Ludics nets,
a game model of concurrent interaction

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Game Semantics has been a successful approach to model sequential computation. Its strength is to capture the dynamical aspects of computation. Recent work has been directed to extend this approach, either to describe a more concurrent form of interaction (AbramskyMellies99) or to liberalize the notion of game in order to play on graph structures (HylandSchalk01, Mellies04).

Ludics (Girard 2001) is a game model of *sequential interaction*, which abstracts away from linear logic proof-theory and which presents remarkable structural properties. In particular, it comes equipped with a built-in notion of observational equivalence, in the sense that two agents reacting the same way to any test are actually equal. The central role of addresses (names) and the interactive methods (close to notions of processes equivalences) open a bridge with concurrency theory. However, Ludics has been developed by imposing strict constraints of sequentiality. The natural step now is to overcome them, seeking a more asynchronous notion of interaction.

In joint work with Francois Maurel, we exploit the theory of Ludics to define a game model of *concurrent interaction.*

L-nets are the abstract structures which in our setting correspond to proofs/programs (or processes), what is called strategy in Games Semantics or designs in Ludics. L-nets are graphs, stating a controlled amount of dependency among actions, and the interactions are partial orders, allowing for parallelism.

Our graphs can be seen as an abstraction of MALL (multiplicative-additive linear logic) proof-nets. While the multiplicative structure deals with parallelism, the additive structure accounts for a proof-theoretical counter-part of non determinism, as it allows us to superimpose different possible evolutions of the system. If tree strategies can be seen as *abstract sequent calculus derivations*, L-nets correspond to *abstract proof-nets.*

L-nets actually are actually leading us to revisit the standard notion of proof-nets, bringing new insights in the way to deal with sequentiality and with the additive superimposition of proofs. We are currently developing this line of research in joint work with Pierre-Louis Curien.