- **actuation method, hardware control labels**

| label | contents |
|---|---|
| $a_1$ | pneumatic |
| $a_2$ | hydraulic |
| $a_3$ | motor |
| $a_4$ | electro and hydraulic |
| $a_5$ | pneumatic and motor |
| $a_6$ | cable-driven |

- **hardware control labels**

| label | contents |
|---|---|
| $ch_1$ | remote operator control |
| $ch_2$ | automatic control |
| $ch_3$ | human-robot collaboration |
| $ch_4$ | manual control |

- **application labels**

| label | contents | label | contents | label | contents |
|---|---|---|---|---|---|
| $A_1$ | road construction | $A_{22}$ | masonry construction | $A_{43}$ | joint filling |
| $A_2$ | titling placing | $A_{23}$ | On-site rescue | $A_{44}$ | panel installation |
| $A_3$ | building service | $A_{24}$ | machinery path management | $A_{45}$ | cleaning |
| $A_4$ | ferromagnetic surface construction | $A_{26}$ | grasp soft objects | $A_{46}$ | machinery mapping |
| $A_5$ | earthmoving construction | $A_{26}$ | remote operating machines | $A_{47}$ | mining |
| $A_6$ | building inspection | $A_{27}$ | airforce construction | $A_{48}$ | logistics |
| $A_7$ | excavation | $A_{28}$ | ceiling construction | $A_{49}$ | transmission tower construction |
| $A_8$ | steel construction | $A_{29}$ | material, sorting, delivery, distribution | $A_{50}$ | operation simulation |
| $A_9$ | tunnel construction | $A_{30}$ | Mars/Lunar construction | $A_{51}$ | pose estimation |
| $A_{10}$ | glass installation | $A_{31}$ | slab finishing | $A_{52}$ | measurement |
| $A_{11}$ | wall construction | $A_{32}$ | machinery navigation | $A_{53}$ | highway construction |
| $A_{12}$ | bridge construction | $A_{33}$ | reduce lifting workload | $A_{54}$ | arc welding |
| $A_{13}$ | construction monitoring | $A_{34}$ | components assemble | $A_{55}$ | underwater work |
| $A_{14}$ | equipment positioning | $A_{35}$ | construction activity evaluation | $A_{56}$ | remote construction |
| $A_{15}$ | building quality assessment | $A_{36}$ | diagnosis detection | $A_{57}$ | improve home living environment |
| $A_{16}$ | concrete printing | $A_{37}$ | timer construction | $A_{58}$ | finishing |
| $A_{17}$ | high rise building construction | $A_{38}$ | marking | $A_{59}$ | object recognition |
| $A_{18}$ | large-scale building construction | $A_{39}$ | hazard detection | $A_{60}$ | drilling |
| $A_{19}$ | building maintenance | $A_{40}$ | harbour construction | $A_{61}$ | scaffolding work |
| $A_{20}$ | spraying | $A_{41}$ | waste collection | $A_{62}$ | fire curtain testing |
| $A_{21}$ | pipe construction | $A_{42}$ | disaster restoration | $A_{63}$ | contour crafting |

## control algorithm labels

| label | contents | label | contents |
|---|---|---|---|
| $cc_1$ | SFT algorithm, NNG algorithm | $cc_{61}$ | pixels regression |
| $cc_2$ | kinematic | $cc_{62}$ | image processing |
| $cc_3$ | analytical model | $cc_{63}$ | Actuator-level languages |
| $cc_4$ | estimate ego-position | $cc_{64}$ | iterative algorithms + regression model |
| $cc_5$ | PI controller, active control algorithm | $cc_{65}$ | path-planning |
| $cc_6$ | pure-pursuit method | $cc_{66}$ | geodetical method |
| $cc_7$ | Dijkstra's algorithm | $cc_{67}$ | Kalman Filter Algorithm |
| $cc_8$ | tractive thrust, numerical simulation | $cc_{68}$ | Msc. Adams and Matlab/Simulink programs |
| $cc_9$ | performance test, evaluation | $cc_{69}$ | dynamic model |
| $cc_{10}$ | heuristic algorithm, heuristics | $cc_{70}$ | PTP control |
| $cc_{11}$ | Mesh Mould | $cc_{71}$ | TCP control |
| $cc_{12}$ | path planning-linear interpolation algorithm-TP language | $cc_{72}$ | Particle Swarm Optimization (PSO) algorithms |
| $cc_{13}$ | NDT-method | $cc_{74}$ | RFID |
| $cc_{14}$ | control travel speed | $cc_{75}$ | IFC + BIM |
| $cc_{15}$ | automated off-line teaching system | $cc_{76}$ | LPA* algorithm |
| $cc_{16}$ | user datagram protocol (UDP) | $cc_{77}$ | digital signal processing (DSP) controller |
| $cc_{17}$ | admittance control | $cc_{78}$ | torque measure methods |
| $cc_{18}$ | CAN-communication | $cc_{79}$ | RBF-PID Control, PID |
| $cc_{19}$ | simplified error analysis model | $cc_{80}$ | augmented reality techniques (AR) |
| $cc_{20}$ | vision based gesture estimation, CARLoS Scenario | $cc_{81}$ | predictive force method |
| $cc_{21}$ | optimizing welding sequence | $cc_{82}$ | Generalized Resolution Correlative Scan Matching (GRCSM) |
| $cc_{22}$ | BIM+ Augmented Reality+Human-Machine Interfaces (IMUs) | $cc_{83}$ | finite element method |
| $cc_{23}$ | power line communication net | $cc_{84}$ | Force feedback control |
| $cc_{24}$ | beacon-based localization method | $cc_{85}$ | iterative learning control, fuzzy logic controller |
| $cc_{25}$ | a search algorithm. | $cc_{86}$ | master-slave system |
| $cc_{26}$ | fusion fuzzy, fuzzy logic, fuzzy set theory | $cc_{87}$ | improved Bug-based path planning algorithm |
| $cc_{27}$ | distributed feedback mechanism | $cc_{88}$ | "point-to-angle" algorithms |
| $cc_{28}$ | motion simulation | $cc_{89}$ | trajectory generation algorithm |
| $cc_{29}$ | planning and stigmergy, Linux-based computer | $cc_{90}$ | C++, Java, C# script, C program |
| $cc_{30}$ | encoder failure detection algorithm | $cc_{91}$ | pre-acting control algorithm |
| $cc_{31}$ | wireless communication, wireless Lan | $cc_{92}$ | Virtual Reality |
| $cc_{32}$ | parametric-integrated algorithm, parametric synthesis | $cc_{93}$ | bar penetration technique, in-process reinforcing technique |
| $cc_{33}$ | Brooks' algorithm | $cc_{94}$ | Raspberry Pi |
| $cc_{34}$ | Anderson Passive control theory | $cc_{95}$ | PLC |
| $cc_{35}$ | BIM, prepare the trajectories | $cc_{96}$ | real time navigation |
| $cc_{36}$ | PID position control | $cc_{97}$ | cost optimization |
| $cc_{37}$ | intelligent beacon | $cc_{98}$ | tree-Based algorithm |
| $cc_{38}$ | least squares algorithm | $cc_{99}$ | dedicated smart sensors |
| $cc_{39}$ | voltage response | $cc_{100}$ | markov chains |

| | | | |
|---|---|---|---|
| $cc_{40}$ | collision avoidance algorithms, feed forward control algorithms | $cc_{101}$ | robust algorithm |
| $cc_{41}$ | timing algorithm | $cc_{102}$ | MPEG algorithm, the pair-wise alignment algorithm, Minimum V variance Matching (MVM) Algorithm |
| $cc_{42}$ | HyperCard program | $cc_{103}$ | motion planning |
| $cc_{43}$ | inverse kinematic and dynamic models | $cc_{104}$ | integral monitoring system |
| $cc_{44}$ | 3D printer/printing | $cc_{105}$ | A* algorithm, A-star |
| $cc_{45}$ | discrete event simulation model | $cc_{106}$ | point cloud data control |
| $cc_{46}$ | embedded, embedding, controller | $cc_{107}$ | random walk algorithm |
| $cc_{47}$ | UML state charts and capsules | $cc_{108}$ | positioning system |
| $cc_{48}$ | Hierarchical planning | $cc_{109}$ | stereovision method |
| $cc_{49}$ | genetic algorithms (GA) | $cc_{110}$ | Iterative Closest Point (ICP) algorithm |
| $cc_{50}$ | simple kinematic connection | $cc_{111}$ | measures vector value of vertical lifting |
| $cc_{51}$ | Iterative Inverse Perspective Matching algorithm | $cc_{112}$ | Ubiquitous Sensor Network |
| $cc_{52}$ | longest common subsequence (LCS) | $cc_{113}$ | velocity control |
| $cc_{53}$ | forward and inverse geometric model | $cc_{114}$ | behaviour-based system |
| $cc_{54}$ | inverse position equation | $cc_{115}$ | self-positioning algorithm |
| $cc_{55}$ | teaching robots' specific skills | $cc_{116}$ | segmentation approach |
| $cc_{56}$ | best-fit algorithms | $cc_{117}$ | automatic battery replacement |
| $cc_{57}$ | C-K Theory | $cc_{118}$ | SLAM |
| $cc_{58}$ | soft additive fabrication | $cc_{119}$ | error modification |
| $cc_{59}$ | primitive static states | $cc_{120}$ | estimate the distance between robot to wall |
| $cc_{60}$ | workflow method | | |
| $cc_{73}$ | Machine Learning: neural, deep learning, CNN, Computer vision, Deep Reinforcement learning, FCN, neural network, deep convolutional neural networks, RRT algorithm, LNSNet network, Network, Fast R-CNN, BP network, Stacked Hourglass Networks, CV algorithm. open CV. | | |

- **sensory system labels**

| label | contents | label | contents |
|---|---|---|---|
| $s_1$ | laser + ultrasonic + CCD camera | $s_{80}$ | infrared + camera |
| $s_2$ | camera + pressure sensor + force sensor + magnetostriction sensor + tactile sensor, gyro | $s_{81}$ | angle sensor |
| $s_3$ | position sensor + camera | $s_{82}$ | laser + lidar |
| $s_4$ | image sonars + camera + LBL, gyro | $s_{83}$ | IMU + laser |
| $s_5$ | pressure sensor + tactile sensor | $s_{84}$ | GPS + lidar + camera + angle sensors + distance sensors + force sensor + depth sensor + radar, ultrasonic sensors + IMU |
| $s_6$ | torque/force sensor + force sensor | $s_{85}$ | pressure sensor + speed sensor + proximity sensors |
| $s_7$ | camera | $s_{86}$ | range sensor + displacement sensor + GPS |
| $s_8$ | pressure sensor | $s_{87}$ | range sensors + distance sensor |
| $s_9$ | visual sensor | $s_{88}$ | pressure sensors + laser sensor |
| $s_{10}$ | ultrasonic | $s_{89}$ | liquid based sensor |
| $s_{11}$ | visual sensor + touch sensor + optical detector + arc weaving sensor | $s_{90}$ | IR sensor + F/T sensor + acceleration sensor |
| $s_{12}$ | tactile sensing system + welding sensor | $s_{91}$ | elasto-magnetic (E/M) sensor |
| $s_{13}$ | arc sensor + laser | $s_{92}$ | robust sensor + pressure sensors + force sensors |
| $s_{14}$ | laser | $s_{93}$ | LPG sensor + a smoke sensor |

| | | | |
|---|---|---|---|
| $s_{15}$ | laser + torch senser | $s_{94}$ | LTK + GPS + pseudofiles + laser + NLS |
| $s_{16}$ | CCD camera + stereo sensor | $s_{95}$ | sonar system |
| $s_{17}$ | LIDAR sensors + IMU + Kinetic | $s_{96}$ | camera + accelerometers |
| $s_{18}$ | various sensors + sensor system | $s_{97}$ | front rear sensors + wireless camera |
| $s_{19}$ | 3D laser + camera + torch sensor + galvanometer scanner | $s_{98}$ | analogy voltage sensor + laser profile probe |
| $s_{20}$ | vacuum sensor + air pressure sensor + position sensor + camera | $s_{99}$ | orientation and proximity sensors + CCD camera + thermographic sensors |
| $s_{21}$ | distance sensor + tilt sensor | $s_{100}$ | ultrasonic sensor + Infrared sensor + dangerous gas sensor + noise sensor + light sensor |
| $s_{22}$ | position sensor | $s_{101}$ | lidar + IMU |
| $s_{23}$ | rotation angles sensors + vacuum sensors + accelerometers + pressure sensor | $s_{102}$ | ultrasonic + Infrared + laser |
| $s_{24}$ | light sensor + infrared proximity sensors | $s_{103}$ | camera + laser scanners + inclinometer |
| $s_{25}$ | infrared distance sensors + camera | $s_{104}$ | gyro sensor + laser sensor + CCD camera |
| $s_{26}$ | shock sensor + infrared ray sensor + laser sensor, magnetic sensor | $s_{105}$ | DSLR camera + rotating sensor |
| $s_{27}$ | laser radar + GPS + RFID | $s_{106}$ | camera + force + laser |
| $s_{28}$ | alignment sensor + brake check sensor + obstacle detecting sensors + laser sensors + ultrasonic sensor + HMR sensor | $s_{107}$ | radar + acoustic sensors + electrical resistivity sensors + impact-echo + ultrasonic + cameras |
| $s_{29}$ | camera + laser + lidar | $s_{108}$ | camera + LED + light |
| $s_{30}$ | GPS + generic pose sensor | $s_{109}$ | GPS + camera |
| $s_{31}$ | tactile senses + force sensor | $s_{110}$ | pressure sensor + Rotary encoder + potentiometer |
| $s_{32}$ | camera + GPS + dust meter | $s_{111}$ | camera + force + laser + pressure |
| $s_{33}$ | force sensor + ultrasonic sensor | $s_{112}$ | vision sensor + proximity sensor + peripheral sensors |
| $s_{34}$ | force sensor + sonar sensor | $s_{113}$ | rotation angle + encoder sensor + laser, accelerometer |
| $s_{35}$ | vision sensor | $s_{114}$ | ultrasonic sensors + encoders + IMU + yaw angle sensor + sonar sensors |
| $s_{36}$ | optical sensors + touch sensor | $s_{115}$ | proximity sensor |
| $s_{37}$ | ultrasonic sensor + 2D LIDAR | $s_{116}$ | IMU + force sensor |
| $s_{38}$ | cameras + pressure force sensor | $s_{117}$ | camera + encoder + proximity |
| $s_{39}$ | camera + image + CCD + Kinect | $s_{118}$ | camera + sonar sensor + temperature sensor + airflow sensors + laser |
| $s_{40}$ | position sensor + velocity sensor | $s_{119}$ | optical (IR) sensor |
| $s_{41}$ | position sensor + load sensor | $s_{120}$ | pressure sensor + tensioner sensor + magneto strictive sensor |
| $s_{42}$ | rotation sensor + force sensor | $s_{121}$ | meteor-sensors + proximity sensor + navigation sensor |
| $s_{43}$ | joint sensor | $s_{122}$ | power/torque sensor |
| $s_{44}$ | force sensor + pressure transducers | $s_{123}$ | force/ touch sensor |
| $s_{45}$ | force and position sensors + ground penetrating radar (GPR) + laser | $s_{124}$ | photoelectric sensor |
| $s_{46}$ | force + pressure + laser | $s_{125}$ | ultra-sonic sensor + magnetic sensor + camera |
| $s_{47}$ | force sensors + Laser + GPS + INS | $s_{126}$ | laser + camera + tempo sonics |
| $s_{48}$ | work environment sensors + GPS + IMU + lidar | $s_{127}$ | 3D sensor |
| $s_{49}$ | infrared sensor | $s_{128}$ | force sensor + pressure sensor + provision sensor + vision sensors |
| $s_{50}$ | position sensor + force sensor | $s_{129}$ | optical + ultrasonic + laser |
| $s_{51}$ | bump sensor | $s_{130}$ | camera + pressure sensor + displacement sensor |
| $s_{52}$ | on-board camera + live video + inductive sensors | $s_{131}$ | gyroscopes, force/torque sensor, video cameras |

| | | | |
|---|---|---|---|
| $s_{53}$ | lidar + distance sensor + IMU + inductive sensor + contact sensors | $s_{132}$ | CCD cameras + acceleration sensors + position sensors + magnetic stroke sensors |
| $s_{54}$ | laser + cameras + Kinect | $s_{133}$ | a stereo camera + acceleration sensors |
| $s_{55}$ | load cell sensor | $s_{134}$ | magnetic stroke sensors + pressure sensors + stereo camera |
| $s_{56}$ | ultrasonic + position camera | $s_{135}$ | force sensor + tracker sensor + stereo camera |
| $s_{57}$ | environmental sensor | $s_{136}$ | camera + position + pressure |
| $s_{58}$ | F/T sensors force/torque + environmental sensor | $s_{137}$ | position sensors + magnetic stroke sensors + pressure sensors |
| $s_{59}$ | position and forces sensor | $s_{138}$ | axis sensors |
| $s_{60}$ | infrared sensor + force sensor + camera | $s_{139}$ | stereo camera + acceleration sensors + a gyro sensor |
| $s_{61}$ | optical sensor + camera | $s_{140}$ | pressure sensor + electronic compass + displacement transducers |
| $s_{62}$ | IMU | $s_{141}$ | angle sensor + ultrasonic sensors |
| $s_{63}$ | proximity sensor + multiple sensors + camera | $s_{142}$ | light sensors + humidity/temperature sensors + sonar sensors + ultrasonic range sensor + infrared distance measuring sensors + CMOS image sensor |
| $s_{64}$ | force + laser | $s_{143}$ | GPS + IMU |
| $s_{65}$ | camera + tactile | $s_{144}$ | camera + angle + lidar + GPS |
| $s_{66}$ | GPS, position sensor, reference sensor | $s_{145}$ | attitude sensor + acceleration sensor + camera, displacement sensor |
| $s_{67}$ | GPS | $s_{146}$ | Kinect + accelerometers + IMUs |
| $s_{68}$ | GPS + inclinometer | $s_{147}$ | webcam |
| $s_{69}$ | GPS + laser | $s_{148}$ | IMU + camera |
| $s_{70}$ | laser + position | $s_{149}$ | force-torque sensor + camera/vision |
| $s_{71}$ | force-torque + photoelectric sensor | $s_{150}$ | RGB LED |
| $s_{72}$ | camera + proximity sensor + F/T sensor | $s_{151}$ | height sensor |
| $s_{73}$ | tilt sensor + distance sensor + camera + laser scanner, gyroscope | $s_{152}$ | stroke sensor + temperature sensor + hydraulic sensor + potentiometer |
| $s_{74}$ | ultrasonic sensor + displacement transducers + ranging transducer + laser scanner | $s_{153}$ | RFID + humidity sensor + temperature sensor + Kinect Sensor |
| $s_{75}$ | laser distance + stereo infrared sensor | $s_{154}$ | equivalent sensor |
| $s_{76}$ | distance sensor | $s_{155}$ | presence sensor + IR interrupt sensor + LVDT inductive sensors |
| $s_{77}$ | force sensor + pose sensor | $s_{156}$ | RGB camera + IMU |
| $s_{78}$ | actuators and electronic sensors + stop sensor | $s_{157}$ | Zigbee sensors + laser finder |
| $s_{79}$ | lidar + camera | $s_{158}$ | depth sensor + colour sensors + camera |

- **hardware design labels**

| label | contents | label | contents |
|---|---|---|---|
| $b_1$ | humanoid | $b_{42}$ | mobile vehicle, aerial lift, manipulator, vacuum suction device |
| $b_2$ | arm, manipulator, mounted on vehicle, track, excavator, caterpillar, lorry, rail, crawler, crane, car | $b_{44}$ | manipulator, vacuum suction, wheel mobility |
| $b_3$ | crawler | $b_{45}$ | wearable |
| $b_4$ | arm, slider pulley | $b_{46}$ | wheel mobile, magnetic gripper |
| $b_5$ | multi-fingered robot hand, gear, belt | $b_{47}$ | mobile formwork |
| $b_6$ | tank | $b_{48}$ | reconfigurable, vacuum grippers, arm, two robots |
| $b_7$ | gantry robot, arm | $b_{49}$ | crane, robotized crane |
| $b_8$ | mobile robotic platform/robot | $b_{50}$ | vacuum cups, overhead gantry crane |

| | | | |
|---|---|---|---|
| $b_9$ | AGV, track lifting arm | $b_{51}$ | omnidirectional wheel, mobile platform, vacuum generator, robotic arm |
| $b_{10}$ | traveling crane | $b_{52}$ | mobile vehicle, carriage, truck, excavator, tank, trolley, dozer, Caterpillar, Forklift, machine |
| $b_{11}$ | lifting rail, and arm moved by carriage | $b_{53}$ | wireless gripper, winch |
| $b_{12}$ | fixed arm (depicted, mounted, hang on, manipulator, attach) | $b_{54}$ | vacuum gripper and robot arm |
| $b_{13}$ | mobile platform arm, manipulator | $b_{55}$ | vertically mobile arm |
| $b_{14}$ | changeable cell | $b_{56}$ | rail moving arm, |
| $b_{15}$ | wheel mobile lifting single arm | $b_{57}$ | wire robot, cable climb |
| $b_{16}$ | climbing platform, pediculate, gripper | $b_{58}$ | UAV |
| $b_{17}$ | lift fixed manipulator | $b_{59}$ | a scissor lift, aerial bucket, and a manipulator arm |
| $b_{18}$ | the legged mobile platform with rods climbs | $b_{60}$ | truss-type robot |
| $b_{19}$ | climbing platforms, with vacuum grippers and suction | $b_{61}$ | double arm excavator arm, double front, dual arm |
| $b_{20}$ | climbing two platforms and a light skeleton, vacuum grippers | $b_{62}$ | caterpillar and, 6-DOF manipulator with vacuum pad |
| $b_{21}$ | mobile arm | $b_{63}$ | scissor-jack type manipulator |
| $b_{22}$ | mobility platform and magnetic gripper | $b_{64}$ | ground-based, aerial robotic platform |
| $b_{23}$ | mobile robot, a light automatic manipulator moves by rail | $b_{65}$ | mobile square |
| $b_{24}$ | climbing system | $b_{66}$ | mobile tracked locomotion |
| $b_{25}$ | parallel robots | $b_{67}$ | frame system |
| $b_{26}$ | rail, vertical-moving robot | $b_{68}$ | mobile platform Husky |
| $b_{27}$ | AGV, unmanned ground vehicle | $b_{69}$ | platform clamp |
| $b_{28}$ | Hexapod-Shaped | $b_{70}$ | mobility feet, leg, limbed |
| $b_{29}$ | a mobile platform, a manipulator mounted on a lifting column | $b_{71}$ | wheel mobile platform, caterpillar |
| $b_{30}$ | ABB arm, arm, KUKA arm, Mitsubishi Robot RV-2AJ, manipulator, UR5 | $b_{72}$ | Hammering Robot |
| $b_{31}$ | UGV and UAV | $b_{73}$ | magnetic wheel |
| $b_{32}$ | wheel mobile robot | $b_{74}$ | worm-like, snake-like robot |
| $b_{33}$ | bucket, arm | $b_{75}$ | mobility, clamping manipulator |
| $b_{34}$ | vertical mobile, a cleaning head, a pressure pump, a suction device, a filter and a tank. | $b_{76}$ | scissor lifter and omnidirectional wheels |
| $b_{35}$ | magnetic clamp and mobile platform | $b_{77}$ | bolting robot |
| $b_{36}$ | mobile arm, manipulator with wheels | $b_{78}$ | collaborative robots, multi robot, team of robots, multiple |
| $b_{37}$ | mobile reconfigurable, platform | $b_{79}$ | omnidirectional wheel |
| $b_{38}$ | reconfigurable vertical climbing | $b_{80}$ | 3d printer, lifting |
| $b_{39}$ | reconfigurable with locomotive wheels | $b_{81}$ | motion base, manipulator |
| $b_{40}$ | caterpillar wheels, commercial impeller, vacuum suction | $b_{82}$ | artificial Nbber/ Rubber muscle (PARM) |
| $b_{41}$ | parallel manipulator, frame | $b_{83}$ | a novel furniture system, terminal wall system |

- **benchmarking technique labels**

| label | contents |
|---|---|
| $ce_1$ | the environmental impact, life cycle Assessment (LCA) |
| $ce_2$ | technical, economic, efficiency |
| $ce_3$ | efficiency |
| $ce_4$ | motion/force transmissibility |
| $ce_5$ | safety, posture load, working environment, risk exposure time, safety improvement ratio |
| $ce_6$ | cost optimization, quality control functions |
| $ce_7$ | productivity, economic feasibility, sensitivity, safety improvement, quality improvement |
| $ce_8$ | life cycle cost, productivity, sensitivity analysis |
| $ce_9$ | material management |
| $ce_{10}$ | position error, internal error, force |
| $ce_{11}$ | tele grasping force perception |
| $ce_{12}$ | sustainability performance, environment |
| $ce_{13}$ | error, cost, power consumption, controllability, complexity continuous time |
| $ce_{14}$ | cost, productivity, efficiency |
| $ce_{15}$ | mental workload |