Artificial Intelligence.

→ John Mc Carthy defined AI as a science & engineering of
1956 - Dartmouth Conference - making intelligent m/c.

→ Also, it is theory & development of computer system able to perform tasks normally requiring human intelligence — Visual Perception, Speech Recog; decision making.

→ Demand of AI:

1) More Computational Power — due to GPUs.

2) Big Data — lot of data at immeasurable pace. Process this data to grow more business insights using this.

It recommends how ← AI agent to process the big data & learn.

3) Better Algorithm — effective algo - based on NN; DL. Better & quicker computation with more accuracy. AI's demand has increased.

4) University, govt, startup & tech giants all are investing in AI. Google, Amazon has heavily invested in AI.

→ AI Apps:

1) Google predictive search engines (NLP, DL, ML)

2) Finance Sector — J.P. Morgan - Chase's Contract Intelli. to analyze legal documents using AI, ML, Image processing. (manually it take 12000 documents analysis as 36000 hrs. So, AI finish it in seconds).

3) Healthcare - IBM Watson - Medicine - 2016 -

4) Google's AI Eye Doctor -

5) Face Recognition.

6) Sentiment analysis

7) Virtual Assistants — Google Duplex.

8) Self - Driving Car -

9) Netflix (ML, AI)

10) Spam Filtering -

History of AI:

→ Under Greek mythology.

→ Talos. was a giant animated bronze warrior programmed to guard the island of crete created by Hephaestus.

→ 19th century - 1950 - Alan Turing published a landmark paper in which he speculated about possibility of creating m/c that think

→ Turing Test - whether or not computer can think intelligently or not. If m/c can carry a conversation i·e indistinguishable ; which means it'll pass turing test

→ No m/c till date passed fully the Turing Test

→ 1951 - game AI - Ferranti mark 2 m/c Using Univ. of Manchester

→ Christopher strachey wrote checker's program & for cheque also. Later they're improved & redone.

→ Intelligence is Composed of: It is the ability to use comprehend speak & write the verbal & written lang.

Judgement decisions prediction

Reasoning — Intelligence — Linguistic intelligence
                                        Interpersonal comm.

Learning — Perception

Problem solving

gaining knowledge learning diff. skills

Perception
acquiring
interpreting
selecting
organising.
(sense or info.) — guided by sense organ

- process of working through details of a problem to reach the sol.. includes.
- decision making

→ mechanism that acquired by sensors.
def puts the data together in a meaningful manner

Intelligents Agents in AI

→ study of rational agent & its environment.

↓ sense →

car (agent)

↓ sensors (device)   Road & Surrounding
Feels   obstacles.
(Object in (sense) ——actuators——→ (environment)
front)

↓
(device)
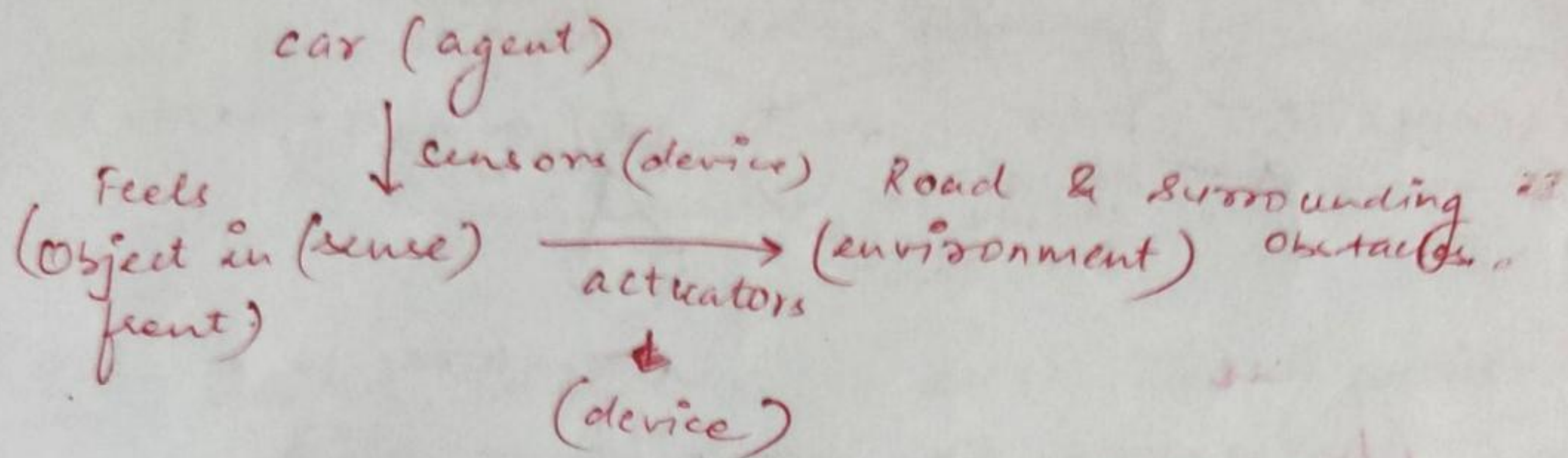
→ AI agent can have mental property — Knowledge, belief &
Intention.

Def:

→ An agent can be anything that perceives environment through
sensors & act upon that environment through actuators.

- **Human Agent:** Eyes, Ears, other organs which work for sensors, hands, legs, works for actuators.

- **Robotic Agent:** Cameras, Infrared range finders.

- **s/w Agent:** key strokes, cell phones

→ **Terminology:**

1) **sensors** — device which detects the change in environment & sends an info. to other electronic devices.
   - An agent observes the environment through sensors.

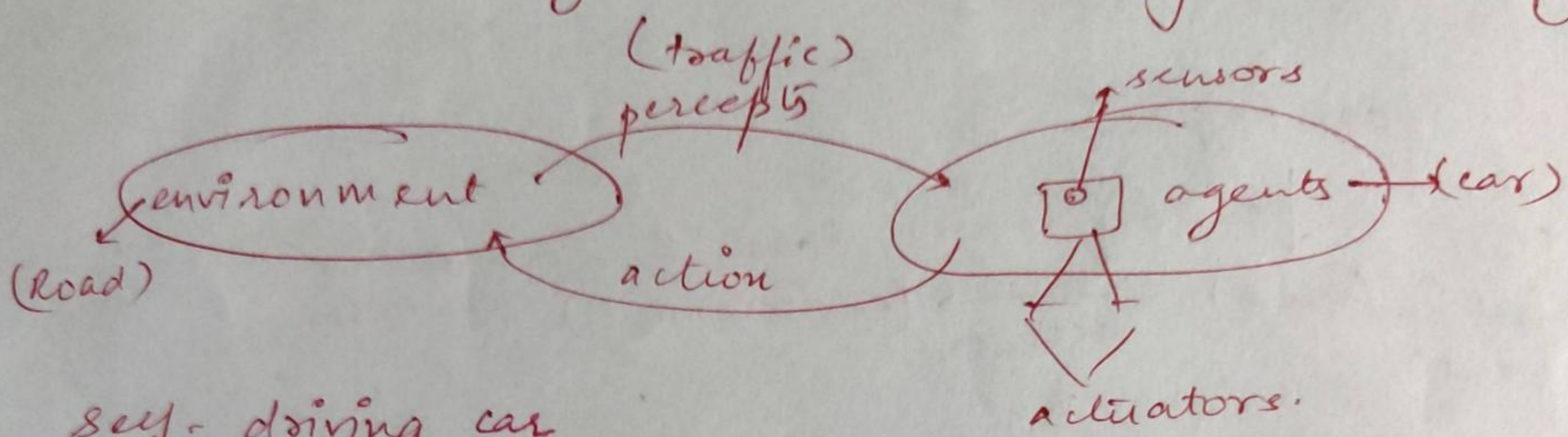2) **Actuators** — component of m/c that converts energy into motion.
   - send signal to various components
   Ex: self-driving car —
   - responsible for moving & controlling of system.

3) **Effectors** – device which affects the environment.

It can be legs, wheels, arms, fingers, & display screen

(traffic)
percepts

sensors

environment

agents → (car)

(Road)

action

actuators.

Ex: self-driving car

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reasoning – thinking power composed of reasoning –
– It enables us to provide the basis for judgement
is a
set of
process
that
making decr &
prediction

learning: composed of learning – activity of gaining knowledge
experiencing, practicing, skills, –

perception: It is a process of acquiring

pblm solving – process of working

Types of Agents in AI

1) **Simple Reflex Agents:** The agents works only on the basis of current perception & doesn't bother about previous state in which system was.

→ Based on condition-action rule -

If the condition is true.
action is taken.
else not.

→ **Problem** - Limited intelligence. — don't think of past & future
- No knowledge about the non perceptual part of the state
- operating in a partially observable environment
- Infinite loops are unavoidable.

→ **Working:** → If there is any change in the environment, then what action should be taken. → Activators.

Environment
↓
sensors

- If condn satisfied perform action otherwise not.

2) **Model-Based Reflex:** It works by finding a rule whose condition matches current situation.

- It can handle partially observable environment.
- updating the states requires info. abt -
- how the world evolves independently from agent
- how agents actions affect the world

3) Goal Based Agents - focus on reaching the goal set.
   - decision is based on how far it is currently from their goal & desired state
   - Their every action is intended to minimize their distance from goal.
   - Flexible ; Decision making skill , choose right path from various available options.

- decision making
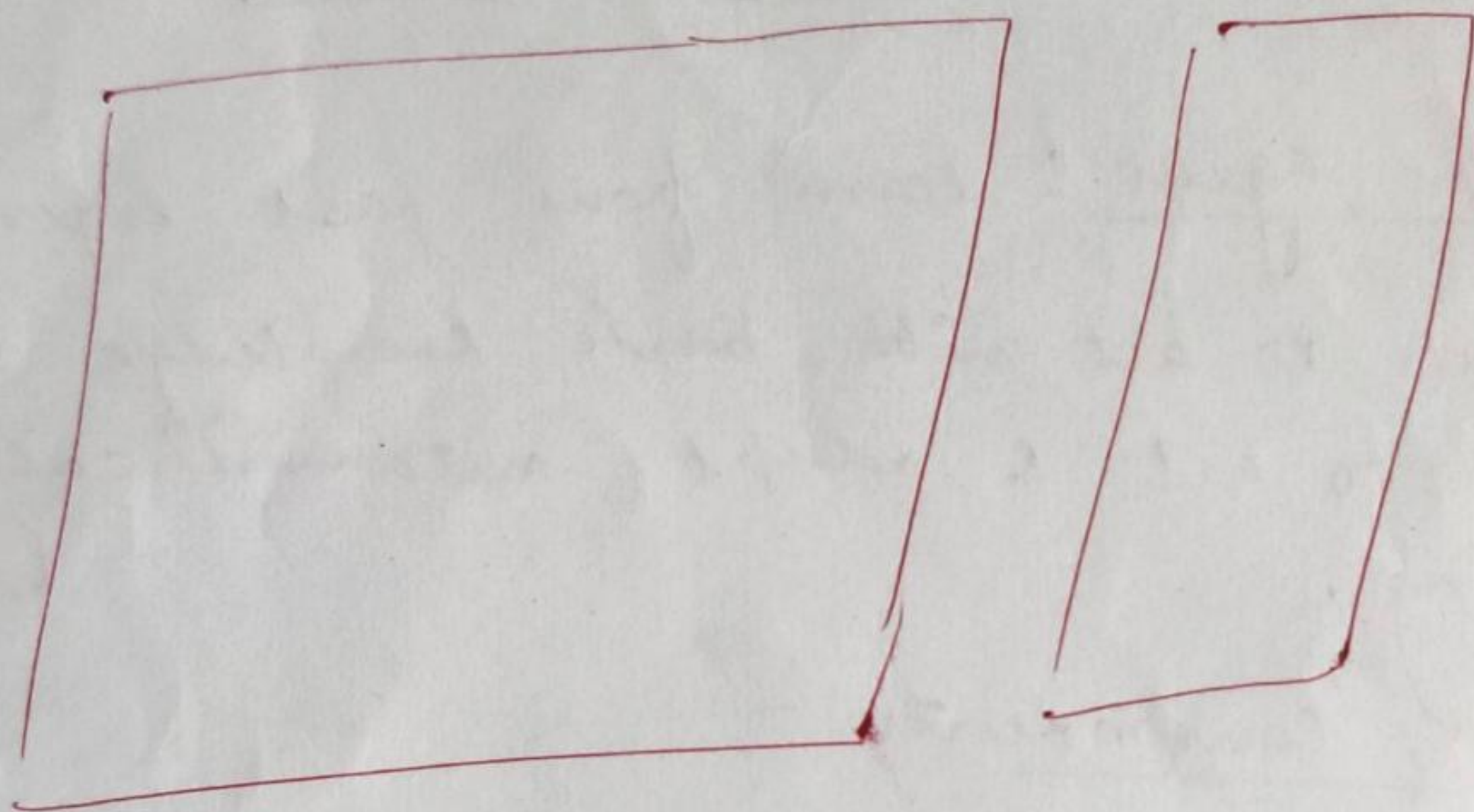
4) Utility Based Agents : Similar to goal based agents
   - Provide extra component of utility measurement which provides a measure of success at a given state.
* - Do Not act only on goals but the best way to achieve the goal.
   - Are useful when there are multiple possible alternatives.
* - It maps each state to a real - no to check how efficiently each action achieves the goal.

Agent diagram with boxes:
- state
- How the world evolve
- what any action do
- utility
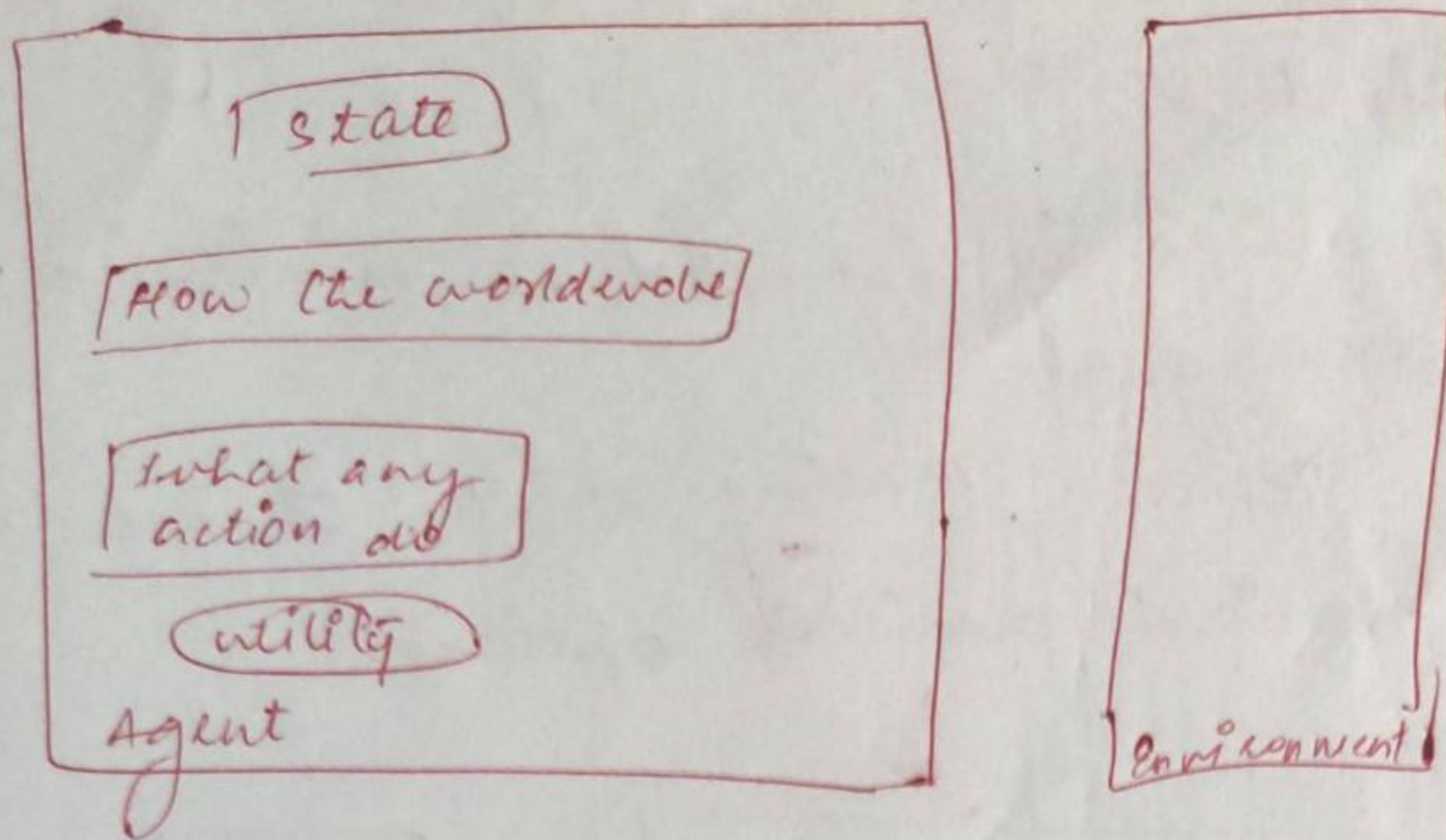
Environment

5) **learning - agent :** learn from past experience

- starts to act with basic knowledge & then able to act & adapt automatically through learning.

- **Four Components —**

ⓐ **learning element :** responsible for making improvement by learning from environment.

ⓑ **critic :** feedback from critic describes how well the agent is doing with r.t. a fixed performance standard.
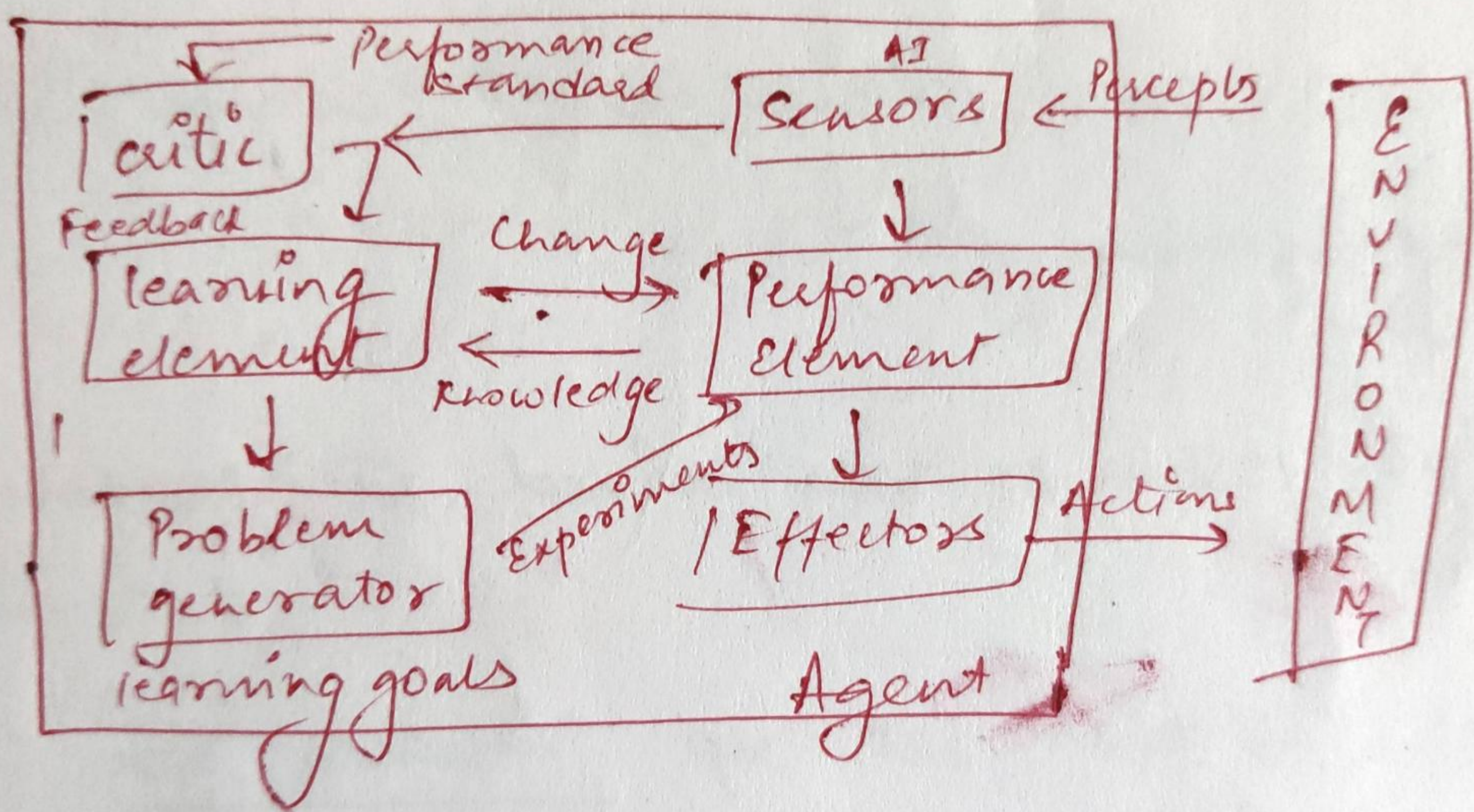
ⓒ **Performance Element :** Responsible for sharing external actions.

ⓓ **Problem Generator :** the components is responsible for suggesting action that'll lead to new & informative experience

→ A learning agent are able to learn, analyze performance and look for new ways to improve the performance.

Performance
standard

critic

Feedback

learning
element

Change

Knowledge

Problem
generator

Experiments

learning goals

AI
Sensors ← Percepts

Performance
Element

Effectors → Actions

Agent

ENVIRONMENT

NLP

→ Eng. lang. to comm". H/w an intelligent system & NLP.

ex:→ A Robot used to perform inst" you gave. as I/P & O/P
- speech & - written text

A m/c will get everything as an NLP system.

I/P → m/c → O/P
(Eng) (m/c) (Eng)
lang. (lang) lang.

* Components of NLP — < NLU (understanding)
NLG (Generation)

1) NLU: the mapping to given i/p in NL into useful representation.
- Analyzing different aspects of the lang.

2) NLG: Need to produce a meaningful phrase & sentence. That is in the form of NL form internal representation. It involves -
    i) Text Planning
    ii) Sentence "
    iii) Text Realization.

* Difficulties in NL

1) lexical ambiguity - It's pre defined at a very initial level - word level.

2) Syntax level ambiguity - we can define a sentence in a parsed way

3) Differential ambiguity - refer sth using pronoun.

Step-by-step Process of processing NLP:

1) **Lexical Analysis** - analyze the str. of words. The collection of words and phrases in lang. (Lexicon of a lang)

2) **Syntactic Analysis - (Parsing)** - Have to arrange words in a particular manner that shows the relationship b/w words.

3) **Semantic Analysis** - It describes dictionary meaning which is meaningfull. In the task domain mapping syntactic str. & objects

4) **Discourse Integration** - The meaning of any sentence depends upon the meaning of prev. sentence. In addition also, brings the meaning of immediately succeeding sentence.

5) **Pragmatic Analysis** - Data is interpreted on what is actual meant. we have to derive the aspects of lang. which required real-world lang.