Update au CR du 31-03-2011
Opening prediction model
(opening prediction and tech tree updating)

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1 Goal

The goal of this model is two-fold: keep an estimation of the enemy tech tree updated, and be able to have a distribution over (predict) her opening strategy/tech (closely related considering the opening). See also: **The goal of this update is to work as a dumb classifier : considering only "one opening from start to finish" by adding a Dirac.**

- CR 15-07-2010 (preliminary work)
- CR 05-11-2010 (first tech tree estimator model)
- CR 09-12-2010 (stable tech tree estimator model)
- CR 31-03-2011 (stable tech tree estimator model)
- `http://forum-fr.com/viewtopic.php?f=56&t=5088` (Appendix on openings)

2 Variables

- $X \in [\emptyset, building_1, building_2, techtrees, \dots]$ All the possible tech trees (see Example).
- $O_{i \in [\![1 \dots N]\!]} \in \{0, 1\}$ Have seen (observed) the given building (it can have been destroyed, it will stay "seen").
- $Op^t \in [opening_1 \dots opening_M]$ Various opening values (depending on the race).
- $Op^{t-1} \in [opening_1 \dots opening_M]$ Opening value of the time before.
- $\lambda \in \{0, 1\}$ Coherence variable (restraining X to possible values w.r.t to $O_{1:N}$)
- $T \in [\![1 \dots P]\!]$ Time in the game (for the moment 1 second timesteps).

3 Decomposition

$$
\begin{aligned}
& P(T, X, O_1 \dots O_N, Op^t, Opt-1, \lambda) \\
= \; & P(Op^t|Op^{t-1} \qquad \text{(NEW!)} \\
& P(X|Op^t) \\
& P(O_{1:N}) \\
& P(\lambda|X, O_{1:N}) \\
& P(T|X, Op^t)
\end{aligned}
$$

4 Parameters

$$
\begin{aligned}
& P(\lambda = 1|x, o_{1:N}) \\
= \; & 1 \text{ if } x \text{ can exist with } o_{1:N} \\
= \; & 0 \text{ else}
\end{aligned}
$$

$P(T|X, Op^t)$ Bell shapes (μ, σ^2) that will be learned from the replays (occurences in games).

$P(X|Op^t)$ Histograms, learned from the replays.

$$
\begin{aligned}
& P(Op^t|Op^{t-1}) \;\; (Dirac) \\
= \; & 1 \text{ if } Op^t = Op^{t-1} \\
= \; & 0 \text{ else}
\end{aligned}
$$