function DECISION-THEORETIC-AGENT($\boldsymbol{E}_t$) **returns** an action

inputs: $\boldsymbol{E}_t$, the percept at time t

static: BN, a belief network with nodes $\mathbf{X}$

$Bel(\boldsymbol{X})$, a vector of probabilities, updated over time

$\widehat{Bel}(\mathbf{X}_t) \leftarrow \sum_{\mathbf{x}_{t-1}} \mathbf{P}(\mathbf{X}_t \mid \mathbf{X}_{t-1}=\mathbf{x}_{t-1}, A_{t-1})\, Bel(\mathbf{X}_{t-1}=\mathbf{x}_{t-1})$

$Bel(\mathbf{X}_t) \leftarrow \alpha\, \mathbf{P}(\mathbf{E}_t \mid \mathbf{P}\, X_t)\, \widehat{Bel}(\mathbf{X}_t)$

$action \leftarrow \arg\max_{A_t} \sum_{\mathbf{X}_t} \left[Bel(\mathbf{X}_t=\mathbf{x}_t) \sum_{\mathbf{X}_{t+1}} P(\mathbf{X}_{t+1} = \mathbf{x}_{t+1} \mid \mathbf{X}_t=\mathbf{x}_t, A_t)\, U(\mathbf{x}_{t+1}) \right]$

return *action*