Oracle skipping CFTP algorithm: a variant of the CFTP technique in which the distribution over events is dynamically modified in order to avoid “inactive” events.

A uniform bound on the mean coupling time using our algorithm for a family of Markov models, while the underlying Markov chains have unbounded mean coupling time.

Collapsing and Expanding

Passive events do not modify the state of the bounding chain.

Collapsing   Expanding

```
abcbbcbca  acba
a  cb  a  abaccba
```

Using Words of Geometric Length and ♯

```
abb...bca ♯ · ac...cb ♯ · · · ♯ · c ♯

G(2⁻ᵏ)  G(2⁻ᵏ+1)  G(½)
```

When collapsed and expanded, these words keep the same distribution, conditioned to having the same sequence of active events.

Sketch of Algorithm

**Main idea:** \( w^{k+1} \sim c \left( u^{k+1} \cdot ♯ \cdot e \left( w^k \right) \right) \)

**Input:** A Markov automaton \( \mathcal{A} = (\mathcal{S}, \mathcal{A}, D, \cdot) \) such that there exists a word for which \( \mathcal{A} \) couples.

**Output:** An element of \( \mathcal{S} \) drawn according to the stationary distribution of the Markov chains generated by \( \mathcal{A} \).

```
function ORACLE-CFTP(\mathcal{A})

    w ← e
    k ← 1
    repeat
        l ← \langle \text{GEOM}(2⁻ᵏ) \rangle
        w ← c \left( \langle D^{⊗l} \rangle \cdot ♯ \cdot e \left( w \right) \right)
        E ← \mathcal{E}(\mathcal{S}) \cdot w
        k ← 2 \cdot k
    until |E| = 1

    return UNIQUEELEMENTOF(E)
end function
```

Lower bound on the mixing time of CFTP:

\[
\frac{C \cdot (\rho + 2)}{8}
\]

Upper-bound on the mean coupling time of Oracle-CFTP (does not scale with \( \rho \)):

\[
4C + 3C^2
\]

Perfomances

**References**