BELBIC AND LOLIMOT:  
DESIGN PATTERNS FOR INTELLIGENT PREDICTION 
AND CONTROL IN SMART ENVIRONMENTS  

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ABSTRACT  
A new paradigm has come to replace the symbol- system representational approach that had been dominant during the past five decades of the formal history of artificial intelligence. Briefly, the new approach can be designated as embodied and situated AI. So as to attack the challenges posed by postindustrial design requirements in a digital economy that no longer can be characterized by the mass production model, new products must be highly modularized with massive component reusability, bottom- up design through dynamic collaboration of intelligent parts that can reconfigure themselves autonomously in order to pursue their goals and provide service to the users in a proactive manner. The new designs are not only biologically inspired, but also sociologically, behaviorally, and cognitively motivated as well. Two techniques that can be utilized in such smart environments: BELBIC, the "Brain Emotional Learning Based Intelligent Controller", and LOLIMOT, the "Locally Linear Neuro Fuzzy net with MOdel Tree learning", are described as design patterns for providing good solutions to problems that appear again and again in these systems, but never in the same form. Following a "Model Driven Architecture" approach, a domain independent abstract model of the two techniques are presented so that for any required implementation platform a domain specific code can be obtained semi- automatically to get the proper implementations of the models. Whereas the neurofuzzy LOLIMOT is ideal for identification of an unknown process from experimentally observed data and prediction of future events, that is for capturing the induction capabilities of human mind; the affective BELBIC is best suited for bounded rationality and satisficing control and decision making.