
Creation Example of the Service Robot's Evolution Tree

(Part 3)

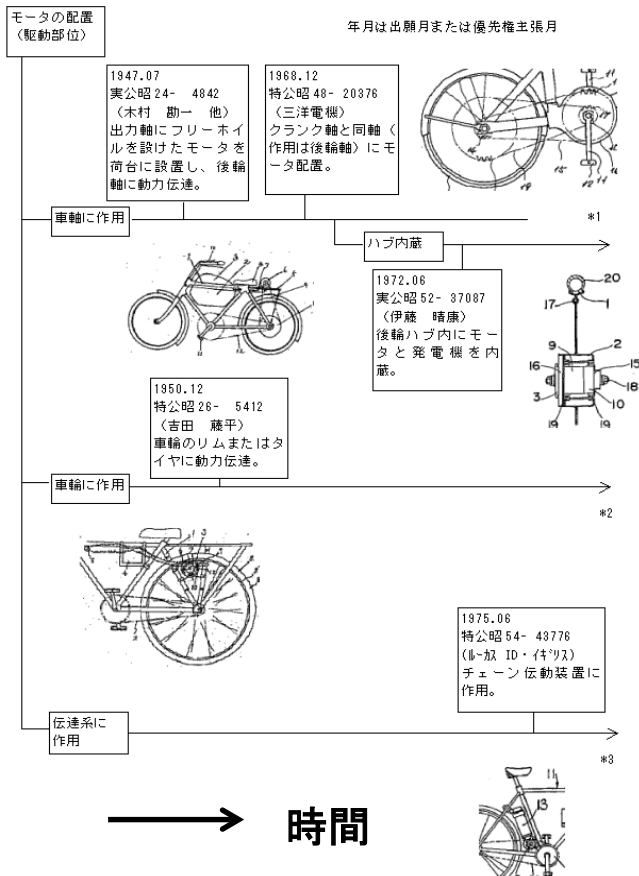
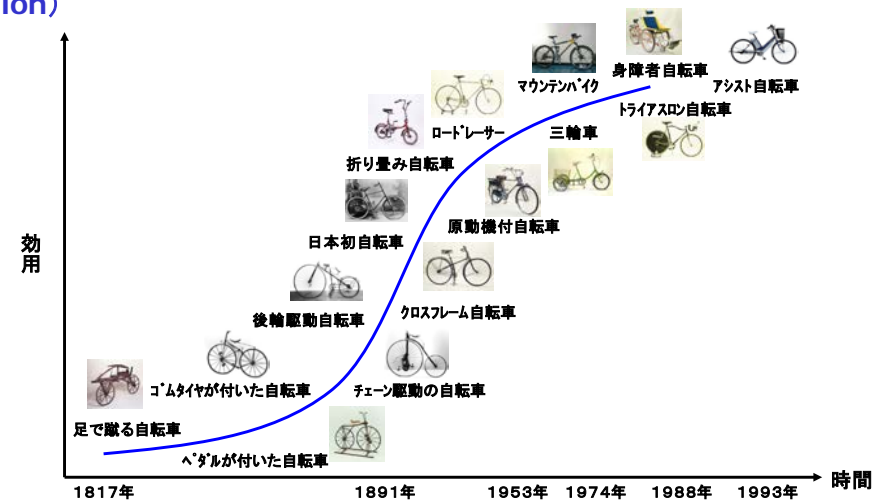
- The Goods Mapping Result to an Evolution Tree, and Future Anticipation -

Kimihiko Hasegawa, Toshimitsu Kataoka, Narumi Nagase, Shigeru Suzuki,
Hirotsugu Ishihara, Sadao Nishii, Takuya Fujii, Tsunamasa Shioya, Yasunori Nakao

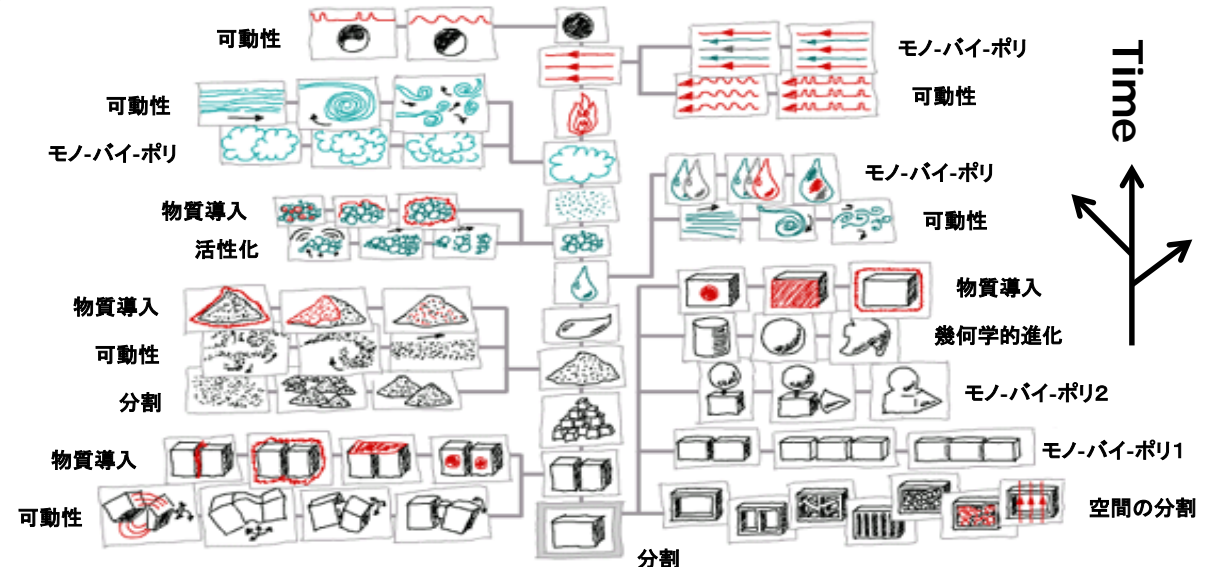
The 15th Japan TRIZ Symposium

The patent map, the market map, and the evolution tree are piled up

Market map
(The past→Present information)

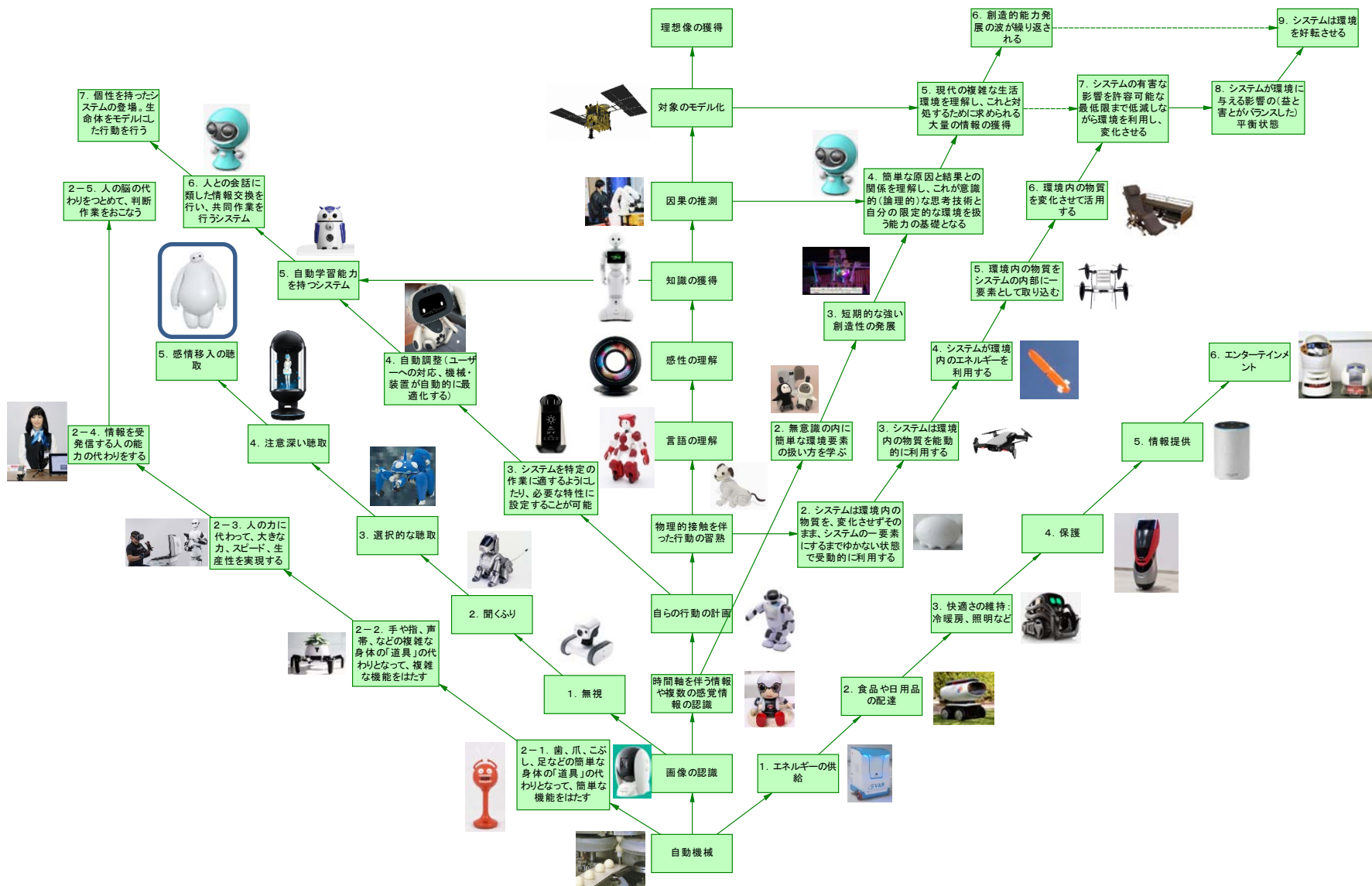


Patent map
(The past→Present information)

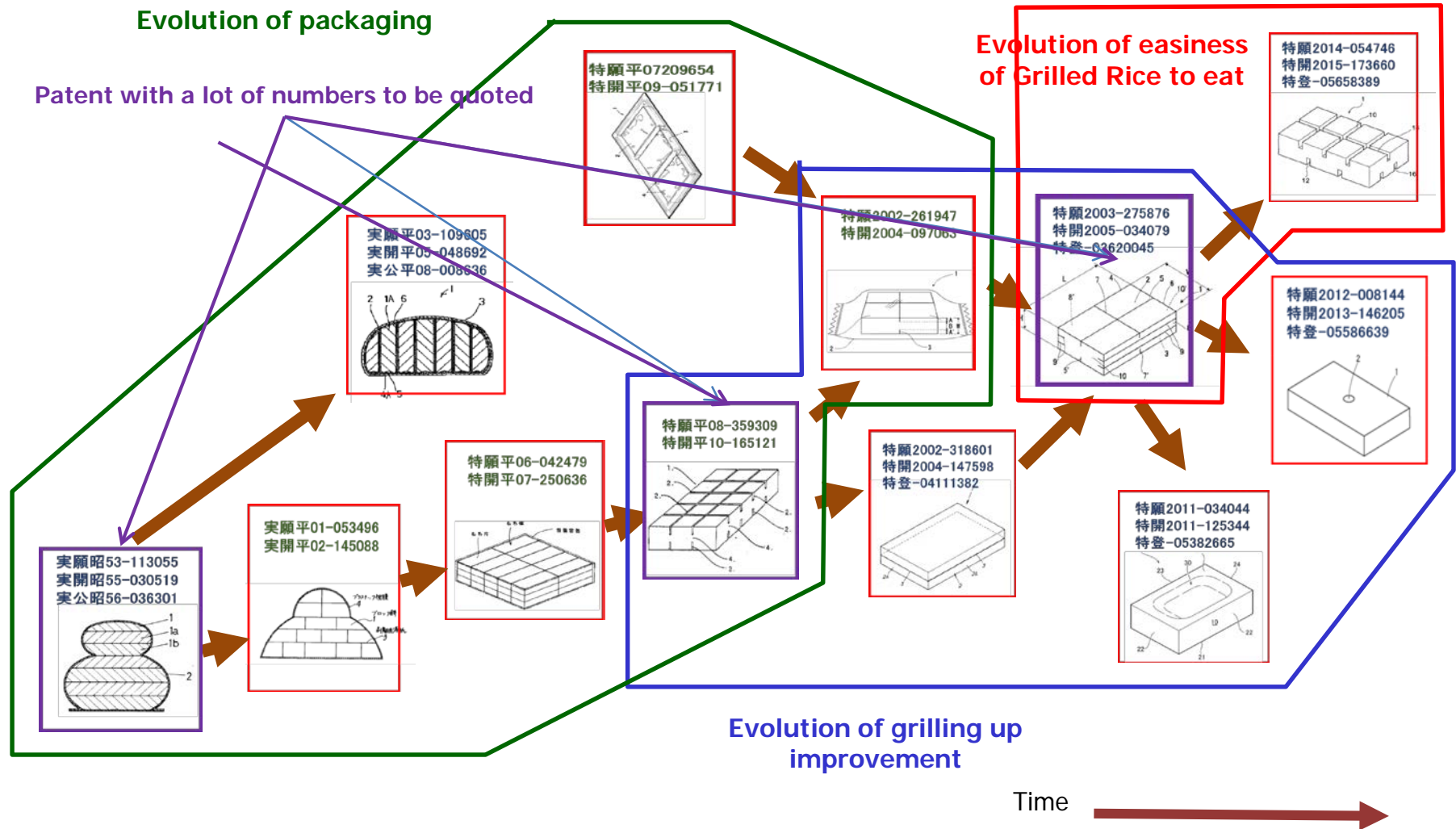


Evolution tree (Evolution potential: The past→Present→Information in the future)

Service robot evolution tree Ver. 2

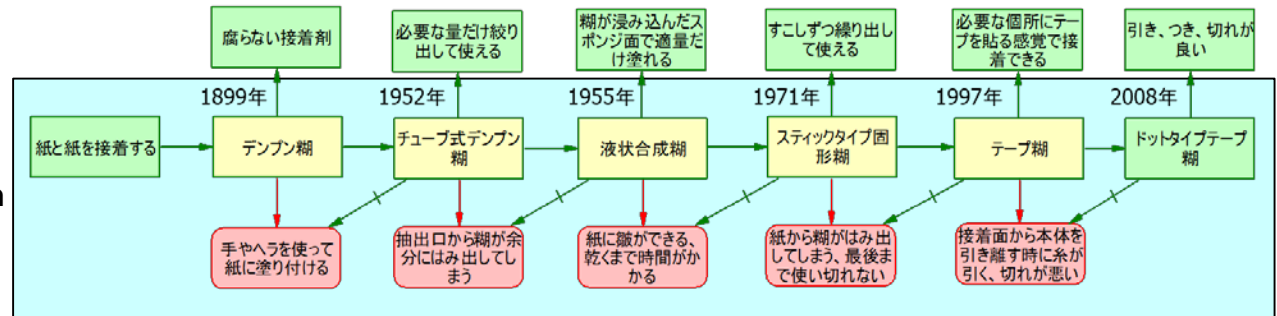


Evolution tree example of Grilled Rice by Citation Analysis

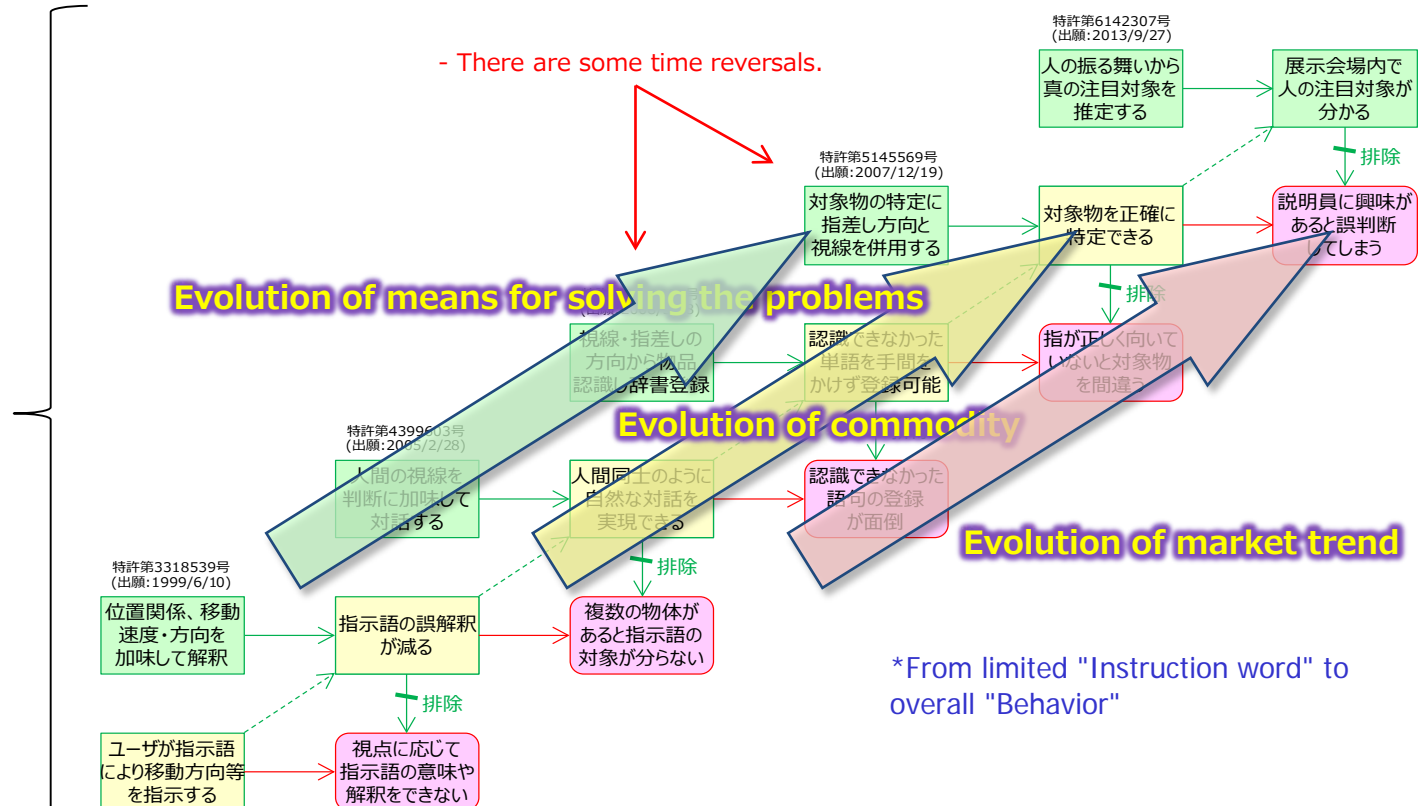


Evolution diagram of robot that reads the person's intention

Prototype of evolution diagram

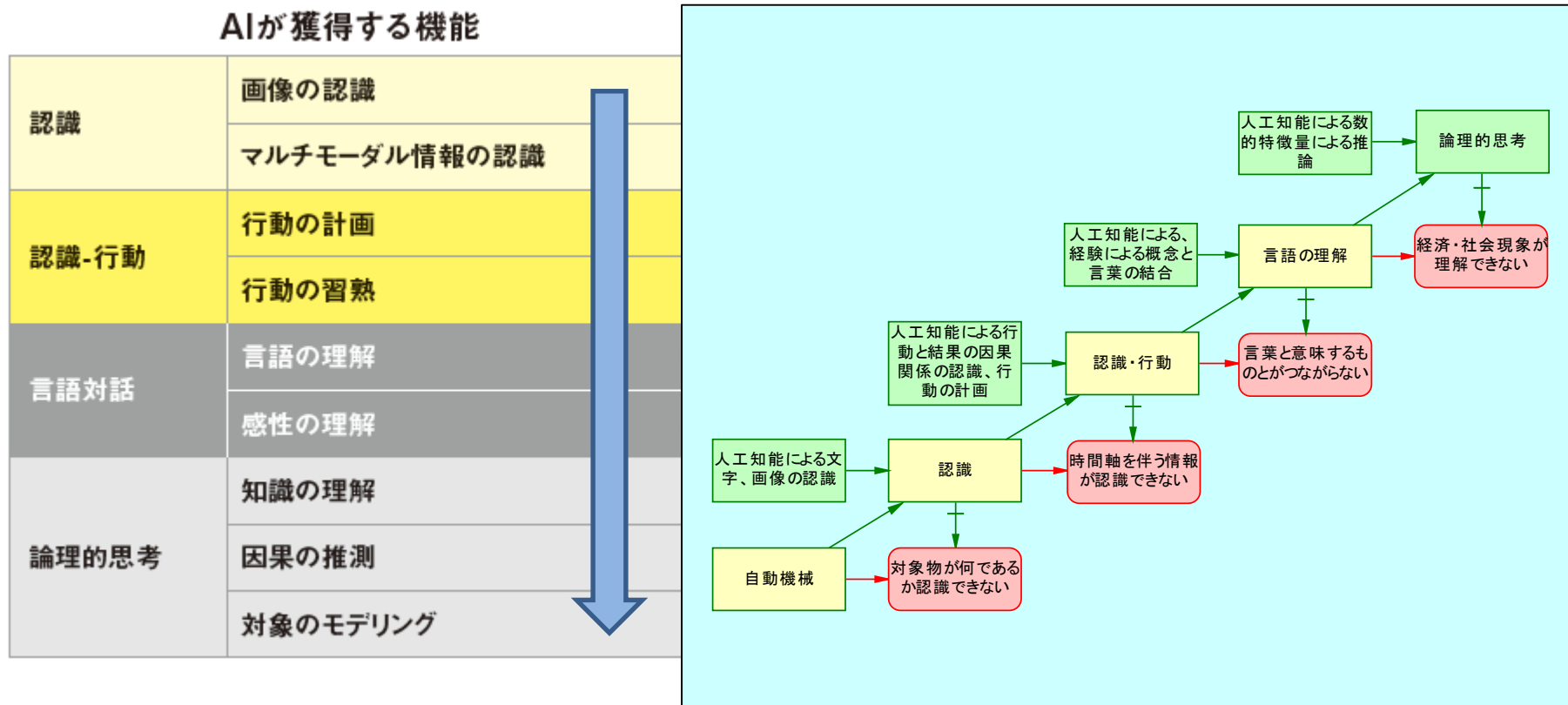


Evolution diagram that expressed relativity of evolution of technology of "Robot that reads man's intention", evolution of commodity, and market trend



Evolution of function of artificial intelligence

(reference)“2017-2026 in the future of robot” Laboratory edit in Nikkei BP the future



"Key function of the robotics in the future" is what advisory EY and consulting Ltd. of the research of an untrodden interdisciplinary area in Europe and America forecast.

Directed Evolution® Kind of evolution line

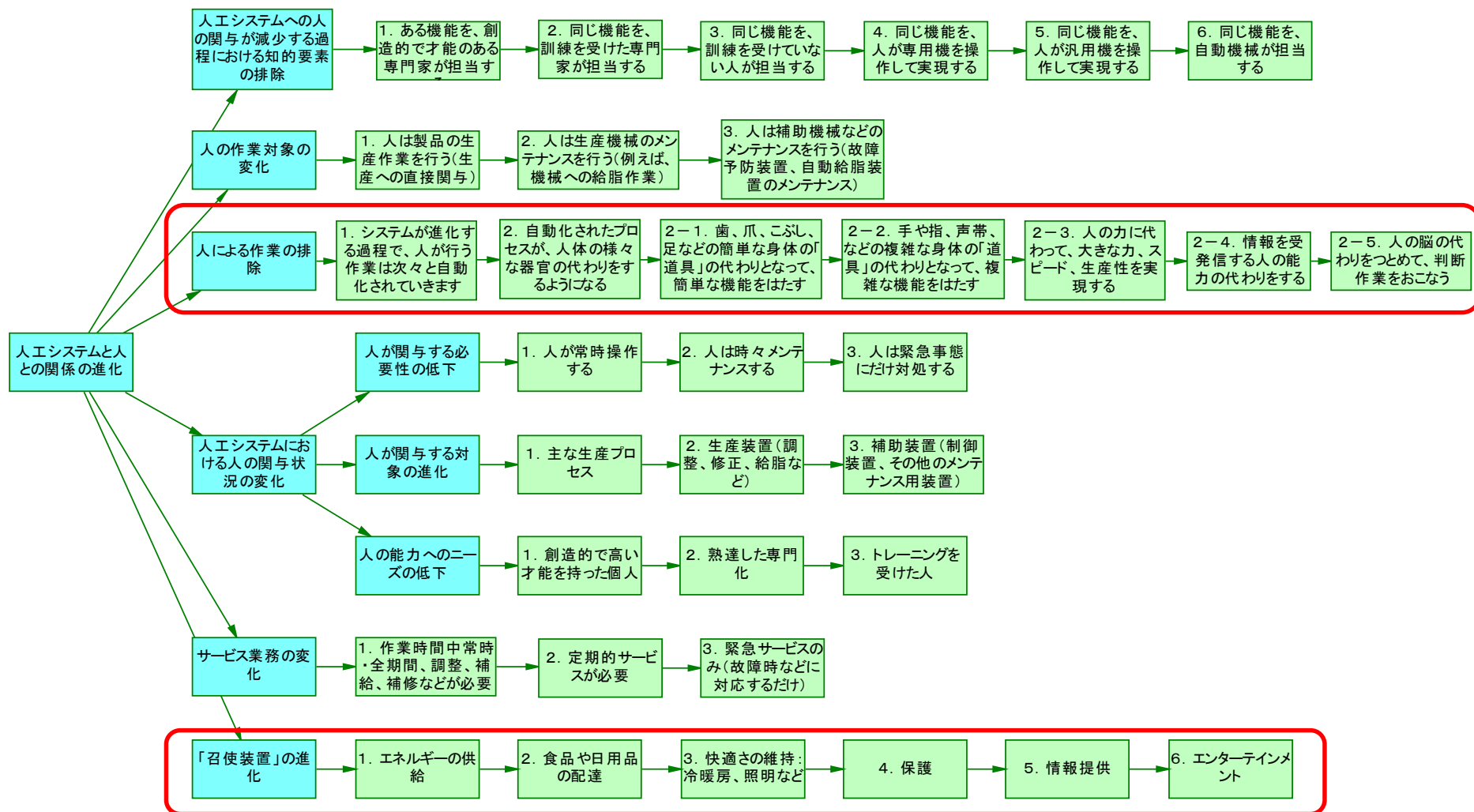
Referred evolution line

* () The figure in the inside shows the number of evolution lines.

Demand function (purpose)	Limiting condition and environment	Action (means)	Structure (means)
Evolution of human needs (9)	Stage of evolution and characteristic (26) of organization	Evolution of action in system (9)	Evolution of material that system uses (6)
Evolution of problem for system (2)	Evolution of power and restriction that obstructs evolution (5)	Evolution of system function (5)	Use of information resources (1)
An increase in utility of system (17)	Various stages of evolution (1)	Addition of new function (5)	Hierarchizing of system (2)
A decrease in inconvenient factor included in system (10)	Evolution of power to adjust evolution (8)	Improvement of interrelation of utility and inconvenient factor (4)	Two or more hierarchies of system and combined use (3) of physical modality and various energy
Change in market that system targets (10)	Change in market in history of system (1)	Progress of use of energy (9)	Aspect that upgrades use of resource (8)
An artificial system assists the person (1).	Evolution of possibility of development (6)	Improvement of ideal (1)	Upgrade of resource use (4)
An artificial system mediates the person and the environment is mediated (1).	Interaction and evolution (7) between artificial system and person	Disproportionate evolution of element (1)	Use as resource in various effects (3)
Evolution of relation between artificial system and person (8)	General scenario to evolve technological system (1)	An increase of flexibility and control (1)	Evolution of system structure (18)
Some aspects of product evolution in market (5)		Simplification after it complicates it (1)	Use of various, physical modalities (1)
		Correspondence and non-correspondence (4) between elements	Simplification of manufacturing process (1)
		Making to micro and hierarchizing (1)	Match of rhythm of transportation and processing (1)
		A decrease in participation of man (1)	Evolution of tool (2)
		Automation of person's role (10)	Evolution of counting system (1)

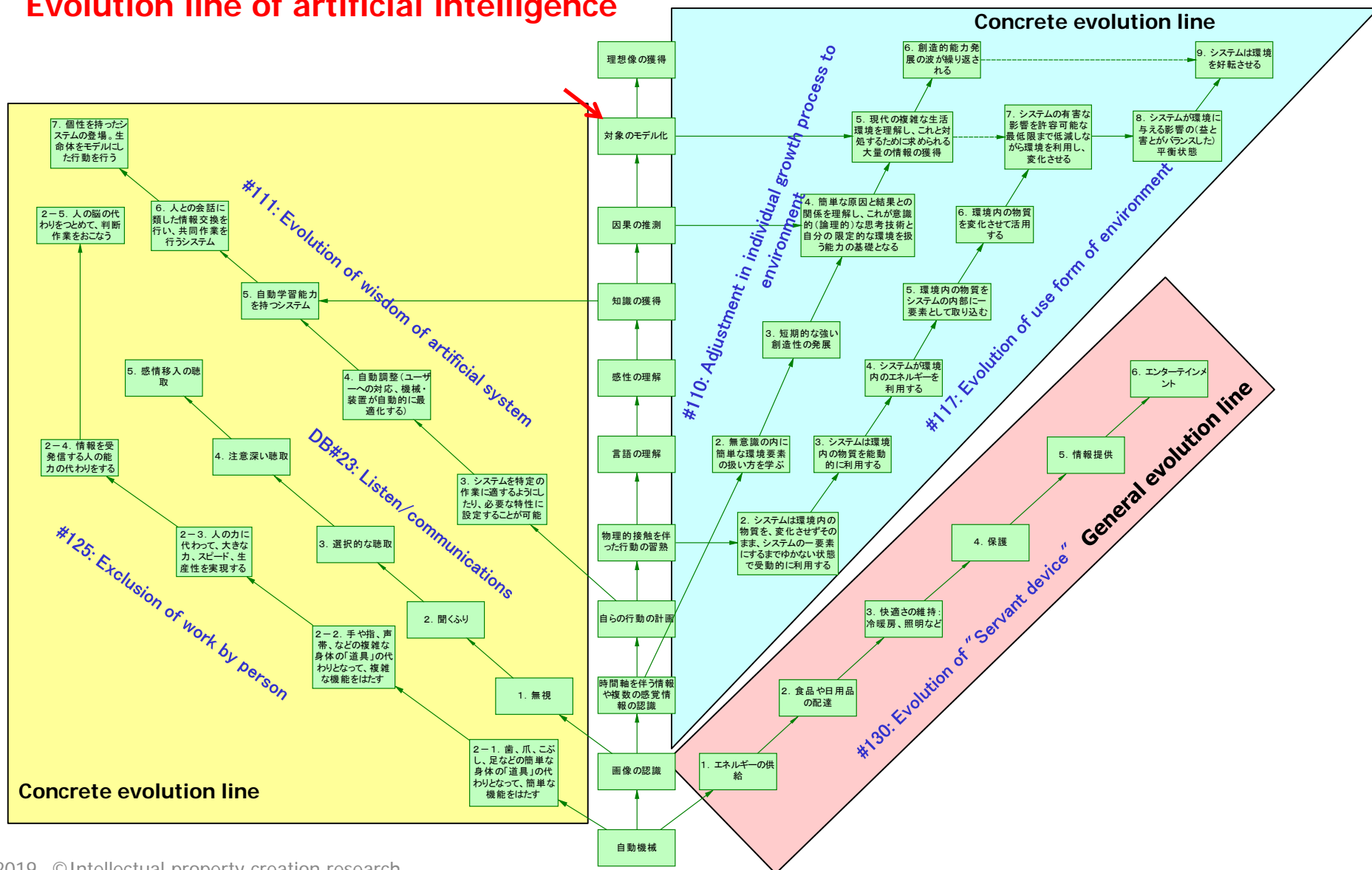
Selection of evolution line related to service robot

「Directed Evolution®」Software and international company

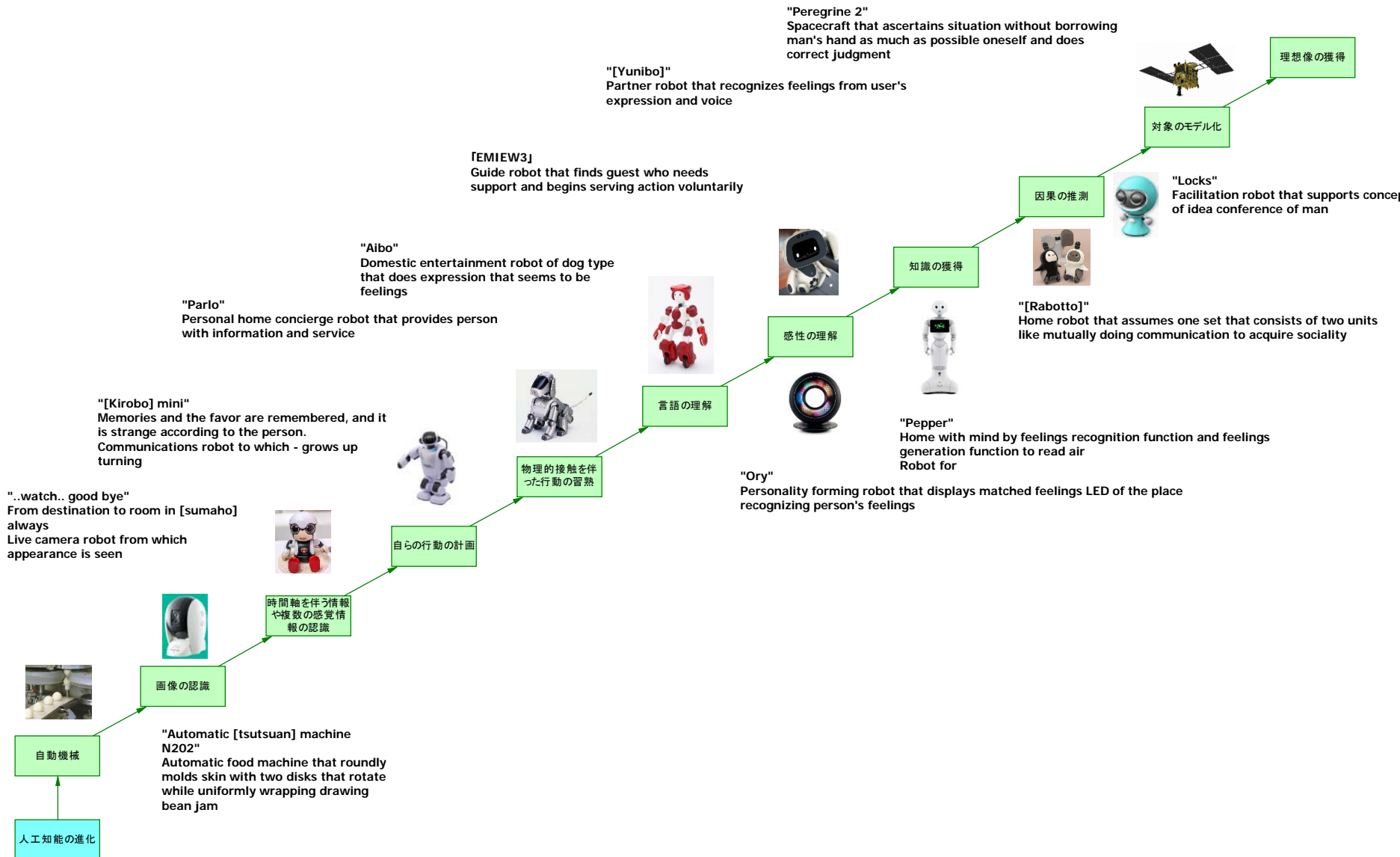


Service robot evolution tree Ver. 2 Division

Evolution line of artificial intelligence



Evolution line of artificial intelligence



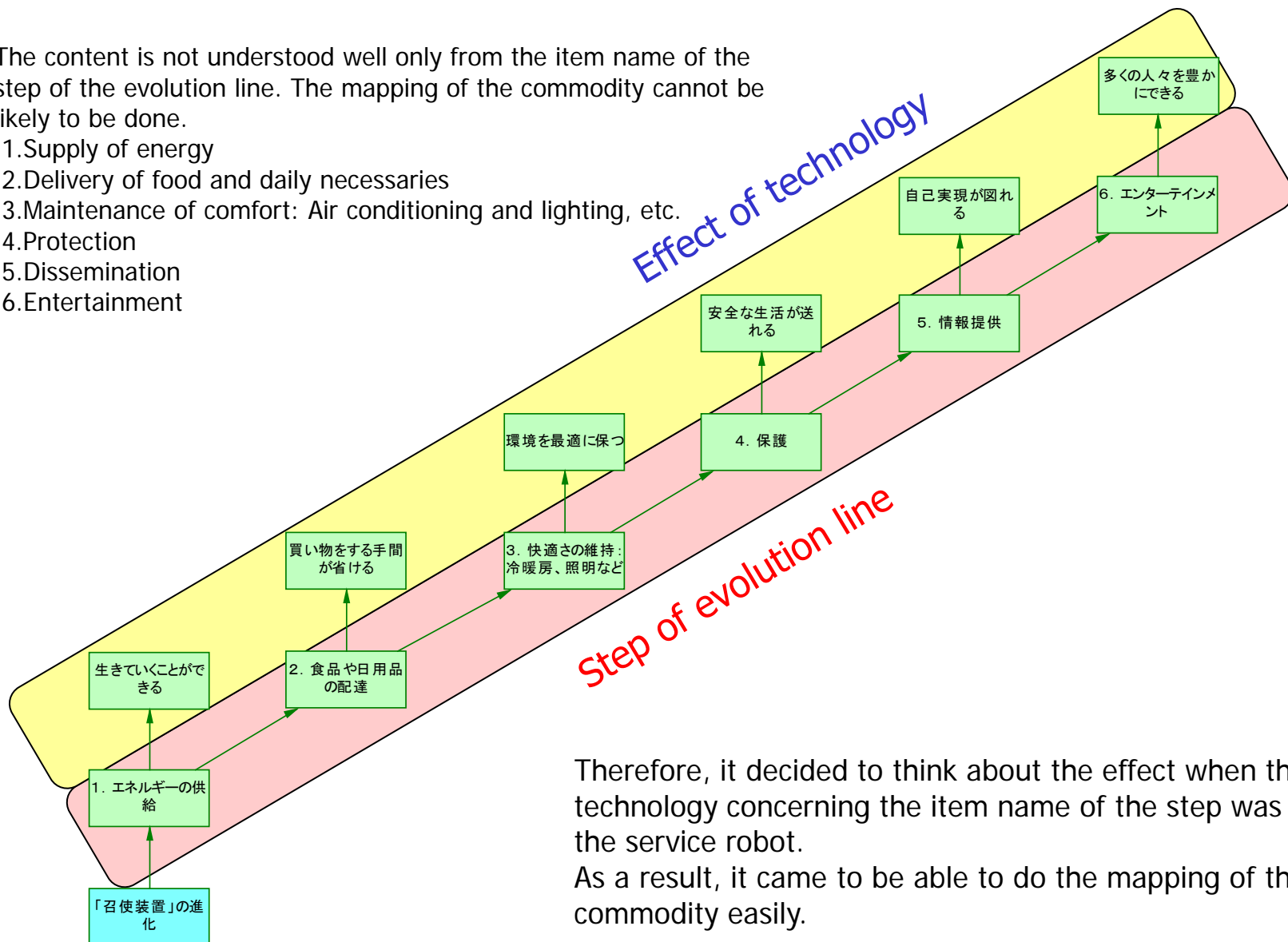
Effect achieved in step of evolution line

The content is not understood well only from the item name of the step of the evolution line. The mapping of the commodity cannot be likely to be done.

1. Supply of energy
2. Delivery of food and daily necessities
3. Maintenance of comfort: Air conditioning and lighting, etc.
4. Protection
5. Dissemination
6. Entertainment

Effect of technology

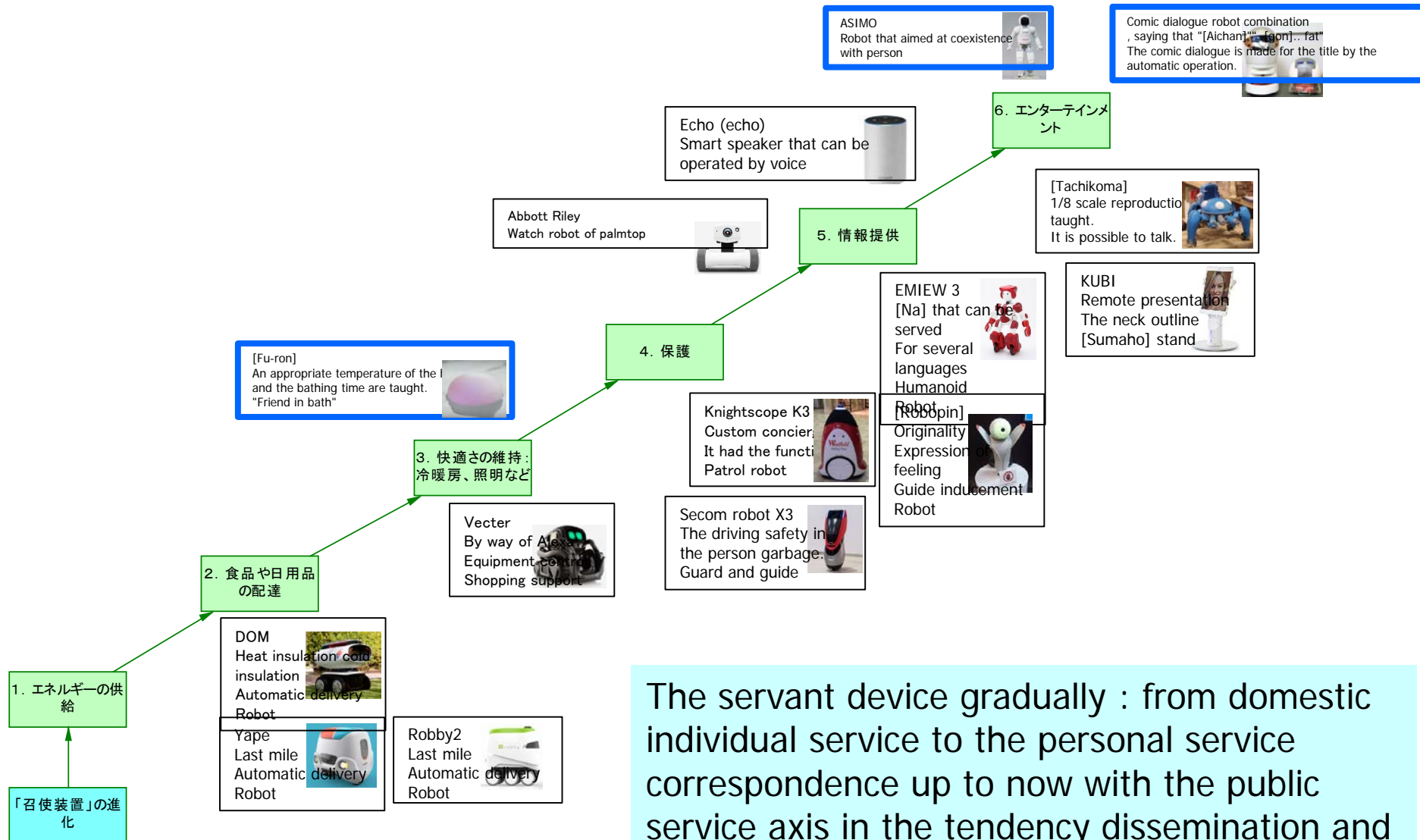
Step of evolution line



Therefore, it decided to think about the effect when the technology concerning the item name of the step was applied to the service robot.







As a result, it came to be able to do the mapping of the commodity easily.

Evolution line of "The servant's evolution" (branch)



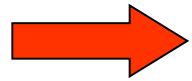
The servant device gradually : from domestic individual service to the personal service correspondence up to now with the public service axis in the tendency dissemination and the entertainment of evolution.

The service robot that becomes it evolves looking like

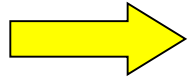
Name/serial number of robot	Category	Illustration	Input part	Control part	Output part	Feature
[Robi] 2013.02.25 Magazine release in the series	Person type communicati ons robot		Mike, person feeling sensor, and acceleration sensor of three axes	Microcomputer board, voice recognition board, person feeling sensor board, LED board, remote control board, and battery	Servo motor, LED, and speaker	ON/OFF and volume adjustment of television not connected with net (conversation log outflow prevention)
[Robi] 2 2017.06.06 Magazine release in the series	Person type communicati ons robot		Mike, person feeling sensor, three axis acceleration sensor, and camera (face recognition, smile recognition, and taking a picture)	Ditto	Ditto	ON/OFF and volume adjustment of television not connected with net (conversation log outflow prevention) The function is added by the QR code. It can enjoy [robi] 2, mate robot (Q-bo), and man's three person communications.
[Robohon] SR-01M-W (3G/LTE) SR-02M-W (Wi-Fi) 2016.05.26 Sale	Mobile type robot telephone		Nine axis (three acceleration axes, three axes in terrestrial magnetism, and three giro axes) sensor and illuminance sensor GPS and bluetooth Liquid crystal display equipped with camera (face recognition, smile recognition, and taking a picture) and touch panels	Voice recognition board and LED board, remote control board, and battery	Servo motor, LED, speaker, projector (The image can be projected with the projector of the prominent forehead), and bluetooth.	It has a basic function of the cellular phone such as the telephone, E-mails, and cameras, and the full spectrum corresponds to the operation by the speech dialogue. It changes gradually by being able to update by way of the network, and studying user's use state and profile, etc. in addition, and it grows up.
[Robohon] SR-03M- Y(3G/LTE) SR-04M-Y (Wi-Fi) 2019.02.17 Sale	Mobile type robot telephone			Ditto Sign language interpreter application that uses AI technology 2017.11.08 Announcement that has been developed (Refer to a left column.)	Ditto	Ditto Cooperation with the consumer electronic such as the televisions becomes possible, and the animation etc. preserved in [robohon] can be projected onto the television screen though the projector was lost in new [robohon].
Atom 2018.10.01 Sale	Person type communicati ons robot		Liquid crystal display with touch sensor (static electricity type) for six axis (three acceleration axes and three giro axes) sensor, mike, person feeling sensor, three axis acceleration sensor, camera, bluetooth, and Wi-Fi and touch panel	Front end AI, Cloud AI, microcomputer board, voice recognition board, person feeling sensor board, LED board, remote control board, and battery	Servo motor, LED, speaker, and bluetooth Liquid crystal display and universal serial bus port	It connects with the net, it has the self- diagnosis function, and the image can be output on the screen of the chest. Growth as the robot and the use of various contents become possible by cooperation with Cloud AI.

How to use the evolution line

(Reference) "Directed Evolution®" Software and international company

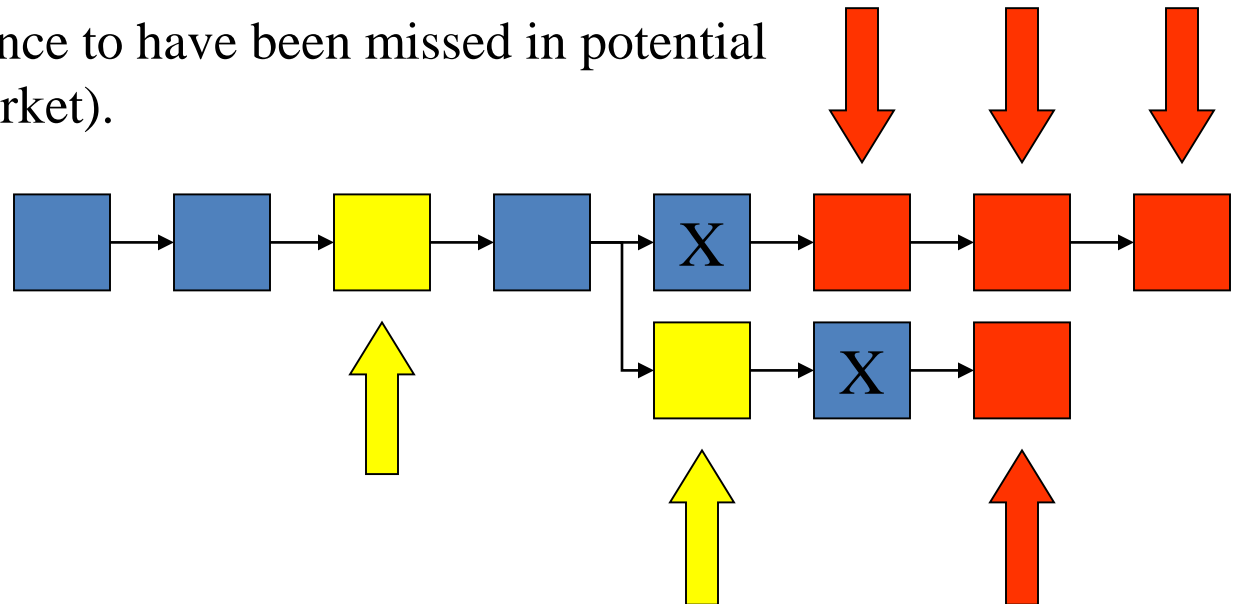


Technical new chance



It is a chance to have been missed in potential
(niche market).

Evolution line



Explanatory notes



Omitted step



Step put into writing in history



Step of the future



Present location

Problem of anti-system of service robot

The indicator of the solution is obtained by thinking about an anti-system of the problem by setting the achievement of a basic, profitable function of the service robot as a problem about the problem of proposing next generation's service robot.

The problem of the system "The service robot supports man's behavior. "

An anti-problem of the system "Man supports the action of the service robot. "

A negative problem of the system "The service robot doesn't support man's behavior (Obstruct it)"

The problem of the low-order system "The service robot supports a part of the behavior of man. "

An anti-problem of the low-order system "Man supports a part of the action of the service robot. "















A negative problem of the low-order system "The service robot obstructs a part of the behavior of man. "

The problem : a high-ranking system. "The service robot straightens the environment that man acts. "

An anti-problem of a high-ranking system "Man straightens the environment that the service robot acts. "

A negative problem of a high-ranking system "The service robot deteriorates man's behavioral environment. "

Example of evolution chance of service robot map

「サービス・ロボット」の進化機会マップ						
2019.06.24、©知財創造研究分科会						
5. 感情移入の聴取						 <p>ASIMO 人との共存 を狙った ロボット</p>  <p>送オロボット コンビ。 「あいちゃん」 と「ゴン太」 お題に自動で 送オ作成</p>
4. 注意深い聴取					 <p>ロボピン 独自の 感情表現 案内誘導 ロボット</p>  <p>EMIEW 3 接客可能な 多言語対応 ヒューマノイド ロボット</p>  <p>KUBI 遠隔プレゼン 首振り スマホ台</p>	
3. 選択的な聴取			 <p>Vector Alexa経由 機器制御 買物支援</p>	 <p>セコムロボット X3 人ごみの中 も安全走行 警備、道案内</p>  <p>アロハトライ 手のひら サイズの 見守りロボット</p>	 <p>Echo(エコー) 音声で操作 できる スマートスピーカー</p>  <p>タチコマ 1/8スケール再現 物を教える 会話が可能</p>	
2. 聞くふり						
1. 無視		 <p>DOM 保温保冷 自動配送 ロボット</p>  <p>Yape ラストマイル 自動配送 ロボット</p>  <p>Robby2 ラストマイル 自動配送 ロボット</p>	 <p>フーロン 適切な湯温と 入浴時間を 教えてくれる 「お風呂の友」</p>			
聴取／コミュニケーション 召使装置	1. エネルギーの供給	2. 食品や日用品の配達	3. 快適さの維持： 冷暖房、照明など	4. 保護	5. 情報提供	6. エンターテインメント