Chp 1 : Introduction to AI (6hr) (20)

The defination of AI :

The science and engineering of making intelligent machine especrally, intelligent computer programs is called an AI.

According to father of AI John Mc Carthy
Defination :

- AI is the intelligence displayed by machines in contrast to the natural intelligence displayed by humans or other animals.

Defination :

- AI is a way of making a computer, a computer control robot or a software that think intelligently in a similar manner that human thinks.

Goals of AI :

1. To implement human intelligence in machines.
2. To create & expert systems.

Intelligence Vs Artificial Intelligence.

| Intelligence	Artificial Intelligence
1. It can be defined as a general mental ability for reasoning, problem solving and learning.	1. It is the study of design of intelligent agent, these have the ability to analyze the environments & produce actions which maximize success.
2. Content memory and thinking are used to perform action.	2. Built in instructions design by scientist are used.
3. Higher creativity.	3. less creativity
4. More biased & less operational ability (some years)	4 less biased in design decision making & more operational ability.

1

Q Trace evolution of AI.

AI definition are ~~categori~~ defined into four categories:
or views of AI fall into four categories.

1. Thinking Humanly
2. Acting Humanly
3. Thinking Rationally
4. Acting Rationally

Rationally → by reasonable or logical means.
Humanly → from a human point of views;
            (in human manner)

1. Acting Humanly (The Turing Test Approach):

According to the test a computer is deemed to have
artificial intelligence if it can mimic human resource under
special condition.
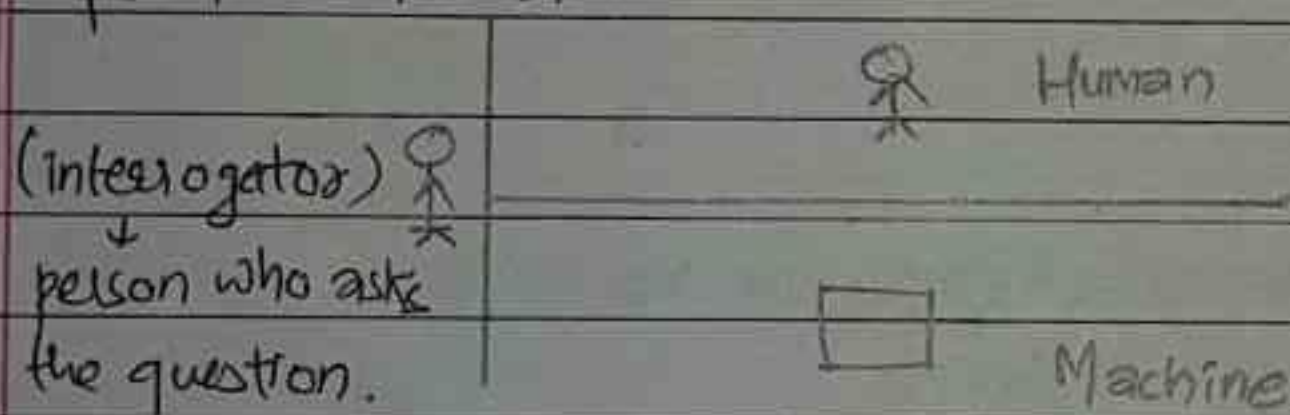
In the above scenario, there are two rows A & B, which
contains the human and machine (computer system respectively)

→ A person ask a question through test and receives answer through
test form both A and B.

→ To pass the test, the machine has to interrogator into believing
it is human.

→ The machine must contain certain abilities to pass the text.

i. NLP (Natural language Processing) must be able to communicate in
english successfully.

ii. Knowledge representation to store what it knows or hear.

iii. Automated reasoning to use the stored information to answer queries
and to draw conclusion.

2

2. **Thinking Humanly :**

→ The cognitive modeling approach makes machine with mind just like that of human.

Cognition: The action or process of acquiring knowledge and understanding through thought, experience and senses.

→ We need to understand the working of a human brain and then express it as a computer program.

→ Two ways of implementing are;

i. Predicting & testing human behaviour (cognitive science)

ii. Identification from neurological data (cognitive neuro science)

3. **Thinking Rationally :**

The laws of thought approach,

- Aristotle was one of the first to attempt to codify "right thinking."

- but He gave syllogisms that always result a correct conclusion when correct conditions are given. Example; Socrates is a man. Man is mortal.

i.e. Socrates is mortal.

This initiated the field of logic.

4. **Acting Rationally :**

(The rational agent approach)

- An agent is something that act or persive from the environment.

- Rational behaviour means doing right think.

- Rational agent is the one that acts so as to achieve the best outcome where there is a problem. In this approach the emphasis is given in correct inferences.

3

Application of AI :

1. **Gaming :** It plays important role in strategic game such as board game, chess, poker, etc. eg: AlphaGo (Board game) program developed by Google.

2. **Natural language Processing (NLP) :**
It is possible to interact with computer that understands natural language spoken by humans.

3. **Speech or Hand written recognition**
↳ digital form (convert)

4. **Intelligent robot**
   i. Aviation sector in teaching people to fix problems in aircraft.
   ii. Education sector in which intelligent robot teaches student.
   iii. Robot used in heavy industry.

5. **Vision system**
   - Doctors use expert system to identify patient.
   - Face detection app in CCTV or smart phones.
   - Making maps through photograph taken.

Advantages:
   - Reduction in error.
   - Helps in difficult exploration like oceans bed, for fuels or travel in extreme condition or carry out heavy task.
   - Helps to carry out repetative jobs.
   - It doesn't require break or replacement. refreshment.
   - Has helped us to achieve greater height in medical, education & carry out labour work.

Disadvantages:
- High cost.
- No original creativity.
- Rise in unemployment for humans.
- Can be used as a way to create weapons for mass distribution.
- No emotion attached so decision may not be that similar to human in some cases.
- A technical glitch can cause whole system to go down & years of training is failed.

AI and related fields:
1. Philosophy
2. Mathematics
3. Economic
4. Linguistic
5. Neuro Science
6. Control theory
7. Physcology.

Objective of AI :
→ Enables computer to perform intellectual task such as decision making, problem solving, perception, understanding and human communication.

Intelligent agent and its type and performance measures:

Agent : An agent is anything that can be viewed as per it's environment through sensors & acting upon that environment through actuators.
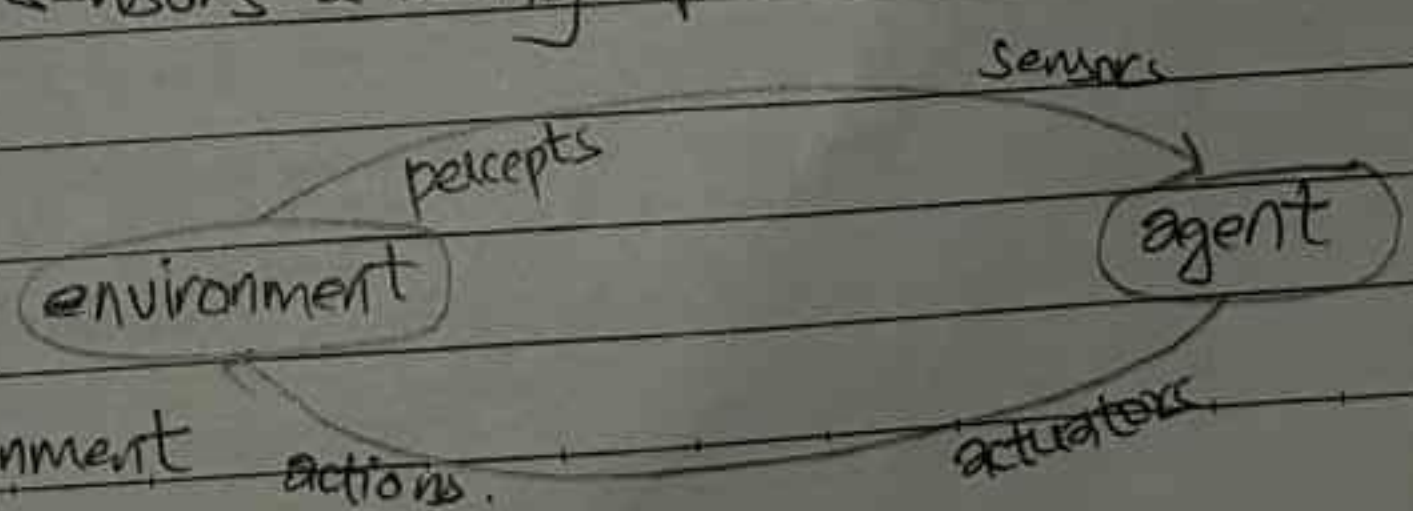
fig: Agent and environment

5

Human agent : eyes, ears as sensors & hands, legs, mouth as actuators.

Robotic agent : cameras and infrared range finders as sensors. Various motors and limbs as actuators.

Properties of agent :
1. Autonomous.
2. Interact with environment & other agent.
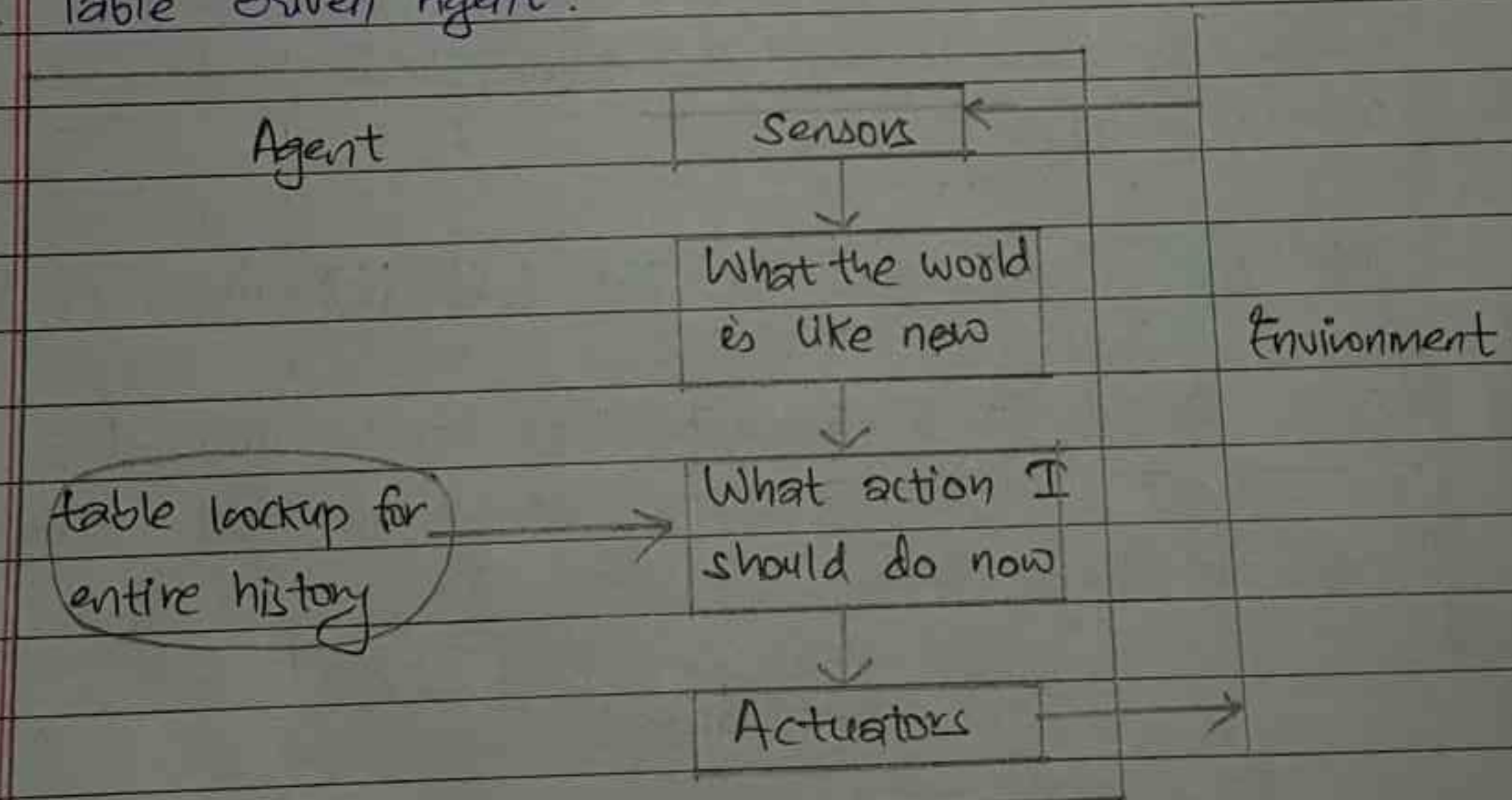3. Reactive with environment.
4. It is goal oriented.

Agent types :
- Five basic types of agents in order of increasing generality.
1. Table driven Agent.
2. Simple reflex Agent.
3. Model based reflex Agent.
4. Goal based Agent.
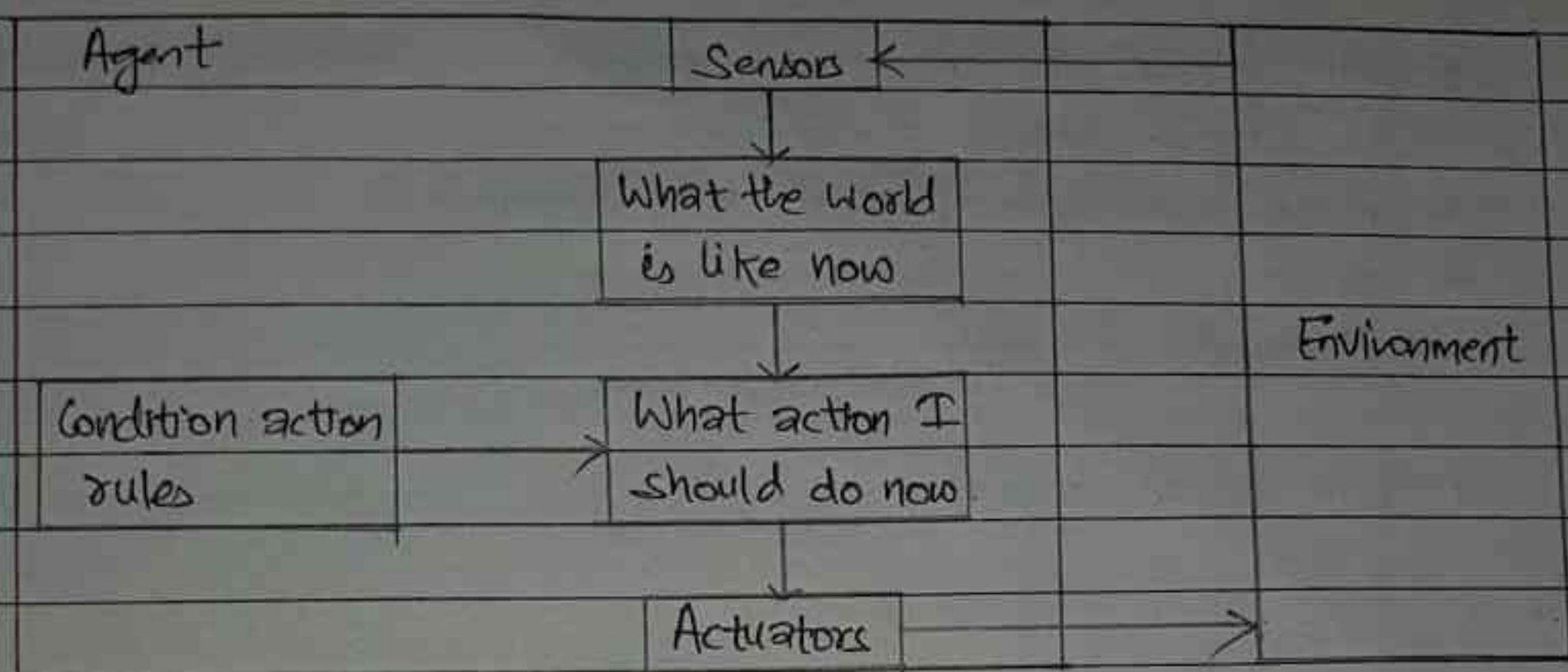5. Utility based Agent.
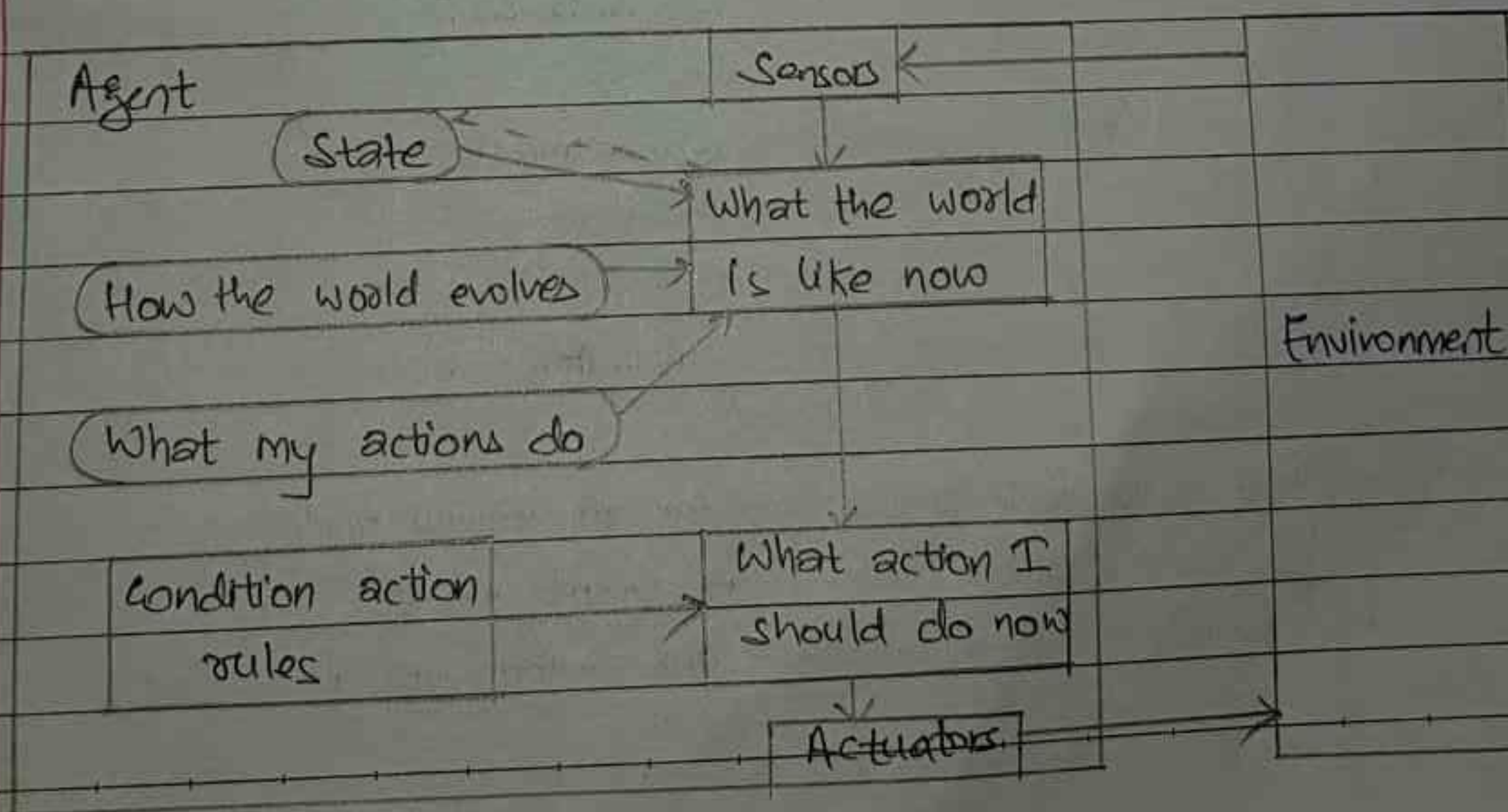
Description :
1. Table driven Agent :

Agent	Sensors	Environment
	What the world is like now	
table lookup for entire history →	What action I should do now	
	Actuators	

6

→ It is impractical
→ It is permitive type agent.

2. Simple reflex agent:

Agent		Sensors ←		
		What the world is like now		
				Environment
Condition action rules	→	What action I should do now		
		Actuators	→	

→ It is fast but too simple.
→ They choose action only based on current perception.
→ No memory is used.
→ Fails if environment is partially observable.

3. Model based reflex agent:

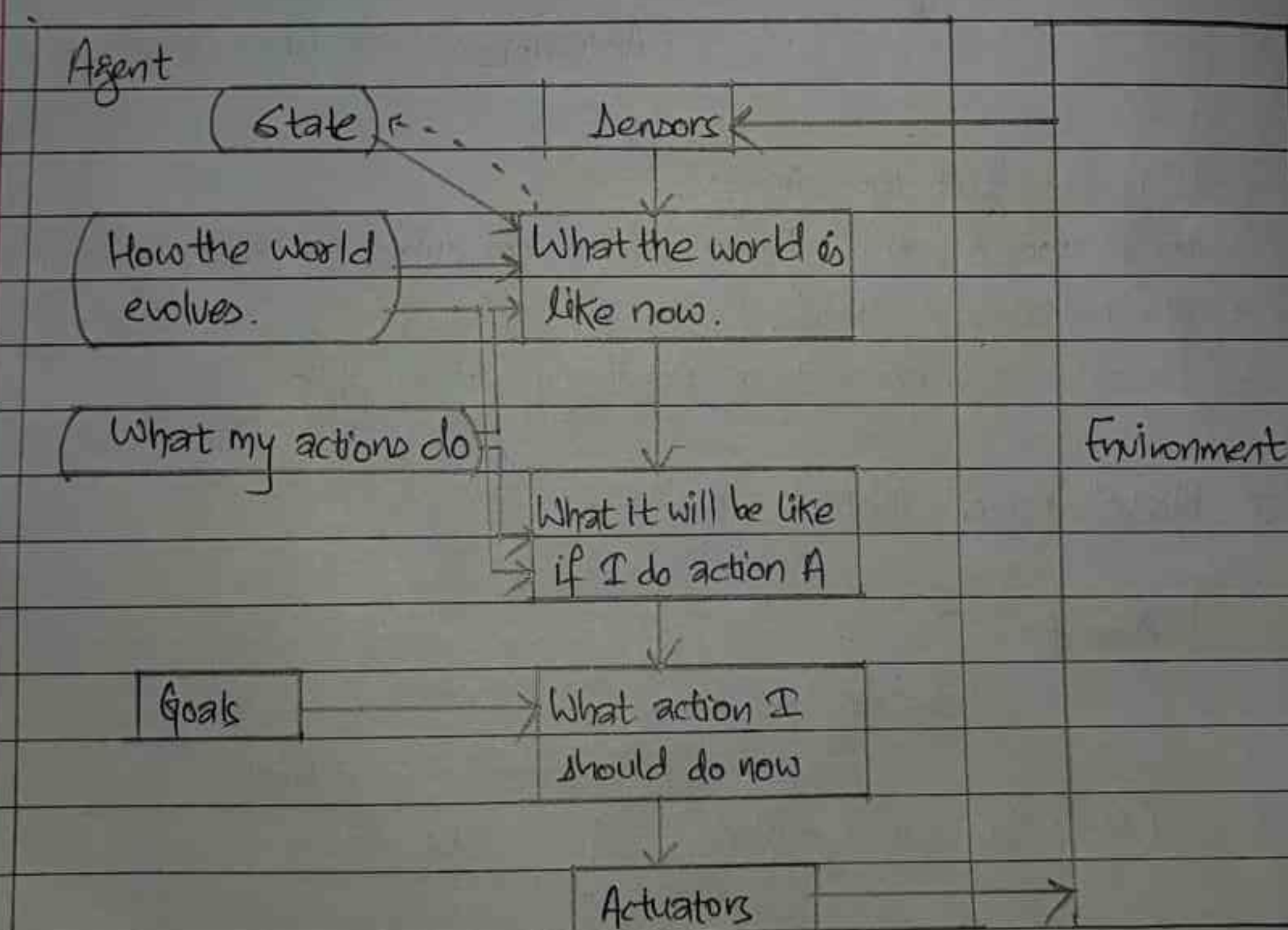| Agent		Sensors ←		
(State)		What the world is like now		
(How the world evolves)	→			Environment
(What my actions do)				
Condition action rules	→	What action I should do now		
		Actuators	→	

7

Model:

→ The knowledge about how the things happen in the world.
→ They are a model of world to choose their actions.
→ This can work even with partial information.

Q. Why model based reflex agent is prefered as compare to simplex reflex agent?

→ Model works in partial information
→ memory
→ draw fig for both.

4. **Goal based agent:**

Agent
- (State) ⟵ ... Sensors ⟵
- (How the world evolves.) → What the world is like now.
- (What my actions do) ⟶ What it will be like if I do action A
- Goals ⟶ What action I should do now
- Actuators ⟶

Environment

→ They choose their actions in order to achieve goals.
→ It is more flexible than reflex agent model.
→ It provides reason to select one action over the other.

5 Utility based agent:
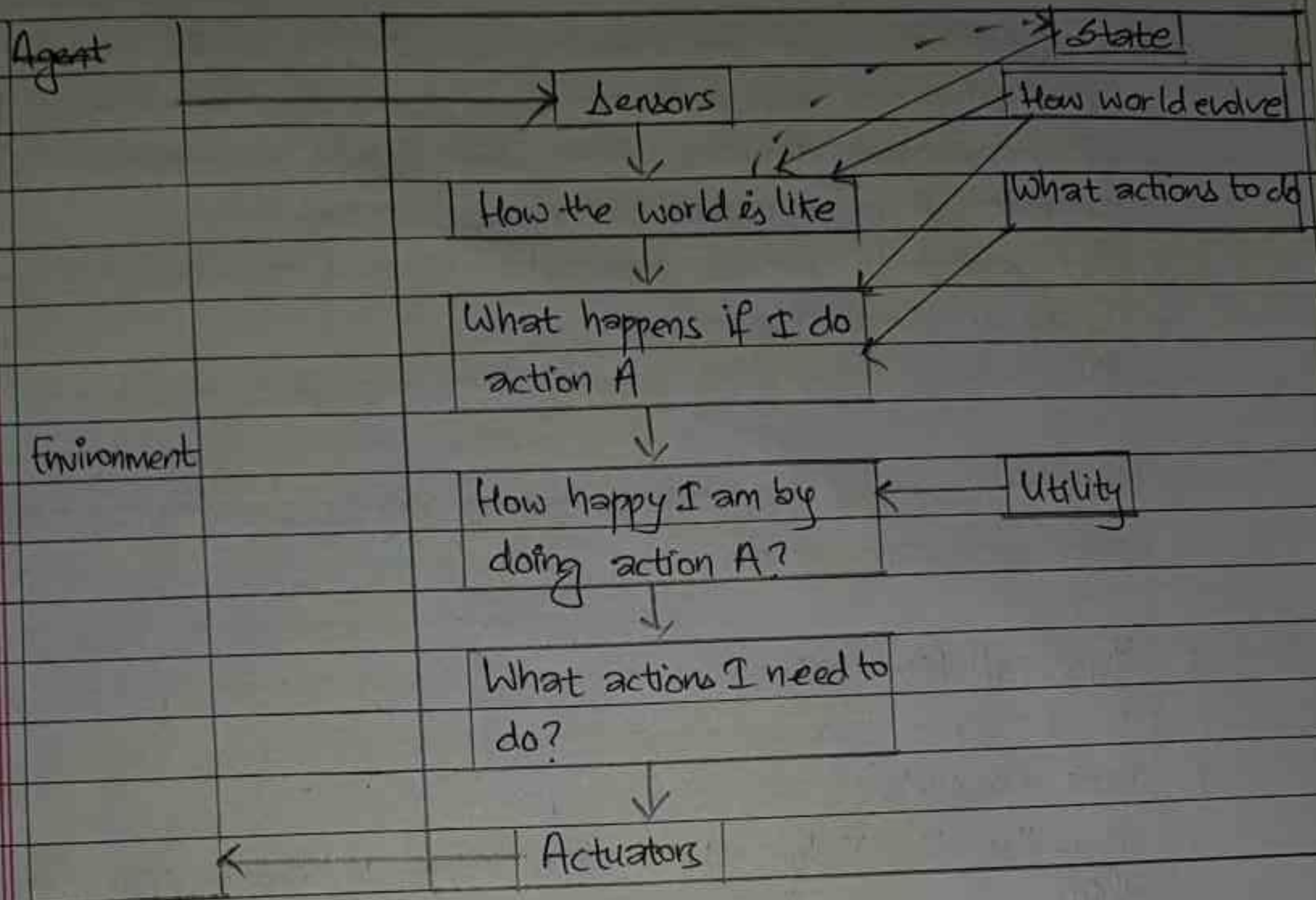
→ They choose actions based on preference utility for each steps.

→ Goals can have some difficulties of being achieved and you need to choose the goal on basis of its importance.

Q. What is your AI? Is AI a boon or a curse in the present scenario?

Q. Is your mobile an AI? Provide reasons for your answer.

Q. As a student of engineering you are asked to prepare a report on "AI its pros and cons and whether it should be implemented in Nepal or not." Write a short report on it.

Q. Machines can be made intelligent artificially but ultimately humans make machine so who is more intelligent the AI machine or human.

9

Knowledge and learning :

→ The fact or condition knowing something that is gained through familiarity and experience or association is called knowledge.

→ To solve many problems knowledge should be represented in computer. A good representation should be,

1. Rich enough to express knowledge needed to solve the problem.
2. Efficient computation.
3. Able to be acquired from people, data and past experiences.

→ Knowledge can be language, concepts, procedures, rules, ideas, abstraction and so on.

Imp # Types of knowledge :

1. **Meta Knowledge :**
   It is the knowledge about knowledge & how to gain it. them).

2. **Procedural Knowledge :**
   It is compiled or processed form of information. It is related to performance of some task. Example; sequence of step to solve problem is procedural knowledge.

3. **Declarative knowledge :**
   It is passive knowledge in form of statement or facts about real world. Example; mark report or statement of student is declarative knowledge.

4. **Heuristic Knowledge :**
   It is used to make judgement and also to simplify solution of problems. It is acquired through experience. An expert

10

uses his/her knowledge that he/she gathered due to their experience and knowledge.

5. Structural knowledge:
Describe what relationship exist between concept/object.

Learning:

→ Learning is constructing or modifying representation of what is being experienced.
→ Learning is acquiring new or modifying existing knowledge behaviour, skills, values, and may involve synthesizing different type of information.
→ Learning involves three factors;
i. Changes
ii. generalization
iii. improvement.

Machine learning:

→ It is a branch of an AI or scientific discipline concerned with design and development of algorithm that allows computer to evolve behaviours based on empirical data such as sensor data or databases.

Q. Define learning. Explain different types of Knowledge along with examples.

11

PEAS

→ To design an intelligent system we must specify its task environment. PEAS stands for performance measures, environment, actuators, sensors.

Performance Measure:

→ An objective criteria for success of an agent behaviour. example; performances measure of vaccum cleaner agent could be the amount of dirt clean up, amount of time taken, amount of electricity consumed, amount of noise generated etc. Example; Agent Bus driver's performance measure are safe, fast, legal, comfortable feel, maximize profit.

Environment: road, traffic, passenger, pedestrians.

Actuators : steering wheels, brake, accelerator, horn, signals, etc.

Sensors : speedometer, odometer, cameras, GPS

Q. Point out task of designing medical diagonsis system (respond system) according to PEAS descreiption.

→ Environment :- PM safe, make healthy patient, recovery time, minimize cost

Environment : clinic, patient, doctor, receptionist.

Actuators : keyboard (entry of symptoms, patient, feedback), voice input

Sensors : screen display (questions, descreiption, refer)

Q Point out task of designing part picking robot system according to PEAS description.

Performance measure : percentage of parts in correct way, time efficiency, power consumption.

Environment : conveyor belts, bins , product.

Actuators : robotic arm

Sensors : camera, joint angle sensors

Q What can AI system do and don't do?

Do.

→ facial recognition

→ Speech recognition

→ It can carry out different diagonis in narrow domain.

Don't

→ learn a natural language.

→ Understand natural language robustly.

→ solving interview puzzles.

→ Make moral choices.

→ Invent or be more creative.

Q. Point out the task of designing a interactive IELTS tutor agent according to PEAS description.

13