

## Modul : Intelligent Agent

P E A S

KK IF - Teknik Informatika- STEI ITB

Inteligensi Buatan  
(Artificial Intelligence)

EDUNEX ITB



# PEAS



By: Strader

Performance Measure

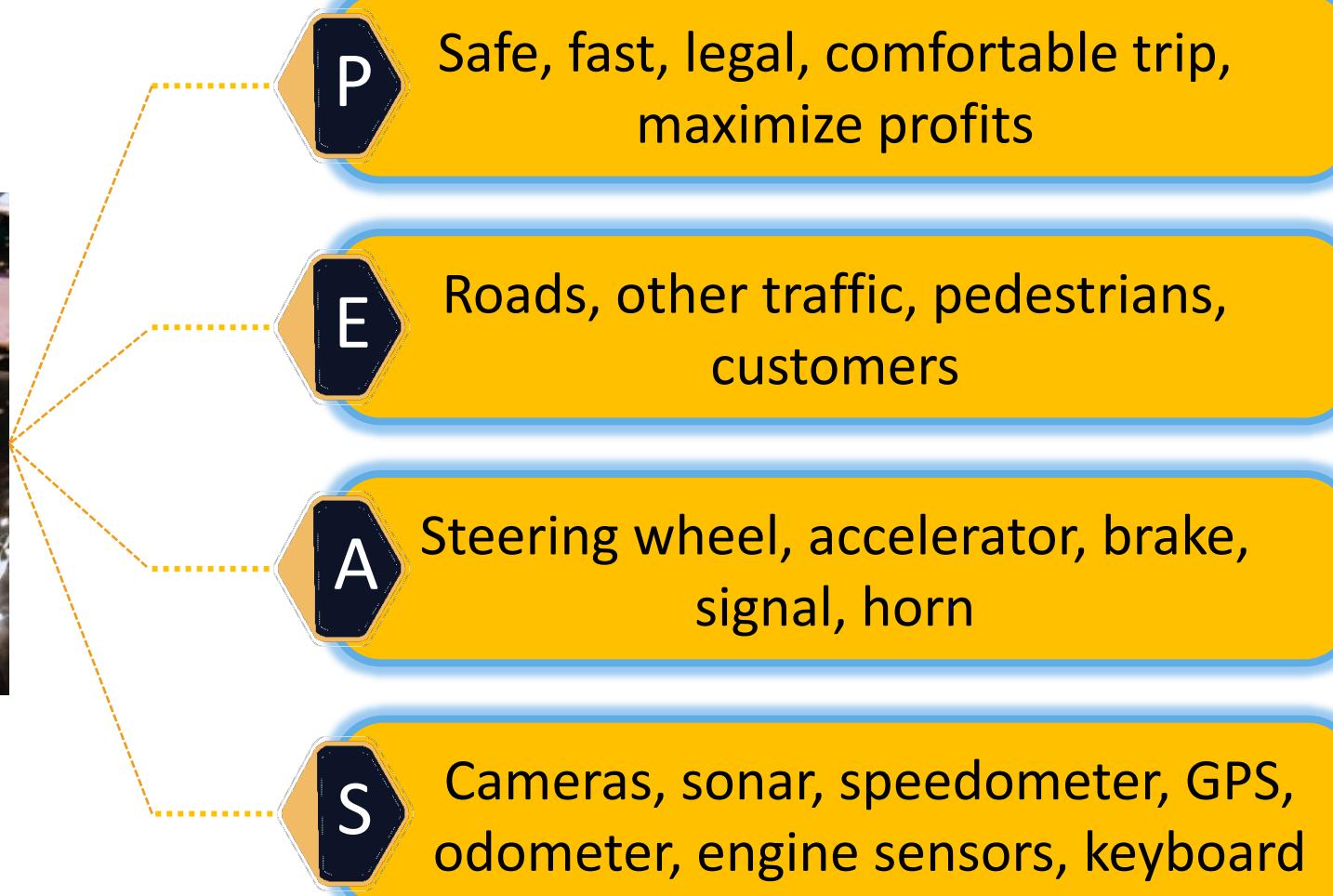
Environment

Actuators

Sensors



## Example: Designing an Automated Taxi Driver



# Example: Medical Diagnosis System Agent

Healthy patient, minimize costs,  
lawsuits



Keyboard (entry of symptoms,  
findings, patient's answers)



Patient, hospital, staff



Screen display (questions, tests,  
diagnoses, treatments, referrals)



## Modul : Intelligent Agent

### Task Environments

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# Task Environment

## Fully vs Partially Observable

fully: semua kondisi environment diketahui

partially: ada kondisi env yg tdk diketahui

## Deterministic vs Stochastic

d: aksi yg menghasilkan hal pasti

s: hasil aksi berupa probabilitas

ex: main kartu, kita gtw hexinya kartu wrong balikin apa



## Episodic vs Sequential

episodic: aksi sekarang ga mempengaruhi aksi selanjutnya

sequential: aksi srg mempengaruhi yg selanjutnya  
ex: main catur

## Static vs Dynamic

static: kondisi environmentnya ga berubah

dynamic: kondisi environment berubah selama agent nya masih

ex: autonomous driving, eh ada yg nyebang, tiba² red light

## Discrete vs Continuous

discrete: lingkungannya bisa dipisah (pastinya)

continuous: tdk bisa dipisahkan secara diskrit (lingkungannya)

cth: automated driver (lingkungan-nya beda terus)

## Single vs Multi Agent

single: lingkungan berubah hanya berdasarkan aksi

multi agent: lingkungan berubah karena ga cuma aksi tapi ada faktor luar

environment yg slvnya ga berubah tp ada pertumbuhan luar yg biken agent jd biken hal yg

EDUNEX ITBIAH

## Semidynamic



# Examples

Fully vs Partially Observable

Chess with a clock

Chess without a clock

Taxi driving

Deterministic vs Stochastic

Fully

Fully

Partially

Episodic vs Sequential

Deterministic

Deterministic

Stochastic

Static vs Dynamic

Sequential

Sequential

Sequential

Discrete vs Continuous

Semidynamic

Static

Dynamic

Single vs Multi Agent

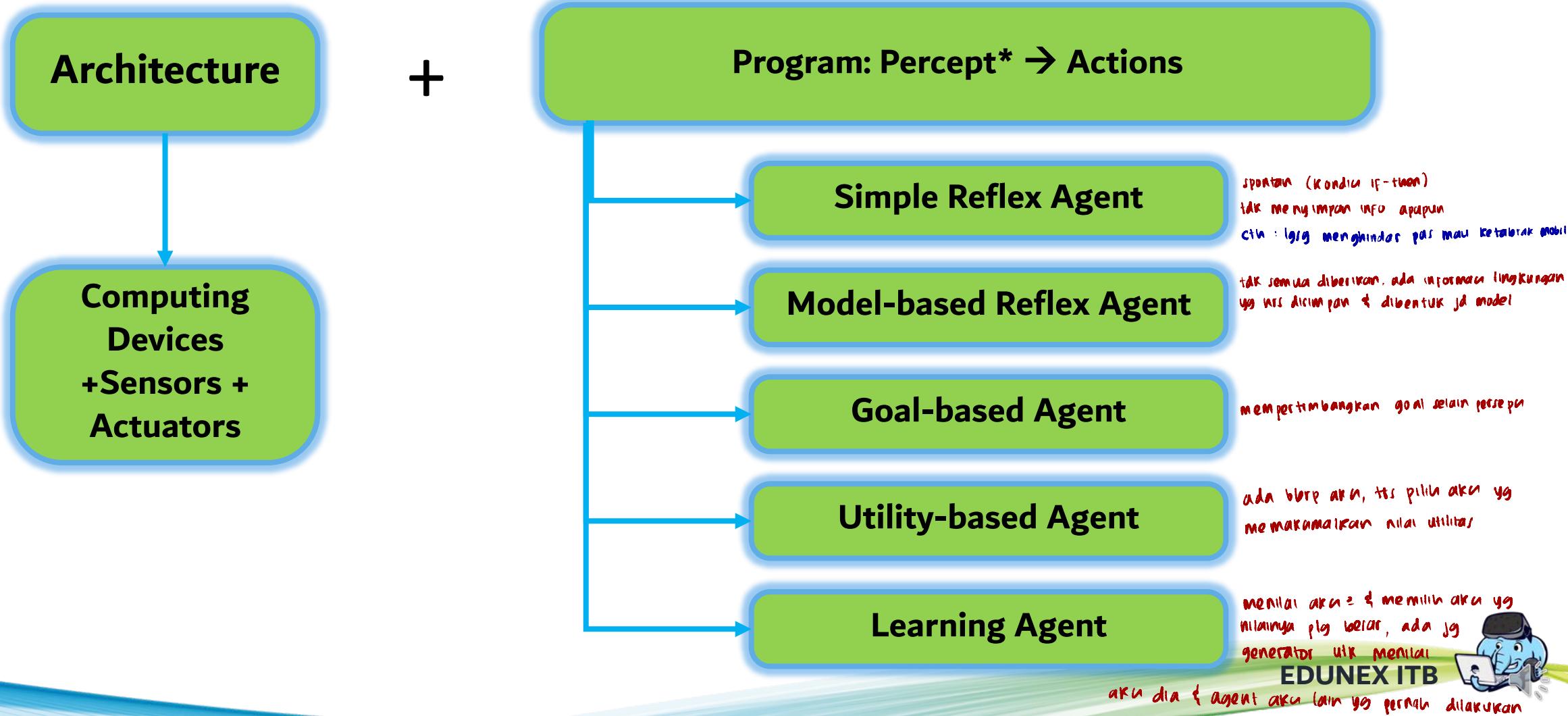
Multi Agent

Multi Agent

Multi Agent



# Agent Structure



## Modul : Intelligent Agent

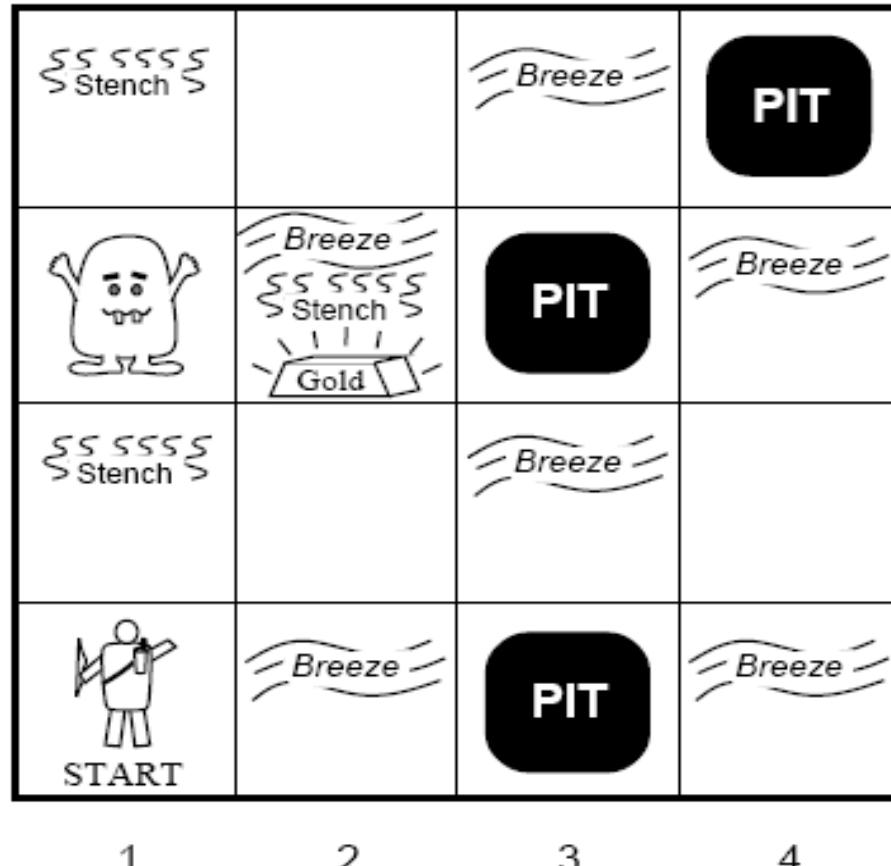
### Agent Level

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# Wumpus World



**Performance Measure:** gold +1000, death -1000, -1 per step, -10 for using the arrow

**Environment:** cave, rooms, Wumpus, gold

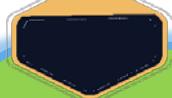
**Actuators:** motor to move Left, Right, Forward, hands to Grab, Release, and Shoot arrow

**Sensors:** sensor to capture [Stench, Breeze, Glitter, Bump, Scream]

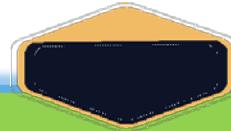


# Level 1: Problem Solving Agent

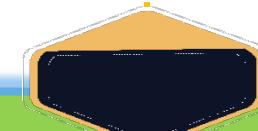
agent punya informasi state scr lengkap



Agent has information about all of the states in Wumpus World



Agent has to 'search', the path that can lead agent to the goal, as fast as possible



There are many searching algorithms, and each algorithm is suitable for certain problem

DFS, BFS, IDS, UCS  
A\*, Greedy Best First,  
Minmax search,  
Genetic Algorithm, Hill Climbing,  
Simulated Annealing,  
Etc...

			Breeze	PIT
			Breeze	PIT
			Breeze	
			Breeze	
4	Stench			
3	Wumpus	Breeze	Stench	PIT
2			Gold	Breeze
1	Stench			
			Breeze	
			Breeze	
	START			
	1	2	3	4



## Level 2: Knowledge Based Agent

Agent doesn't have information about all of the states in Wumpus World. It only has 'basic knowledge/ premises'

When agent percept a state in a room, it will try to reason new facts/ states, this is how agent will step by step collecting all of the states of wumpus world in order to achieve its goal

yg diberikan ke agent hanya knowledge saja

agent gapunya info state lengkap.

Jadi trp ada state baru dia hr

MIRIP based on hal yg udh diketahui

Reasoning has to be done by Agent → by deducting the premises with percepted fact.

SS Stench		Breeze	PIT
Wumpus	Breeze	PIT	Breeze
SS Stench	SS Stench Gold		Breeze
SS Stench		Breeze	
START	Breeze	PIT	Breeze
1	2	3	4

contoh : If ada locu, maka ada wumpus

ini ya wumpus



## Level 3: Learning Agent

↓  
bodoh  
di awal,  
pintar di  
akhir

Agent doesn't have the information of all of the states and doesn't even have the basic knowledge of the wumpus world

Agent plays several times (perhaps dies several times) →  
The **observation data** from playing several times is the 'input' for learning process

The result of the learning process, agent will have basic knowledge, e.g. Squares adjacent to pit are breezy

		Breeze	PIT
4 Stench			
3 Wumpus	Breeze	PIT	Breeze
2 Stench			
1 START	Breeze	PIT	Breeze
1	2	3	4

There are many learning algorithms, that suitable for certain purposes, and the 'availability' of the data/ feedback

- Supervised learning
- Unsupervised learning
- Reinforcement learning



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**THANK YOU**

Kuis 1 2020/2021

- Definisi AI pada Bellman 1978 yang menyatakan bahwa AI : "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning..." merupakan definisi AI dengan pendekatan ...

thinking humanly



- Definisi AI pada Rich & Knight 1991 yang menyatakan bahwa AI : "The study of how to make computers do things at which, at the moment, people are better." merupakan definisi AI dengan pendekatan ...

acting humanly

No Kalimat

Benar/Salah Alasan (Nilai 2)  
(Nilai 1)

- a Sebuah aplikasi chatbot harus dapat berpikir seperti manusia agar lolos Turing Test : salah → acting humanly
- b Persoalan teka-teki logik yang diselesaikan dengan memanfaatkan algoritma Backtracking Search, merupakan contoh aplikasi berbasis AI dengan pendekatan thinking rationally. → Logika (law of thoughts) : salah, dia acting rationally
- c Bahasan Intelligent Agent dalam kuliah ini adalah agen yang bisa bersifat rational, artinya agen yang bekerja pada lingkungan tugas dengan properti 'partially observable' tidak akan bisa bersifat rational.  
↳ tetap bisa bersifat rational

Terdapat sebuah intelligent agent yang dibangun sebagai aplikasi web untuk membantu pembuktian suatu teorema matematika, dengan langkah sesedikit mungkin dan waktu secepat mungkin. Pembuktian ini memanfaatkan kaidah-kaidah inferensi yang sudah terdefinisi dalam domain matematika. Tentukan lingkungan tugas (task environment) PEAS dan 6 properti lingkungan tugas dari agen tersebut, dengan mengisi tabel berikut ini. Jawaban disertai alasan dengan singkat.

p : Ketepatan, cepat, langkah  
performance measure

E : orang (dia yg masukin teorema), web, kaidah<sup>2</sup> inferensinya  
environment

A : layar, modul yg menerapkan kaidah inferensinya untuk  
membuktikan teorema math

actuator  
S : Keyboard  
sensor

semi-dynamic karena  
harus secepat  
mungkin

fully (di soal ah kelatihan cemua,  
kaidah2 jd dh tau)

deterministic (hasilnya udh pasti)

sequential ( bisa pacui kaidah1 jd lalu nya)

static (pasi agent ntar, lingkungannya  
tidak berubah)

discrete (lingkungan bs dipisah, hasilnya  
julog . pasi diaplikasikan  
ndh pasti hasilnya)

single

- Lingkungan Jawaban dengan alasan singkat
- Tugas
- P Pemilihan dan penerapan kaidah tepat, waktunya secepat mungkin dengan langkah sesedikit mungkin
- E Web, orang yang akan membuktikan teorema, kaidah
- A Modul inferensi yang dilengkapi dengan kaidah-kaidah, display untuk state antara dan hasil
- S Keyboard atau touch screen, bergantung asumsi device yang digunakan.