MULTI-AGENT INTERACTION IN SOFTWARE PROJECTS A SYSTEM DYNAMIC APPROACH

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Abstract: Software development is intellectual skill intensive group activity. Since the software project environment is characterized by accumulation and distribution of knowledge for decision making , it is not sufficient to treat the software development personnel merely as an intellectually skilled person. He/ she is, in fact, an autonomous intelligent agent acting in a multi-agent environment. In this article the authors outline the system dynamics equivalent of architecture of an autonomous intelligent and interaction of an agent with another agent. The authors also outline certain styles of cooperation and non-cooperation emerging out of certain basic preconditions for them.

Key words and phrases: Multi-agent interaction , software development, cooperation, non-cooperation.

INTRODUCTION: Software development is a process. Personnel with skill reasoning and decision making ability work in a group to attain a common goal, thus, constituting a multi-agent environment. When an autonomous agent is introduced in multi-agent environment he/she brings with him/her an agent space characterized by perception , skill , reasoning capability , and decision making capability
(Demazeau, Y. & Muller, J.P., 1990). These agent spaces interact through their; Perceiving capabilities (Steels, L.; 1990), Reasoning capabilities (Martial, F.V., 1990) and Decision making capability (Castelfranchi, C.; Campbell, J.A. & D' Inverno, M.P.; 1990).

When agents interact with each other through their perceiving-, reasoning- and decision making- capability, cooperative and non-cooperative aspects come to the fore, for , they are the property of interaction (Rai, V.K., Bandyopadhyay, S. & Basu, A.; 1996). Demazeau, Y. & Muller, J.P. (1990), present several kind of agent behavior based on the following criteria.

1) The locality of the task to be performed by the agent: Personal(local) or interpersonal (global).

2) **The capability of the agent to perform the task alone:** able or unable.

According to these criteria there are naturally four ways to describe how to take into account the other agents evolving in the same world.

Cohabitation: The agent has to successfully accomplish a task and it is able to execute it alone.

Cooperation: In order to perform a personal task , an agent will have to cooperate with others either because it is not able to accomplish it alone or because others can accomplish it more efficiently.

Collaboration: Some global goals may concern all agents and may be realized individually by several agents. The main problem deals with electing one of the agents to carry out the task.

Distribution: Finally, some global goals can be achieved only by several agents collectively. The main problem deals with splitting the global task and distributing it to the cooperative agents.

In carrying out these modes of behavior following are exchanged among agents.

i) Knowledge ii) Possible solution iii) Choice

These criteria and subsequent mode of behavior thereof has been discussed in the paradigm where intelligent agent is a machine/ expert system . While dealing with human agents, authors believe, another set of criteria , involving cognition , be taken. Our presentation of several kinds of agents behavior is based on the following two criteria.

Capability of the agents: Whether the agent is capable or not capable.

Willingness of the agent: Whether the agent is willing or not willing.

And ,therefore, cooperative and non-cooperative aspects both come to the fore in multi-agent interaction given the fact that an agent may or may not be capable and may or may not be willing to act or cooperate. Some of the most frequently occurring non-cooperative styles are:

i) Conflicts ii) Lack of capability iii) Lack of Interest iv) Deception v) Lack of ; communication and Knowledge & Information sharing.

It should be noted that while no one disputes the desirability of cooperation, non-cooperation insinuates to the deeper malaise in the system which must be addressed in order to create preconditions for cooperation. Also, non-cooperation is some times desirable for the robustness of the system (Galliers, J.R., 1990).

In the light of the above, we propose the following in the form of figures / illustrations.

I) Cooperation / Non-cooperation as a joint function of capability and willingness of an agent.

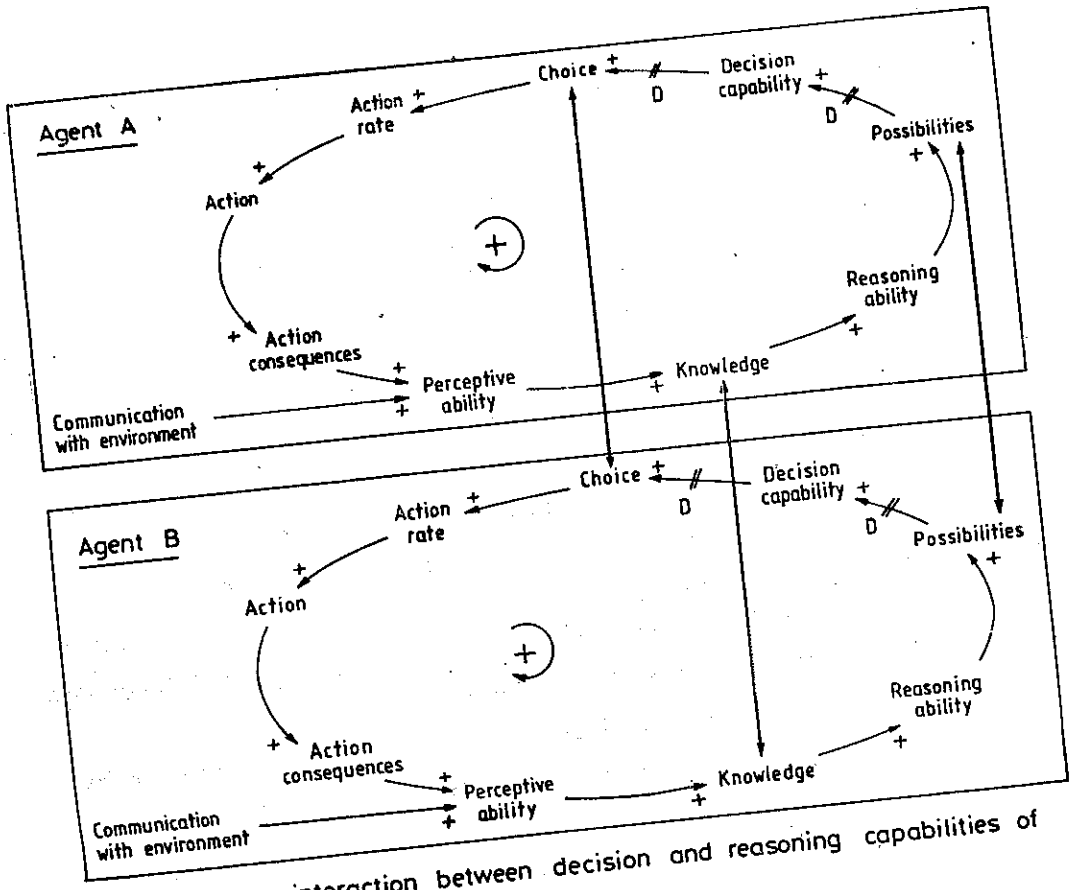

Fig. 2 Strong interaction between decision and reasoning capabilities of Agent A and Agent B.

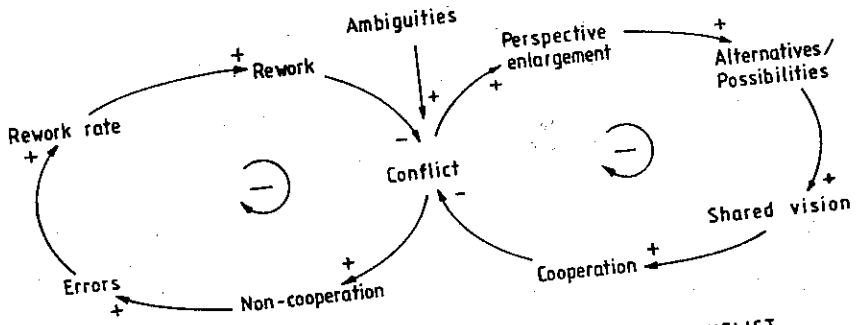

Fig. 3 Negative and Positive role of conflicts.

II) The architecture of an intelligent agent as envisaged by a causal loop and its interaction with other intelligent agent.

III) Positive and negative role of non-cooperation, specifically, conflicts.

REFERENCES

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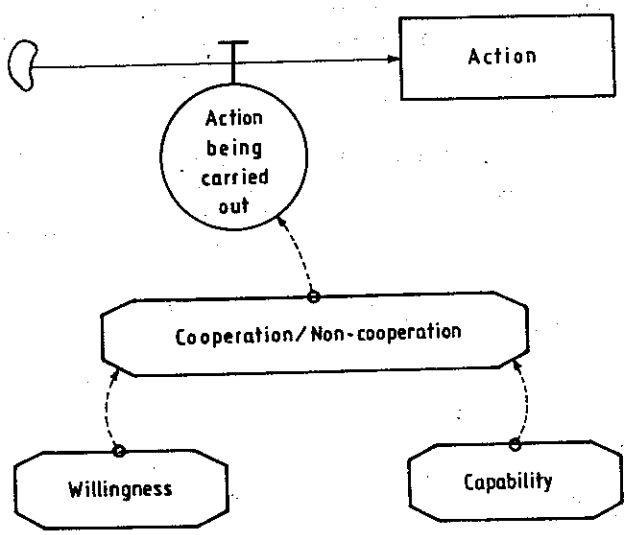

Fig. 1 Action as a joint function of capability and willingness of an agent.