

EMERGENCE OF SPONTANEOUS PROTO-COOPERATION

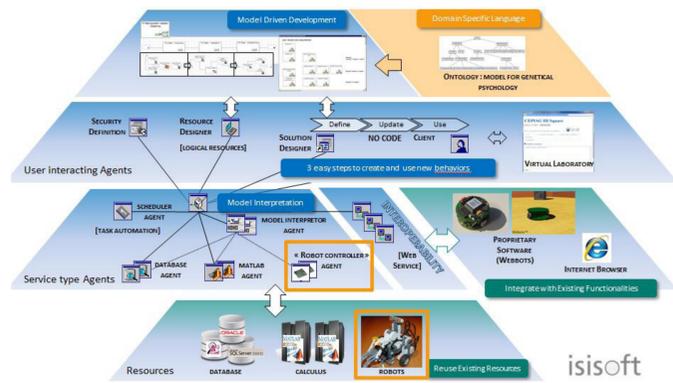
Wolfgang Schachner, CEPIAG



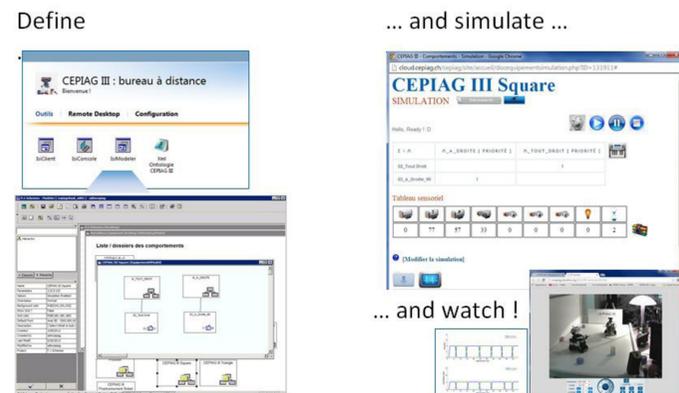
ABSTRACT

The emergence of proto-cooperation between our “baby” robot CEPIAG III and its “mother” robot is the subject of our research. It focuses on the beginning of the construction of a social relationship. The goal is to determine how it is possible to evolve from a proto-cooperation forced by phylogeny to spontaneous proto-cooperation. This construction should gradually bring our “baby” robot to manage itself: to force it to schedule the right task at the right time. This may be the seeds of an architecture of the will. This social dimension complements our research on Piagetian first sensory-motor stages.

SIMULATION ENVIRONMENT



VIRTUAL LABORATORY



ACKNOWLEDGEMENTS

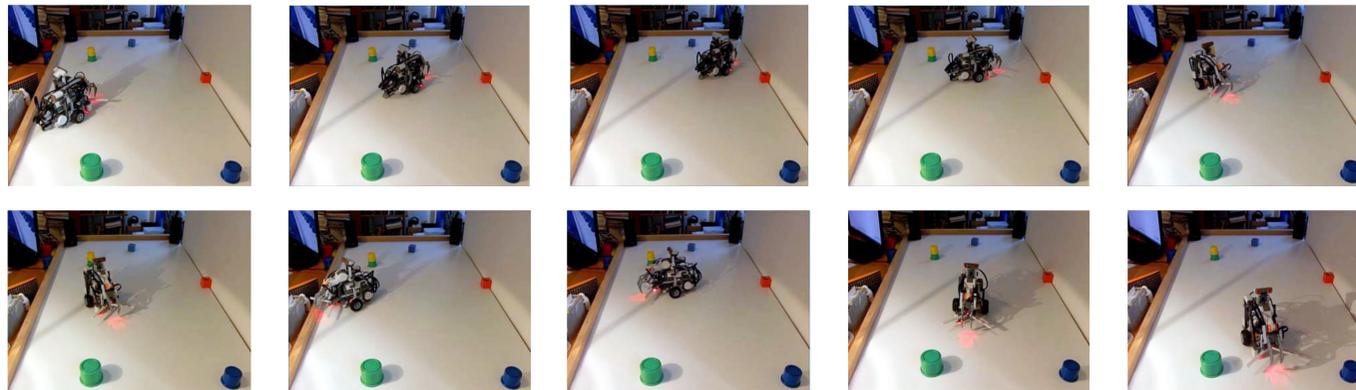
Special thanks to Olivier Real del Sarte, Jean-Jacques Ducret and Guy Cellérier for their contribution to this research.

FROM SUBJECT-OBJECT INTERACTION...

With the interiorization of the stimuli (external or internal) appears the cognitive assimilation, which is able to discriminate the activating pattern. With this interiorization and than generalization appear the first behaviors which are not given in the hereditary equipment: first habits centered on the body itself. These habits, then, are practiced and selected on the basis of their fitness (solidification). Through these interactions with the environment, and the associated assimilations and accommodations functions, the “baby” robot becomes more and more autonomous and adapted. The assimilation process lets the “baby” incorporating “new things” and the accommodation process allows the robot to adjust its own functioning to the apparition of novelties.

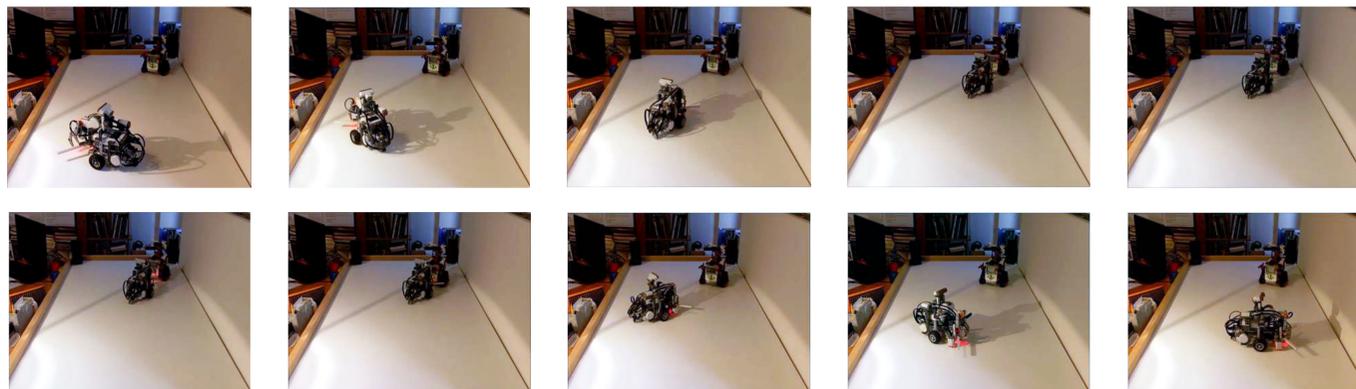
“EXPLORATION” BEHAVIOR

The robot explores the environment to find walls (limits of the environment) and objects without touching them.



“PROTO-COOPERATION” BEHAVIOR

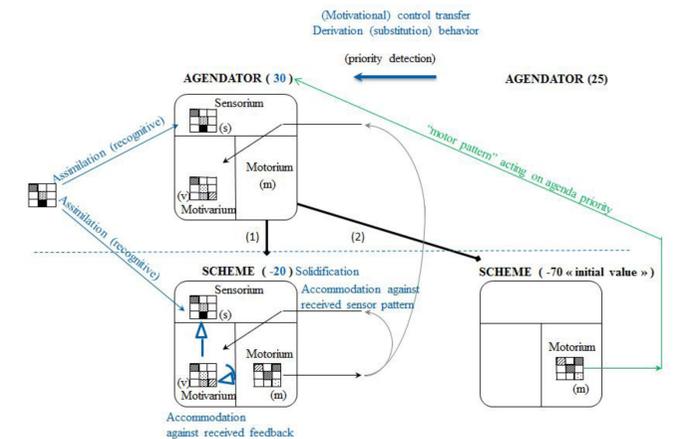
When the robot hears a sound, it turns around to search its “mother”. When found, it goes to her and opens and closes its claw. Then, after its mother beside it, it restarts “exploring”.



TO SUBJECT-SUBJECT INTERACTION

From the beginning, the young robot is immersed in its physical as well as social environment. In the physical, the urgency to “release” a behavior is given either by the context (perception activity or cognitive assimilation) or by a “given” priority (an innate rhythm). In the social environment the situation is more complex. Even if proto-cooperation is innate (such as attachment behavior given by “phylogeny”), conflicts appear very soon between tendencies to satisfy urgencies coming from physical environment as well as from social engagement. Because of the pressure of the mother (through her “random” apparition), the robot is “forced” to manage itself to answer her solicitations. And to answer correctly, it has to modify priorities of its behaviors. By doing so, it has to resolve (learn to resolve) how to make the initial weaker tendency to cooperate stronger.

SOCIETY OF SCHÈMES



DISCUSSION

By developing the social dimension, the goal was to add another brick to the trial of achieving the construction of intentional behaviors. The work on affective regulations, present during the “baby – mother” interaction, should bring the robot to manage more and more its “schèmes” (to apply top-down approaches such as planning) and therefore to be less “controlled” by them (bottom-up approach, reactive approach). At the actual stage of the research, no spontaneous cooperation has really appeared, but the add of proto-cooperation has clearly shown that the “baby” robot takes a lot of time dealing with conflicts of tendencies, trying to solve them by arranging priorities (seeds of affective operations which may lead to “will”). With this new skill, it should be possible for the “baby” robot to find it “appropriate” to start “spontaneously” a cooperation with its “mother”.

REFERENCES

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