Not exist

Transitions from EC to PC





Engineering contradiction as Technology for thinking about disadvantages

Physical contradiction as Technology for thinking about disadvantages

MICRO LEVEL

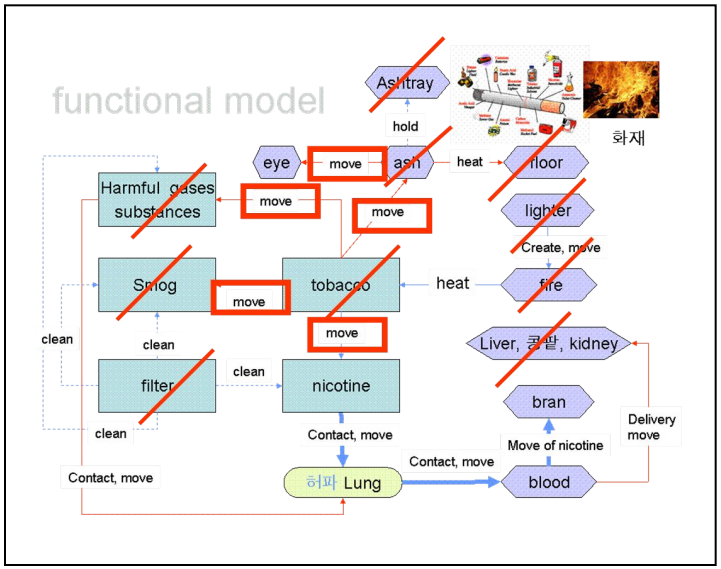
Theory

PC- exist/not exist (1/ 0) and “trimming” (delegation of function)

Object exist 1
Object not exist 0

open
close
big
small

(some parameter)

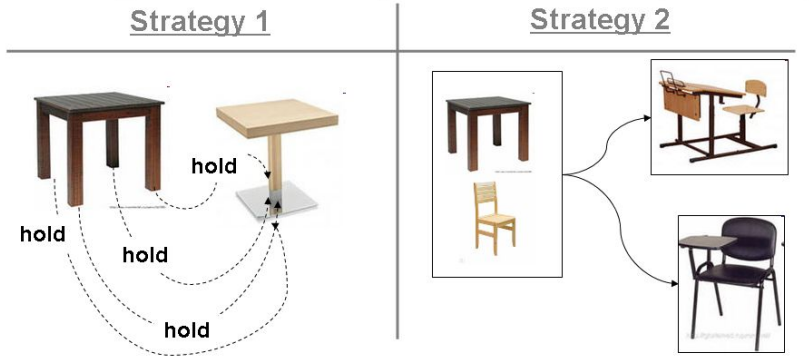


TRIMMING as a philosophical approach

- **Main idea and easy logic according to increase of Ideality:**
- **strategy 1** - delegate the similar function in one element for 1) decrease of cost 2) increase of convenience
- **Strategy 2** – include some elements from Super System in System (decrease amount of elements in process for executing of main useful function)

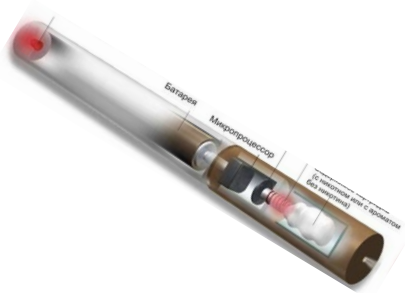
$$i = \frac{\Sigma(f)}{\Sigma(\$)}$$

A. i is↑if Σf is ↑
B. i is↑if Σ $ is ↓



Exist
Not exist

=



Another examples PC 1/0 (pump for wheel)

Variants for describing the disadvantages for explaining the existing engineering solution on the standard 5.1.1.1

Use of emptiness

Long time of preparation for operation

Harmful (mechanical) fields

Necessity to use the pump

Significant energy consumption in switch-on

Harmful substances (nail)

IFR & trimming reasoning

Some object in the process (system)

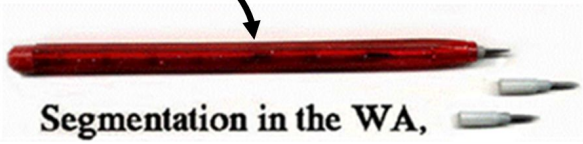
Must be → Exist / Not exist

1 / 0

www.triz-solver.com

invention

Knife for repairing



Segmentation in the WA,

Yury Danilovsky © 2014

Yury Danilovsky © 2014

PC- exist/not exist (1/ 0) and IFR

IFR correspond with Ideality model

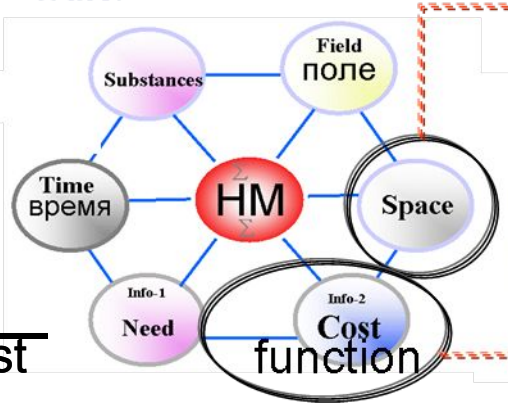
- **Version 1 :** Exist some X element for solve of current problem (remove or destroy of existing **disadvantages**)

- **Version 2 :** The system ITSELF can solve problem (remove or destroy of existing **disadvantages**)

- **IFR 1:** There is X element in the bottle for remove of disadvantage – "spend big time for looking for of cup"
- **IFR 2:** The bottle can ITSELF removed of disadvantage - "spend big time for looking for of cup"
- Portrait of answer – *using resource of cover "space in cover for hold of water"*

$$i = \frac{\Sigma(f)}{\Sigma(\$) + HF}$$

- Small amount function (disadvantage)
- Harmful function or big cost (disadvantage)



Calculation of X element

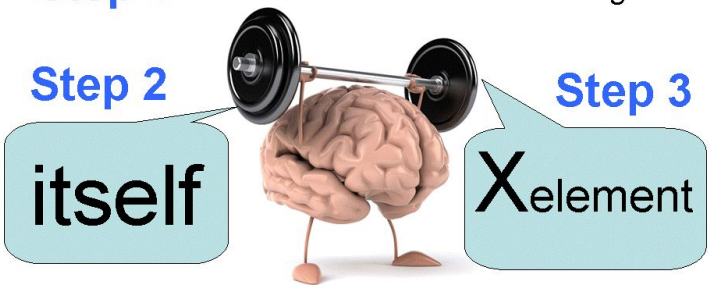
Theory

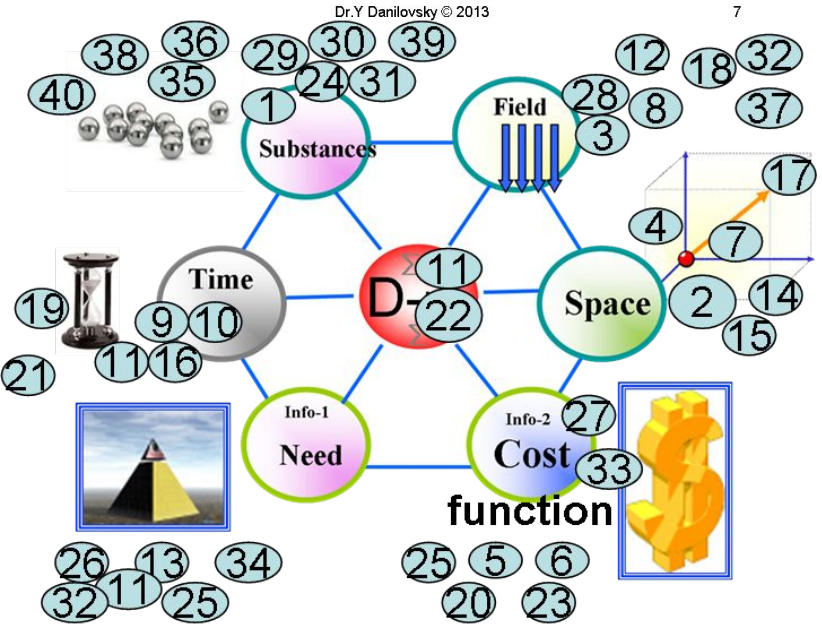
Helper for search “X element”

Ideal Final Result (algorithm)

- Special model for thinking about disadvantages

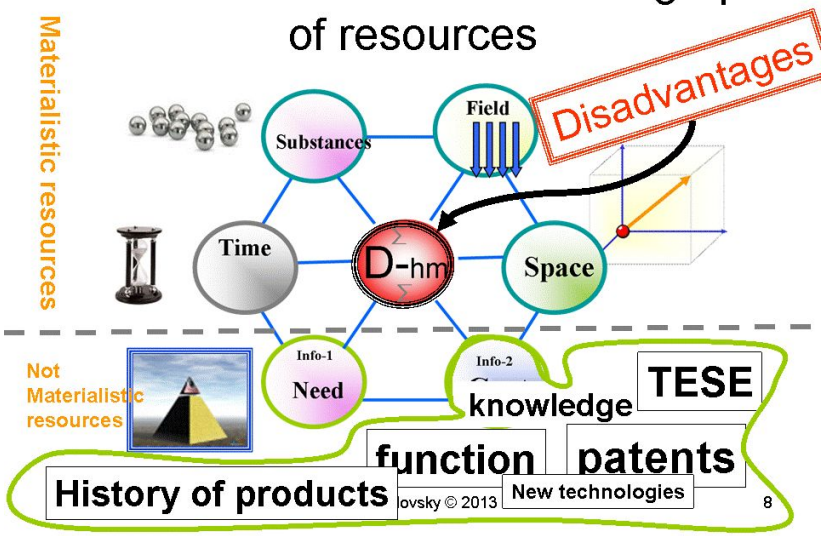
step 1 – definition of current disadvantages

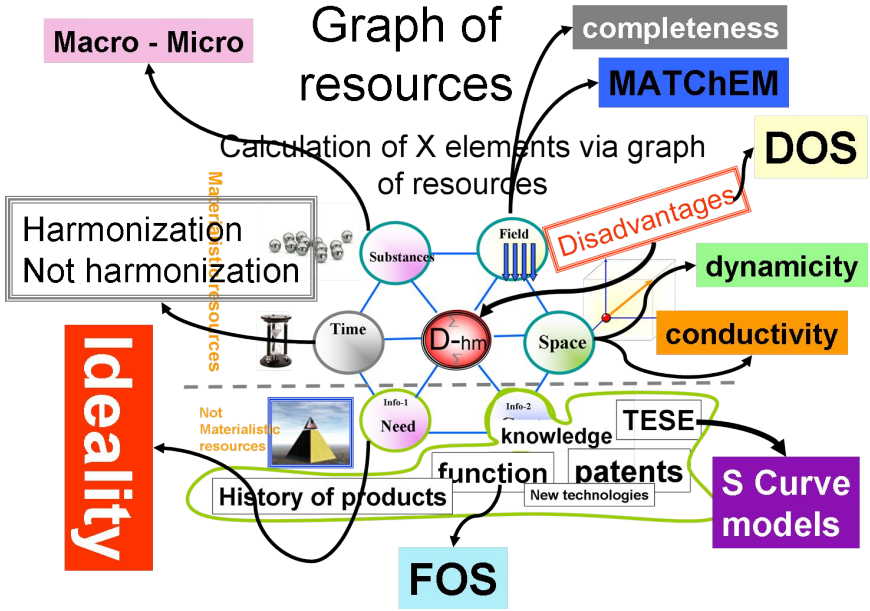




Legend (N) Principles {1 ---- 40}

Calculation of X elements via graph of resources





Theory

Certain popular disadvantages of engineering systems

- substance: 1)Harmful substances 2)Presence of consumable substances 3) Low efficiency 4)Low energy intensity of the substance 5) Necessity to utilize substances 6) Poor control of substance flows
- fields: 7) Harmful fields 8)Significant weight 9) Great overall energy consumption, including the utilization of system after use 10) High energy consumption in switching on 11) High energy consumption in switch-over 12) Many moveable parts
- space: 13) Large dimensions in transportation 14)Large dimensions in storage 15) The shape is not harmonized with the supersystem (SS) 16) Banal shape and color 17) Short distance of travel 18) Absense of mobility
- Time: 19) short life of the system (longevity degree is low) 20) Long recharging period 21) short period of stationary work 22) Long period of preparation for use 23) Long period of process performance 24) Long period of mastering the skills
- functions: 25)No corrective function 26) Excessive level of function performance 27) Insufficient level of function performance 28) Few additional function 29) Low reliability 30) Requires the presence of additional systems (trimming as a transfer of function to other components of the system)

НЕКОТОРЫЕ ПОПУЛЯРНЫЕ НЕДОСТАТКИ ТЕХНИЧЕСКИХ СИСТЕМ

- 1)Вредные вещества 2)Наличие расходных веществ 3) Маленькая производительность 4)Низкая энергонасыщенность вещества 5) Необходимость убирать вещества 6) Плохая регулировка потоков вещества
- 7) Вредные поля 8)Большой вес 9) Большое суммарное энергопотребление, включая утилизацию системы после использования 10) Большое энергопотребление при включении11) Большое энергопотребление при переключении 12) Много движущихся частей
- 13) Большие габариты при переноске 14)Большие габариты при хранении 15)Форма не согласована с НС 16) Банальная форма и цвет 17) Маленькая дистанция пробега 18) Отсутствует мобильность
- 19) Маленькое время жизни системы (долговечность) 20) Большое время перезарядки 21) Маленькое время автономной работы 22) Долгое время приготовлений к использованию 23) Большое время исполнения процесса 24) Большое время овладения умением
- 25)Нет исправительной функции 26) Избыточный уровень исполнения функции 27) Недостаточный уровень исполнения функции 28) Мало дополнительных функций 29) Низкая надёжность 30) Требует наличия дополнительных систем (тримминг как передача функции другим элементам системы)

Typical problem (simplify list)	Trends (simplify list)	helper in 40principles family	Suitable Standards
Small capacity	S curve model (mono- bi-poly) consider non linear process of development	5,6,7,20,38,39,40	**2.1.2 , 3.1.1, 3.1.1, 5.3.3 , 5.3.4**
small reliability of system, big tiredness	Completeness consider increase of part until to robotic system	9,10,12,23,32,34,37, 38	1.1.3 ,1.1.7 ,2.4.11 ,5.2.2 ,5.2.3 ,5.4.1
High cost of result	Conductivity increase different ways for increase of productivity	4, 9,14, 15,18, 17,21, 25	2.2.4 ,2.3.1 ,5.2.1 ,5.4.2
small amount of function, big amount of parts	Ideality consider increase amount of function and decrease of spending materials/ time, movement	4,5,6,7,8,9,10,16,19, 20,22,24,25,26,27,32	1.1.4 ,2.3.3 ,3.1.4 , 4.5.2 ,5.1.3 , 5.2.1
Expensive resources. Old (perfect) system	Transfer to SS consider contact with super system	2,6,11,13,26,38	5.1.1.1 ,5.2.3 ,5.1.3 ,5.4.1,5.2.2
Size of system before application	Dynamicity consider bond between parts of system	1,7,13,15,17, 18,25, 29,30	2.2.2 ,2.2.5 ,2.4.3 ,5.1.4
Small efficiency	MATChEM consider probability of change type of energy for process	5,6,8,9,10,19,22,23, 24,28,32,34, 36,37	1.1.1 ,1.2.5 ,2.1.1 ,2.2.1 ,4.3.2 ,5.3.4 ,5.3.5
Cost reduction, old system	Macro→ micro consider every condition of substances	1,5,6,23,27,28,29,30, 31,34,35,36,38,39,40	1.1.2 ,1.1.5 ,2.2.2 ,2.2.3 ,2.2.6 ,5.1.1.1 , 5.1.4., 5.3.1 ,5.3.3 ,5.3.5
Small convenience	Harmonization consider increase level of conveniences	1,2,3,7,9,10,12,23,24 ,33,39	**1.1.4,1.1.6,1.2.1,1.2.4,2.2.5, 2.2.6,2.3.1,3.1.3,4.2.2.4.2.3,5. 5.1.4,5.2.3,5.3.3,5.1.1.1**

- Necessary create the inspection between 39 parameters from Altsuller's matrix and 30 popular disadvantages. Several parameters from list 39 is clear, several parameters not clear…
- After creation of helper, connector between 39 and 30, we can create database for PC in diagonal elements for Altsuller's matrix.

Certain popular disadvantages of engineering systems

substance
1)Harmful substances 2)Presence of consumable substances 3) Low efficiency 4)Low energy intensity of the substance 5) Necessity to utilize substances 6) Poor control of substance flows

• fields
7) Harmful fields 8)Significant weight 9) Great overall energy consumption, including the utilization of system after use 10) High energy consumption in switching on 11) High energy consumption in switch-over 12) Many moveable parts

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• functions
25)No corrective function 26) Excessive level of function performance 27) Insufficient level of function performance 28) Few additional function 29) Low reliability 30) Requires the presence of additional systems (trimming as a transfer of function to other components of the system)

1. Weight of moveable object
2. Weight of immobile object
3. Length of moveable object
4. Length of immobile object
5. Area of moveable object
6. Area of immobile object
7. Volume of moveable object
8. Volume of immobile object
9. Speed
10. Force
11. Tension, pressure
12. Shape
13. Stability of object composition
14. Strength
15. Action time of moveable object
16. Action time of immobile object
17. Temperature
18. Light
19. Energy consumption by the moveable object
20. Energy consumption by immobile object
21. Power
22. Energy losses
23. Substance losses
24. Information losses
25. Time losses
26. Amount of substance
27. Reliability
28. Measuring accuracy
29. Manufacturing accuracy
30. Harmful factors acting upon the object
31. Harmful factors of the object proper
32.Convenience of manufacturing
33. Convenience of operation
34. Convenience of repair
35. Adaptation, universality
36. Complexity of device
37. Complexity of control and measuring
38. Degree of automation
39. Efficiency

0/1 — (13) то, что тело изменяет ...

(10.10) Вид — Б/М: нож — ножницы (рычаг) — ...) МАТХЭМ лук — арбалет — порох
1/0: электрич. магнитный замок, баллонет
магнитный ... (23) ...

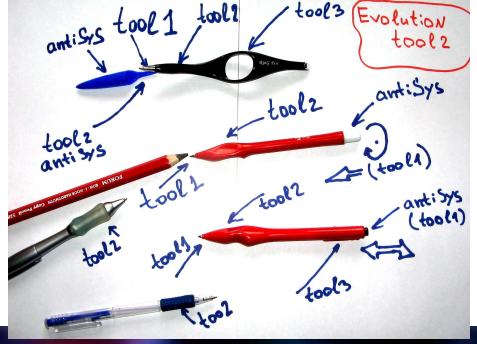
(11.11) Напряж. давление — Б/М: связан с весом колесо — пружина 0 — 1 — 2 — 3
1/0: пресс — давление
МАТХЭМ ... — лазерная резка
(3) подковка на ботинок, (16) — насечка на пакете
... броня (4) углы ... на броне

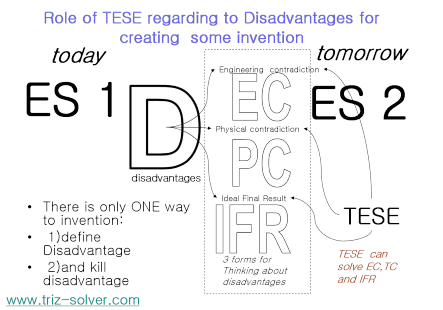
(12.12) форма? тип симметрии? эргономика? → ... движения
Б/М: раздернуть / разнять
(17)(15)(29) 1/0: форма ... мешок
HARMONIZATION форма не согласована с н.с.
(3)(36) занавеска ткань
макро-микро → стекло ... поляризатор

(13.13) устойчивость состава объекта ??? много шагов в процессе / мало шагов в процессе; много элементов, мало элементов.
или механическая устойчивость типа бампер (11) ... → ... память → ... технологии
четырёхцветный карандаш (5) ... полноцв. — принтер + 3 цвета → RGB; картридж (1), (10)
макро — микро 1/0

(14.14) Прочность Б/М: ... стекло разделённая на ... (1)(10) ... труба (5) ... (40) закалённый ... (5)
Упрочнение материалов: карбонизация ..., обволакивающие слои, ..., упрочнение стекла ионами Na, Ca ... УЗ упрочнение стали

(15.15) время действия ...
эффективность? ... кофе → пуля, ...
скорость ... Б/М в ...
1





IFR & trimming reasoning

Some object in the process (system)

Must be → Exist / Not exist

1 / 0

www.triz-solver.com

6 7 8 9

5

Physical contradiction N
And reasoning via TESE

Disadvantages as fundament of thinking

Physical contradiction N
And reasoning via IFR

10 11

4

12

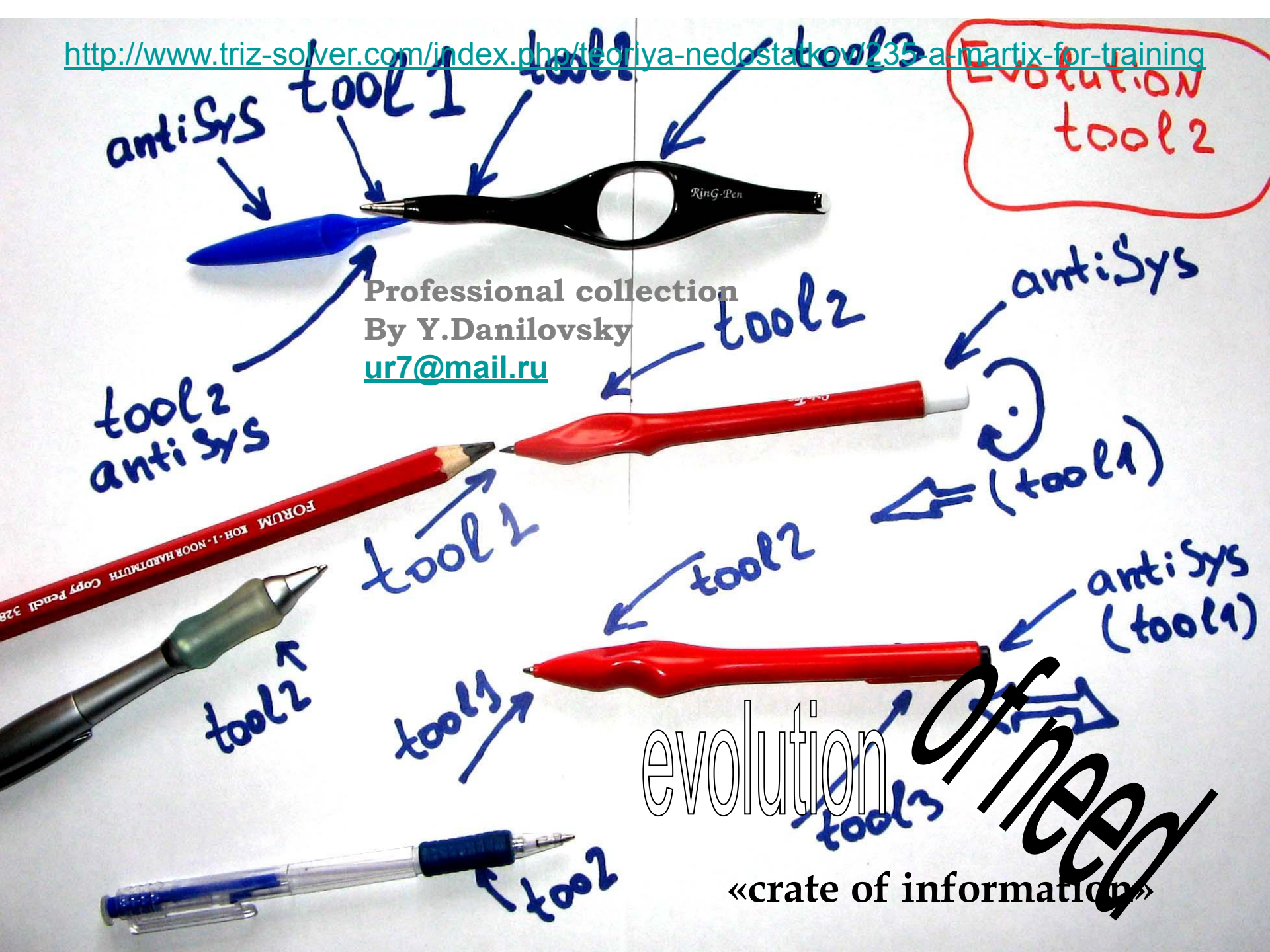
Engineering contradiction 1
and reasoning via principles

14 13

3 2 1

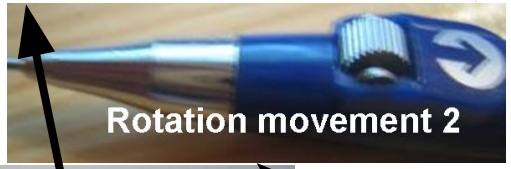
It is picture of hormone. I use it for explanation evolution of goods: D (reason) → creations of new

http://www.triz-solver.com/index.php/teoriya-nedostatkov/235-a-martix-for-training



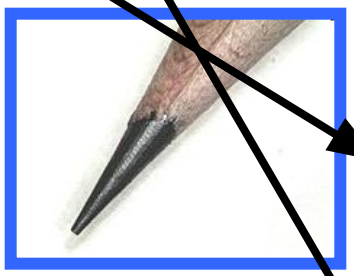
1560 — 452 — 2012

Crisis in evolution of 연필



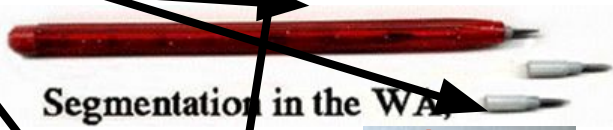
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

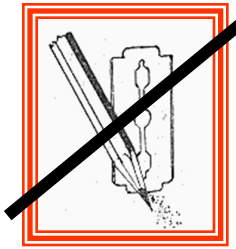
1560,an Italian couple named Simonio and Lyndiana Bernacotti

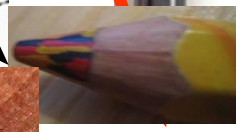


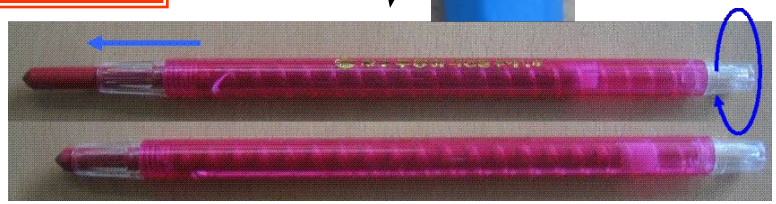
Pencil for wood

Копировальный
Карандаш
«химический»









http://de.wikipedia.org/wiki/Bleistift

http://en.wikipedia.org/wiki/Collet

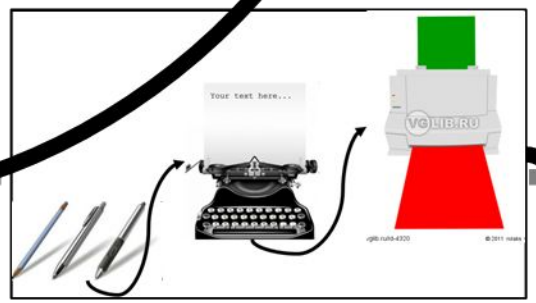
http://ko.wikipedia.org/wiki/연필

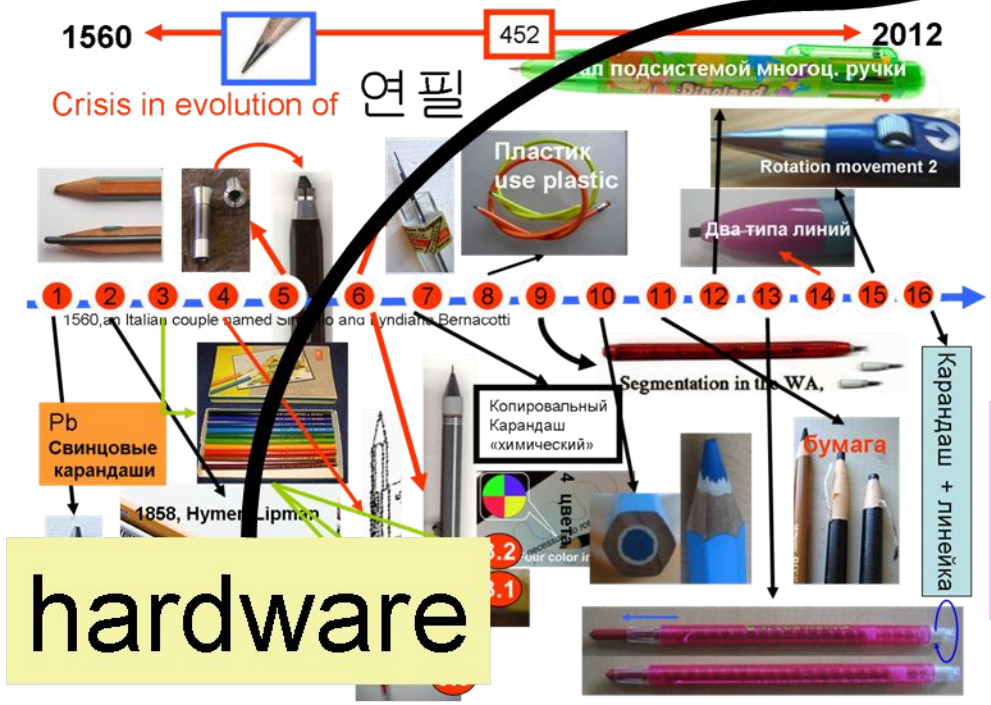
Trends of Engineering System Evolution for Functions:

- Move
- Add
- Remove
- Hold
- Reflect
- Transform

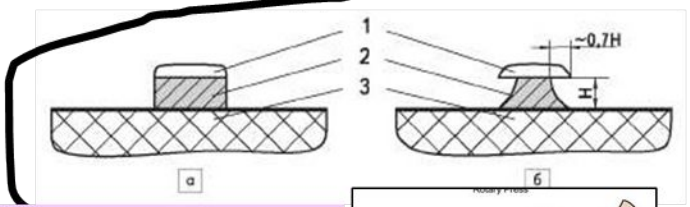
INFORMATION

software

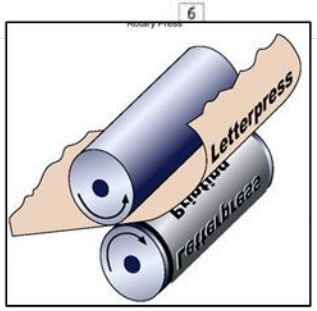




hardware

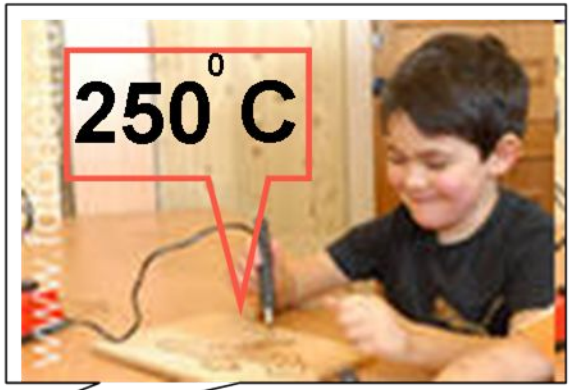


- Dye-sublimation printer
- Laser printer
- Piezoelectric Ink Jet
- Serial Impact Dot Matrix
- unprinted

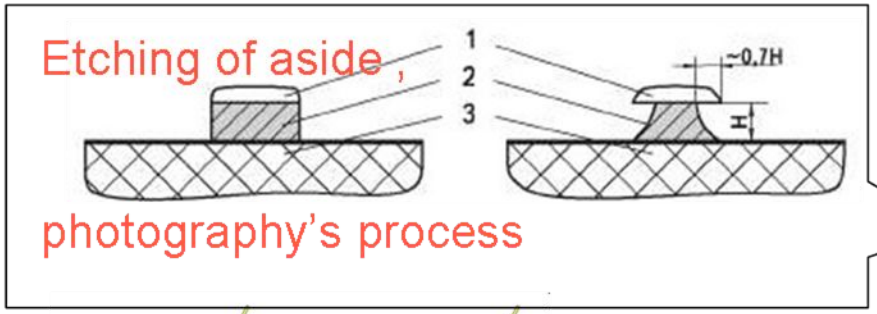


Semiconductors area

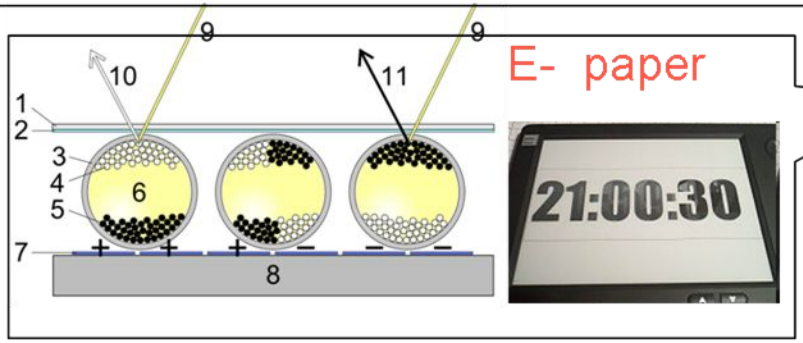
Function- transform of information



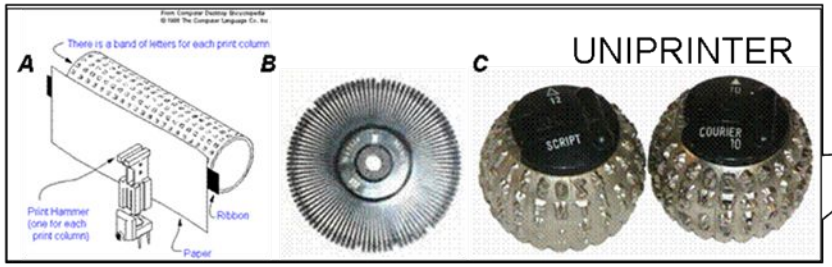
M A T C E m

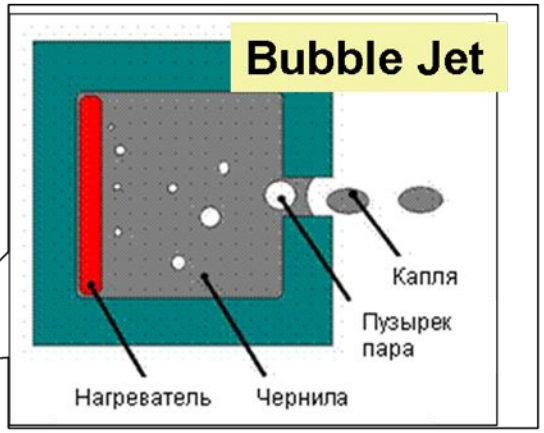


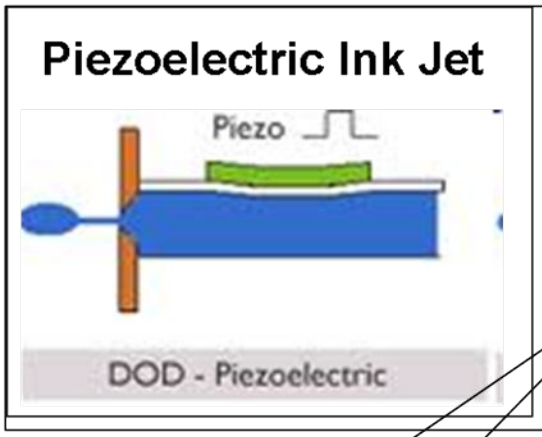
Touch screen panel

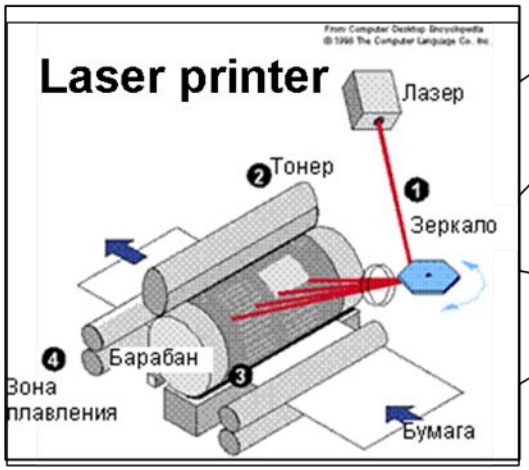


Printers as functions: move and add of substances



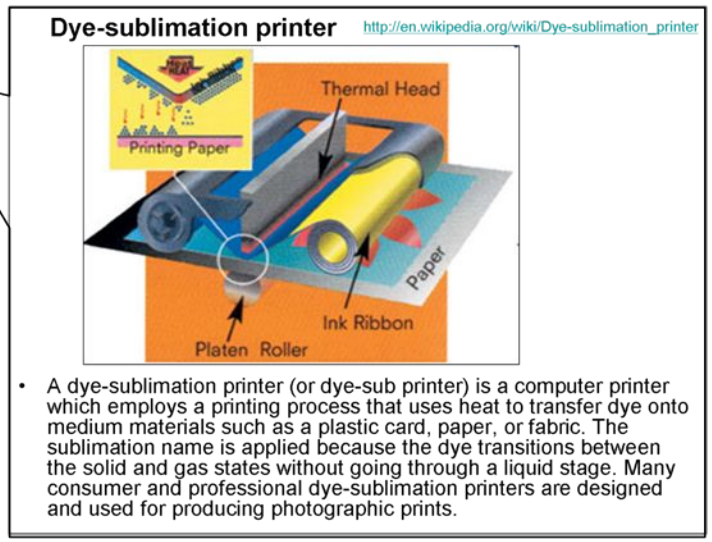


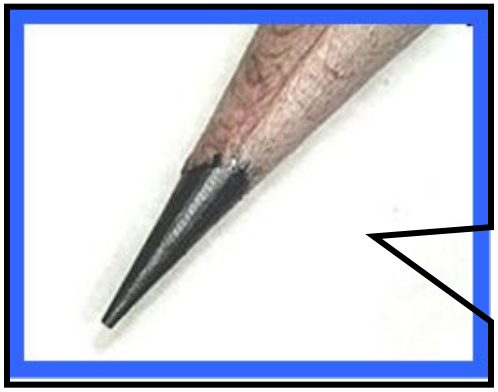


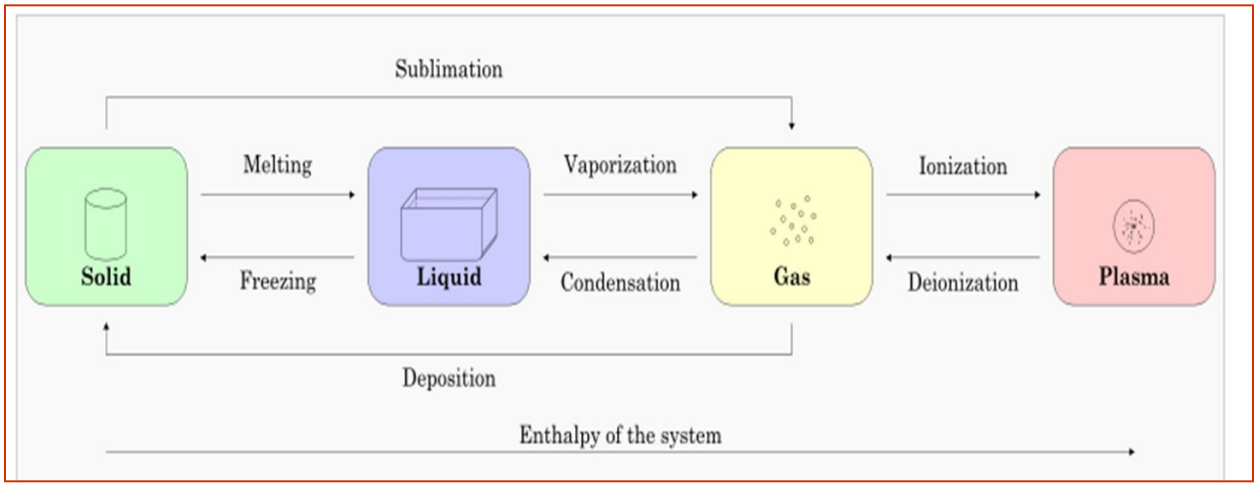


M A T C E m

L

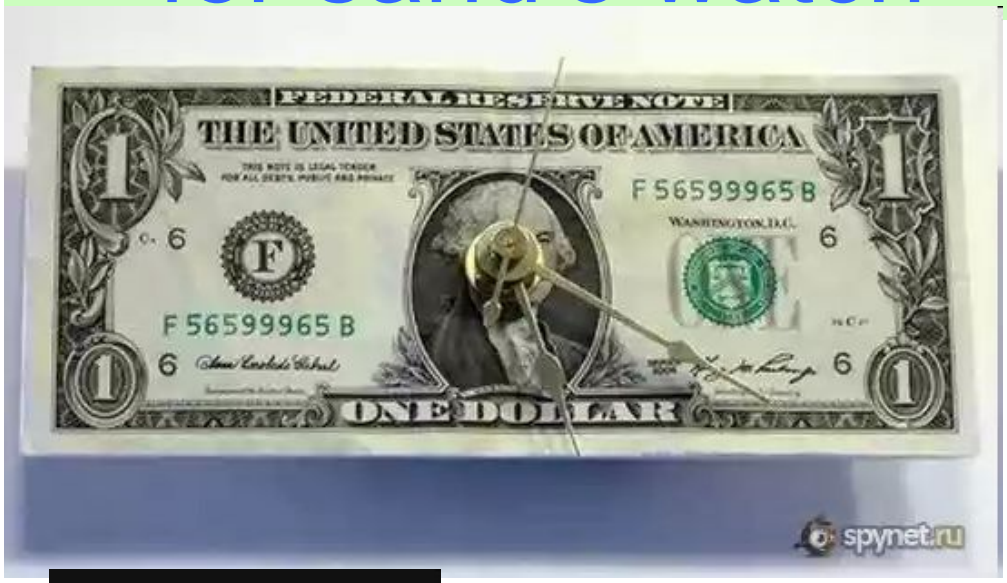






АЭРОГРАФИЯ
AEROGRAPHY
(AEROSOL)

Use LED and mimicry for sand's watch



Rotary movement

http://www.smu71.ru/