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Plats: 10

KTH

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TENTAMEN

ID2209 ht2014 4.5 hp - TEN1 - AF

Distribuerad ai och intelligenta agenter/Distributed Artific

torsdag 2015-01-15

kl 09:00-13:00

Poäng	Betyg

Mark answered questions with 'X'													Number of Sheets
1	2	3	4	5	6	7	8	9	10	11	12		
X	X	X	X	X	X	X	X					All	31
													: Poäng

Vakt kontrollerat antal blad: 12 30

OBS: Denna sida måste ligga överst - This page should be placed in front

Före inlämning av tentamen: Avlägsna tomma blad

Empty sheets should be removed before handing in the Exam

Name	Ia	IIa	IIb	IIc	IIIa	IIIb	IIIc	IVa	IVb	IVc	IVd	IVe	Va	Vb	Vc	VIa	VIb	VIc	VIIa	VIIIa	Exam	BonHW	BonPr	Total	Grade
Din Zainab	6	4	5	3	3	4	5	4	6	4	5	3	5	4	4	1	3	5	3	3	80	5	5	90	A

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1-9

Traffic signals along with their controls can realt like agents the communicate and coordinate to control traffic at different time of day, so that as mutually smooth traffic would be following through out the city.

This structure can be divided into many agents that are acting on different task towards a common goal.

There are some weak notain properties of an agent and some strong. [2]

The weak notation are the properties that all agents should fulfill as agents well developed to be show autonoms behaviore.

The properties are as follows.

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We assume there is an agent that controls the time intervals of a signal. and all lights have their own.

(1) Autonomy:- A property of an agent that he can control his action. A traffic signal on a particular road can decide ~~weather~~ its own time intervals for signal on and off. And can decide weather to ~~change~~ manage its interval time to change on the request of other traffic signal agent.

(2) Pro active:- the property to achive a goal

The traffic signal time interval control can change its time intervals of traffic flows depending of the day and time of day (short signales on office start and end times)

(3) Reactive:- The property to decide beyond goals. On a ~~holi~~ holiday the time interval agent can adjust the traffic apart from daily notimes.

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1-a

Social: traffic lights have spearil agents that can communicate with other light signals and the controll towel. The ability to commicate.

There are some strong properties an agent should posses.

(5) Verocity:- The ability of thruthness. The interval agent will always give true information about the intervals scheduled.

(6) Benevolce:- The ability to not preform some thing that is with conflicts and obsta-cles goals. The controll agent will always manage the traffic control and will not create a disaster situation.

(7) Mobility:- If needed controll tower can send agents from one signal to another.

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(8) Mentalistic, like belife and desire

The agent belives that he knows the information about day, time, traffic flow

reasoning

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2. a. The two prespective of study knowledge is indivinal and group.

→ an indivined knowledge is that I know what I know. but it is not nessacrialy known to all the agents in the enviorment

→ a group prespective is that I know that all I know that it is known by all the agents and they know what I know and they know what the know. So, its a common knowledge.

For enample:-

In wise men problem only the king knows that what color hat are the wise men wearing. This is an enample of individual knowledge.

and the knowledge that there are 2 white hats and 3 red hats is a group knowledge known by all wise men and the king.

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2-b what are axiom of the logic.

① K axiom :- $\Box KA \rightarrow (\Box K \wedge \Box A)$

T axiom :-

$K_1 A \rightarrow A$

what is known is true

D axiom :-

$K_1 A \rightarrow \neg K_1 \neg A$

It is known

what is not known

4- axiom :- If I know what is known then I know that i know it the positive interopertion)

$K_1 K_2 A \rightarrow K_1 A \wedge K_2 A$

5- axiom If I dnt know what is not known then I know what is not known (the negative interopertion)

$\neg K_1 K_2 A \rightarrow \neg K_1 A \wedge \neg K_2 A$

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The axiom SD45 are said to be logic of belife

The axiom STD45 are said to be logic of knowledge.

The T axiom is not valid in knowledge of belife.

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2-c

Here "agent doesn't know weather p" = "$\Diamond p$ & $\Diamond \neg p$"

In logic of knowledge

$K_1 A$ means Agent 1 knows

and

$\neg K_1 A$ means Agent 1 doesnot know

So, Here my assumption is

that K means I

N means neighbour

So,

$\neg K(\Diamond Kp \,\&\, \Diamond \neg Kp) \wedge \neg K(\Diamond Knp \,\&\, \Diamond \neg Knp)$

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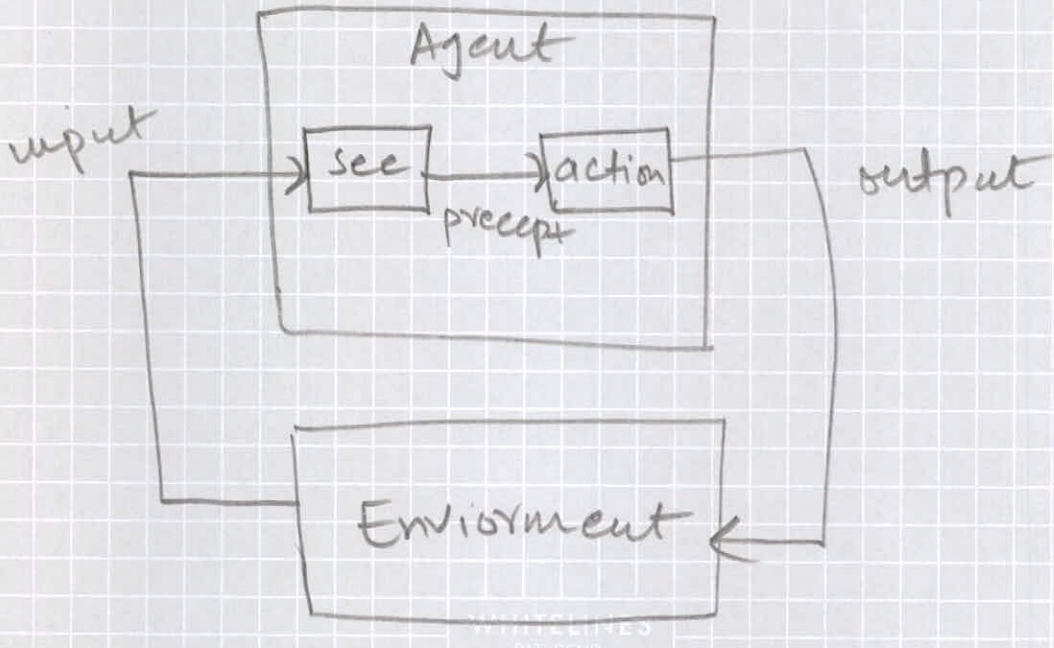
3-a

The purpose of 'see' function into an abstract agent architecture is to observe the enviorment of the agent. This can be a sensor that observees the enviorment such as a lense or camera, a sensor like an optical reader that reads the ink on a paper.

→ The see function observes (view) the envior-ment that the agent is developed for and then generates a precept that is an input to the action function to preform the output requried.



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3-b Subsumption architecture is a hireachy of tasks.

The action function select set of reactive tasks, filter them in hireachy from low to high. and fires all actions one by one. The input to this action function is precept

action (p: D) : a

for here

$c_1 < c_2$ means c_1 is less in hireachy from c_2

R is set of reactive tasks.

```
action ( p: D) a
for
  if ( c1a < c2a ∈ R)
then
  fired (      )

return  a
```

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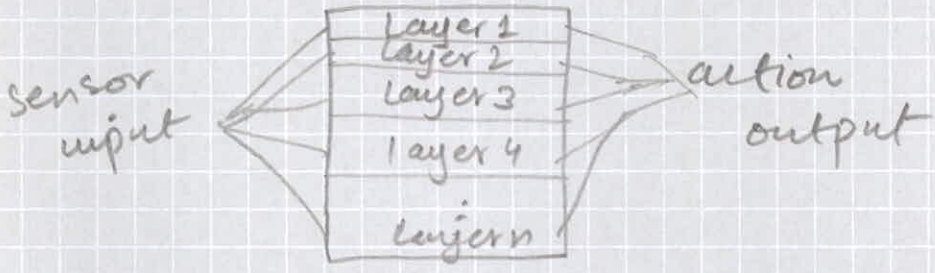
3-c There are two types of layered hybird architecture

① Horizontally layered :-

In this architecture the layers are directly connected the sensor input and action output.



→ The advantage of this layering system is that as each layer has its own input and out they can behave as an individual agents and can preform different actions and task for the enviorment at the same time.

→ The disadvantage is that in some stituations the agent may not be coherent as they preform different tasks at the same time.

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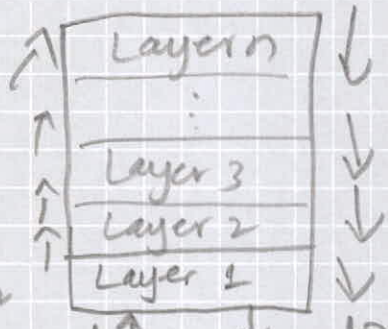
(2) Vertically Layered

In this architecture the layers have at ~~least~~ one layer for sensor input and one for output action and the control flows vertically.

~~There~~ They are 2 two types.

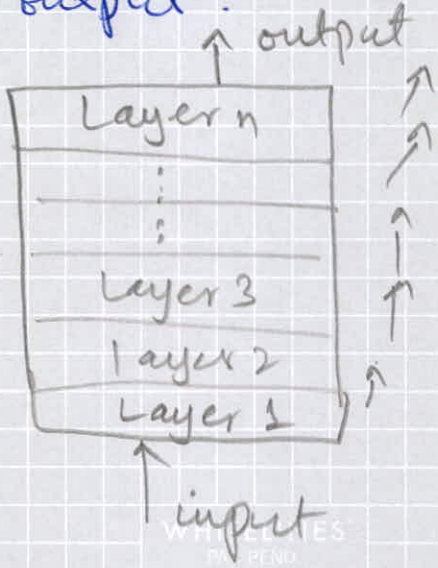
(a) One way

In which only one layer is responsible for input and output



(b) two way

In which one layer is for sensor input and one for output.



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The advantage of this layering is the the control of flow is equally divided among all layers but at the same time these layers are ~~as~~ this architecture is not fault tolarent, if one layer fails all can fail.

uniliteraly

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4-a.-

Pareto efficiency is a property of negotiation in which an agent cannot maximize it utility ~~unilitera~~ uniliteraly with decreasing others agents..

→ Once the sum of payoffs is calculated one agents utility cannot be increased with out decreasing others.
for example x is utility for agent 1 and x' is utility of agent 2.

and $x + x' = y$

the if we add 1 to x then we have to minus 1 form x' to keep 'y' same

$$(x+1) + (x'-1) = y$$

In payoff matrix which cell holds this quality that is pareto optimal.

→ social welfare solutions are where the social choice of votes is beign tried to maximize.

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→ pareto efficient solutions are subset of social welfare solutions.

→ In a payoff matrix a maximum social welfare solution is the one with greatest sum of ~~utilit~~ ~~utiliti~~ utilities. and that is also pareto optimal.

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4-b:-

1 Conflictdeal:- The middle point E is conflict deal for both agents.

Conflict

Conflict deal is when negotiation results in negative (means no negotiation occured)

2 Negotiation set:- Set of all legal negotiations that can be happend.

the area BEC is circle is possible negotiation set. including the inner part and the edge.

3 Pareto optimal:- The edge of the area BEC are the negotiations that are pareto optimal. (No agent can uniliterary change the payoff).

4 Individually rational:- The inner part of the area is individualy rational. There the agents can uniliterary change their strategies.

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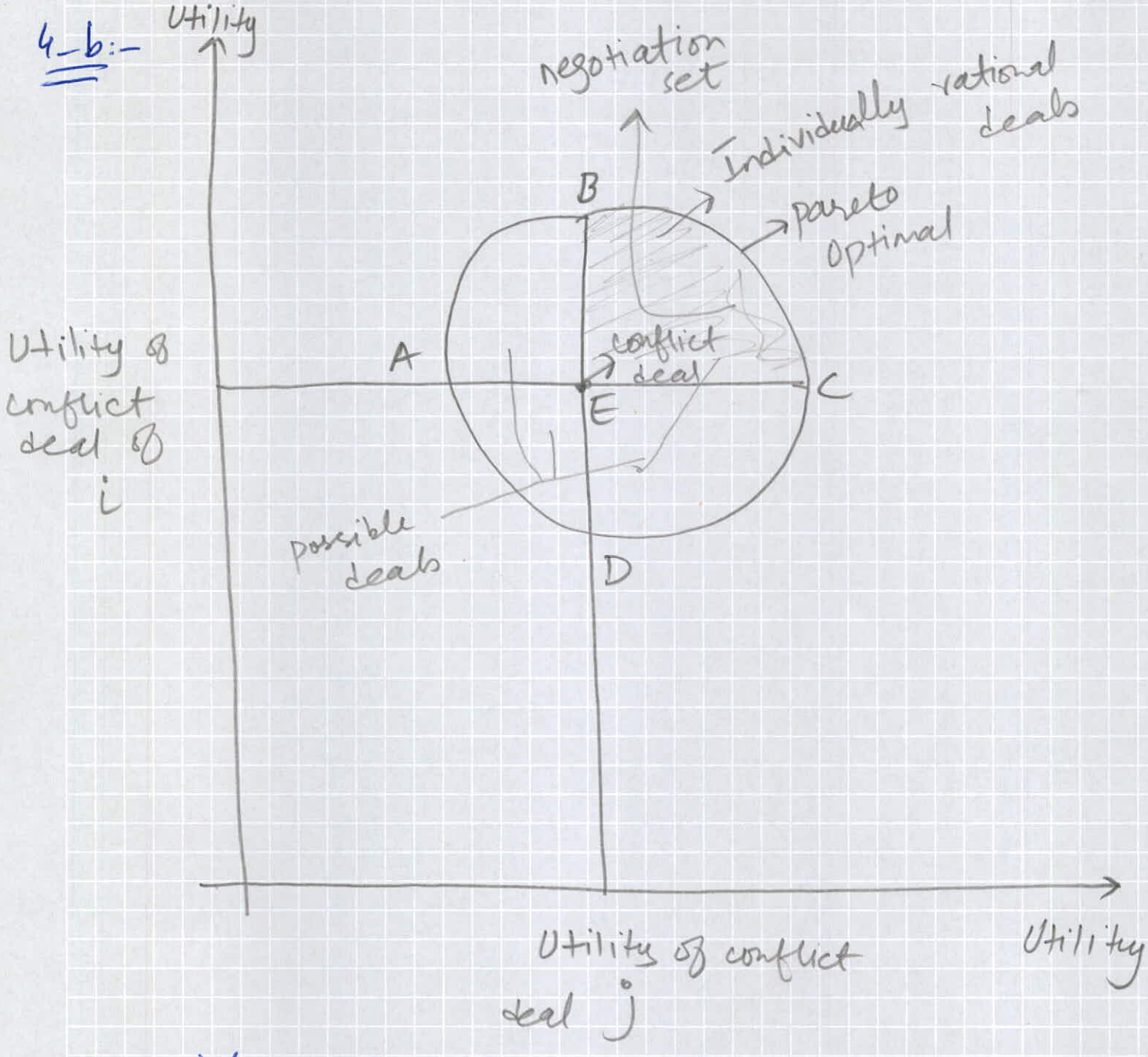
4-b:-



5 Possible deals:-

the whole circle ABCD is set of possible deals that agents can make.

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4-c

↳ Borda protocol is computationally more efficient. as in binary protocol we have a pair wise comparision of alternative in pairs, this pair wise computation is not as optimal. In borda protocal rank we use assigning of values to alternatives as they are prefers and then the getting a sum of all values is less computatinal. The alternati-ve with highest sum value wins.

~~So/Borda~~

↳ Both of these protocols are not independa from irrelevant alternatives.

* in borda protocol adding a new alternative or deleting an old one can totally change the result.

* in binary protocol also adding an irrelevant ~~add~~ alternative ~~the~~ can change the ~~agenda~~ agenda of prefrences.

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4-d :- Clark Tax algorithm :- The main objective was to maximize social welfare.

→ The objective of clark tax algorithm is to avoid lies and cheatings during a negotiation by an agent that have an high influnce on the outcome of that voting and effecting social prefrence.

→ It is achived by enforcing high tax to the agent whoes change in prefrence or (utility) payoff impacts the result.

→ So, there is no good gain in lieing if you have to pay a higher tax value.

→ This ensures agents to give thier thrutful bid (prefrences) payoffs.

forexample:- In bidding for memory usage the prefrence of CS departmat is 64 Gb and, EME and ES depaltmnt is 16 mb. So the socially acceptable prefrence is 16, but if CS dept changes its payoff to maximize the sum of the payoffs it would be charged with high tax and that is no use of it.

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4-e :- → here C: Coop
D: Defect

(a) Social welfare : $(D,D) = 4$, $(D,C) = 5$, $(C,D) = 5$ $(C,C) = 6$

The cell (C, C) correspond to social welfare as it has the greatest payoff sum. that is $3+3 = 6$.

(b) Pareto optimal

All the cells in this pay off matrix ~~is~~ statisfy the pareto optimal condition.
as you cannot increase one agents pay off with out ~~keeping~~ decreasing others to keep the sum same.

for example

in $(D,D) \Rightarrow (2, 2) = 4$

if $(2+1, 2-1) = 4$

$(3, 1) = 4$.

So, all the cells hold this value.

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~~Nash~~

c) Nash equilibrium.

The cell (D,D) hold the nash equi-
- librium property.

as Defect is the best strategy available ~~in response~~ that an agent can play in response to other agents Defect strategy.

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5-9.- Yes, same propositional content of the ACL message can be used to present different speech acts.

For example

The content The door is closed can be enpressed as

Speech act

(1) Inquive — Is the door closed?

(2) Informative — The door is closed.

(3) Assertive/ Order — Close the door.

(4) Commisive — He made me to close door.

(5) prohabative — Donot close the door.

So, there are many more examples that statisfies this condition.

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5-b

(1) h believes (s believes (s want α))

→ post condition.

S ~~you~~ want to make h belive the s belives it ~~can do~~ wants α to be done.

(2) S believes (h believes (h can do α)

→ pre condition

when you belife he belive that something can be done

(3) S belives (S want α)

→ pre condition

to want it you should belive it

(4) S belives (h can do α)

→ pre condition

To want some one to do it you should belife it.

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5-c,-

KQML and FIPA are ACL language developed for communication in a MAS. The work as an outer envelop for the message to be send, that describe the sender, reciepnt language used in the message, protocal, and ontology.

→ These Languages donot interpreter the content of the message rather just the outer envelop.

→ The Basic difference between them is the number of performative verbs the provide In FIPA this number is greater then KQML.

→ For the interpreutence of the message content the need other languges like KIF.

→ They are quite similar in the structure.

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a) Organizational structure are.

① Explicit Analysis and planning

② Multi agent planning

③ Meta level information exchange

④ partial and global planning

⇒) The advantages and disadvantages are

① Explicit analysis and planning,
advantage syncronization, standarization
provides high coordinat
disadvantage computationally inefficient

② Multiagent Planing
disadvantage not coherent
advantage a bigger prespective of system is understood.

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(3) Meta Level:-

→ control level information exchange so it is changed frequently.

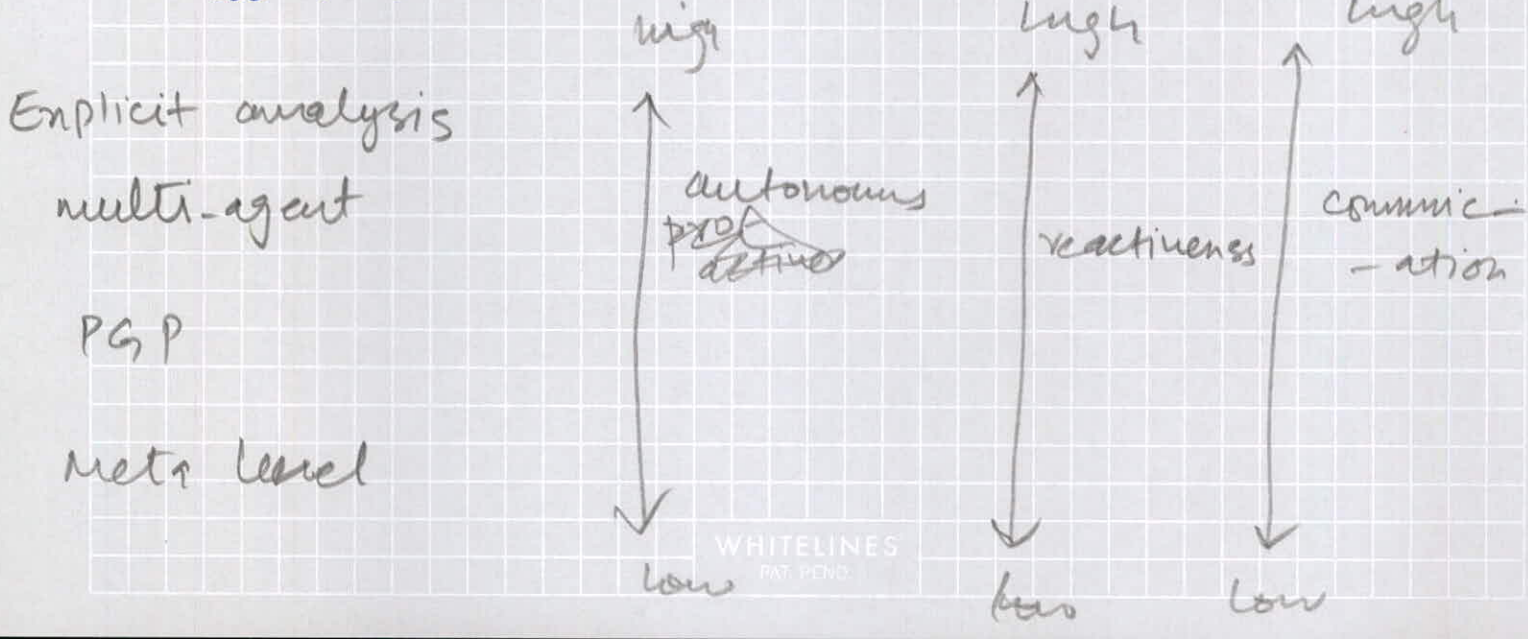
→ on a particular action agents all well coordinated.

(4) PGP:-

a partial plan for global goal is available, so all agents can sub plan tasks to achive a global goal.

but

agents are not free to set their interaction set.



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6-b

The main difference between meta-level exchange and multiagent is that

→ meta level exchange just exchange the control level information, that can be changed as the agent changes its action plan. Whole set of actions and interactions is not exchanged. So, the coordination is done just for a particular time and is changable.

→ In multi agent planing system the coordination is done by exchanging all the action plans and interaction set with centeralized or distributed controll. So all the agents have the plans of other agents and they can coordinate well.

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6-c

→ norms are pattern of bellaviour that are expected. If you donot follow ~~that~~ them there is no penalty on it like for enample

→ To respect a queue on the bus stop if you donot follow this you will not be punished, but people will think bad about this

Same applies to the agents, norms are such rules of coordination that the agent should follow in order to establish a good coordination, certain actions that are not ~~forbidd~~ forbidden but should be avoided by the agents.

→ Social law are strict actions that you must follow as it is controlled by authority, like traffic rules.

→ In agent system there are certain actions that are forbidden and ~~cannot be~~ pre must not be preformed by the agents. these rules are embeded to enforce syncronization in coordination and avoid bottle necks. All the agents coordinating

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in a particular problem all forced to follow these rules by giving a set of action α that are ~~for~~ forbidden.

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7-9 :=

→ In MAS architecture that use middle agents, the control is not centeralized. The middle agents are use to locate other services and agents and then the agents can directly communicate to the them. So, the control of commication is distributed among the agents, and middle agents just provide path (for how) to connect.

→ In MAS architecture that use market based, the control is centeralized via the malketing agent that establish the connection, So, you have a centeralized Controller that controls all the communication.

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8-9 Mobile agents are appropriate to use when you try to communicate between two resources that all placed remotely for example:-

→ Mobile agents are use instead of RPC (Remote procdure calls)

for example

① If a client connected to a network wants to access a file that is placed on server, if we use typical RPC then the procdure of client that sends the request will be blocked until the reply is received and so is the bandwidth of the network that it accesses in waiting. if we use mobile agents they directly migrate to the receipient preform the action and come back with a reply, The client producer is neither blocked nor the network bandwidth is preserved.

→ It is also approiate to use mobile agents when a remote resource is connected to network like a PDA or personal PC.