

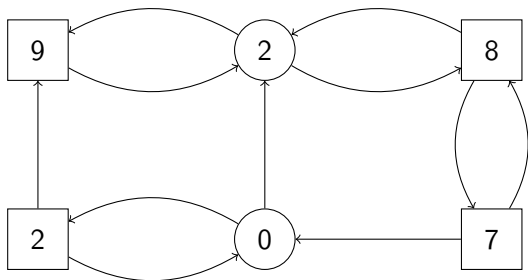
# An Ordered Approach to Solving Parity Games in Quasi Polynomial Time and Quasi Linear Space

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## Parity Games



Open question: are parity games in P?

Recent Progress:

Parity games can be solved in  $O(n^{\log(d)+6})$  time and space

(Calude, Jain, Khossainov, Li, Stephan, 2017)

# This Paper

## Problem:

The CJKLS algorithm uses quasi-polynomial time **and space**

## Solution:

Come up with a quasi-polynomial **value iteration** algorithm

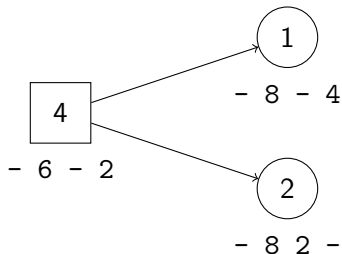
- ▶ Using small-progress measures (Jurdziński, Lazić, 2017)
- ▶ Using the **original** data structure (F., Jain, Schewe, Stephan, Wojtczak, 2017)

# $i$ -sequences



- 8 4 2  $\implies$  9 - - -

## Our work



We create a **value iteration** algorithm

- ▶ Based on the CJKLS data structure
- ▶ ... in reverse
- ▶ ... with an appropriate ordering

# Results

Another quasipolynomial-time **polynomial**-space algorithm

- ▶ Actually nearly linear space

## Also

- ▶ Better upper bounds for certain special cases
- ▶ Exponential examples (this algorithm and CJKLS)
- ▶ Implementation

