An algorithm for computing Semi-Stable Semantics

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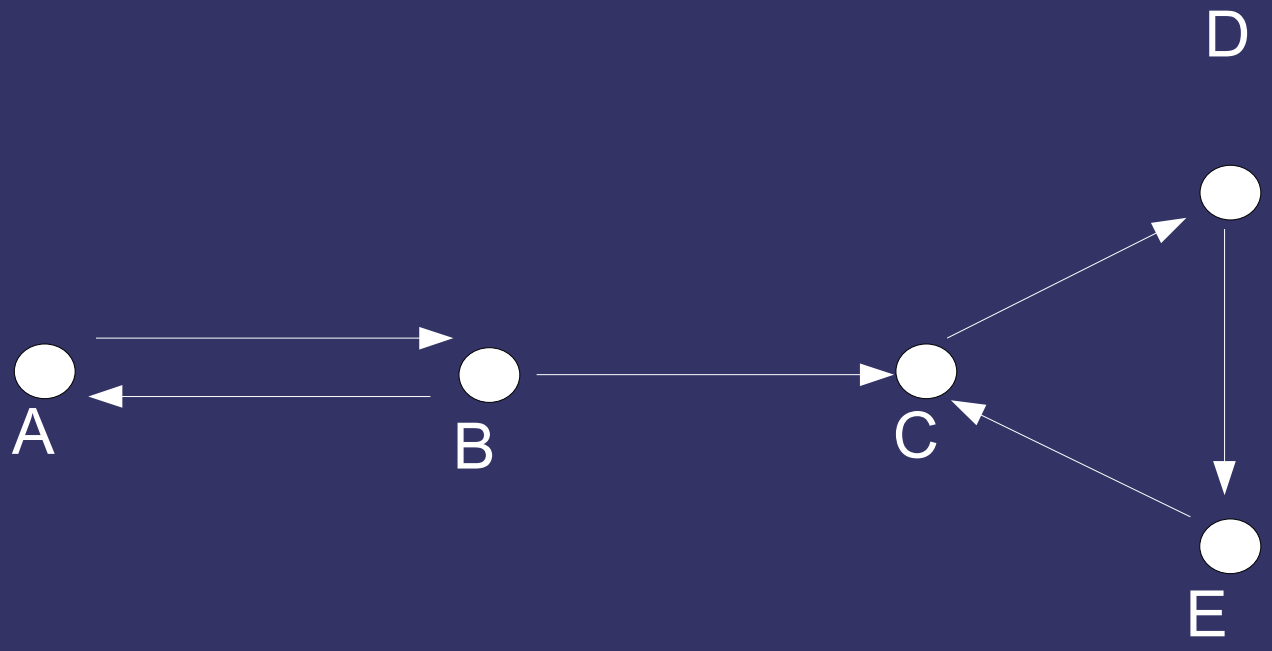
Abstract Argumentation

Argumentation Framework: (Arguments, Defeat)



Args+ = { A | ∃ B∈Args: B defeats A }

example: {B, D}+ = {A, C, E}

Argumentation Semantics

Let AF = (Arguments, Defeat)
A set of arguments *Arg* is

- stable iff *Args*+ = Arguments \ *Args*

- preferred iff it is an admissible set where *Args* is maximal

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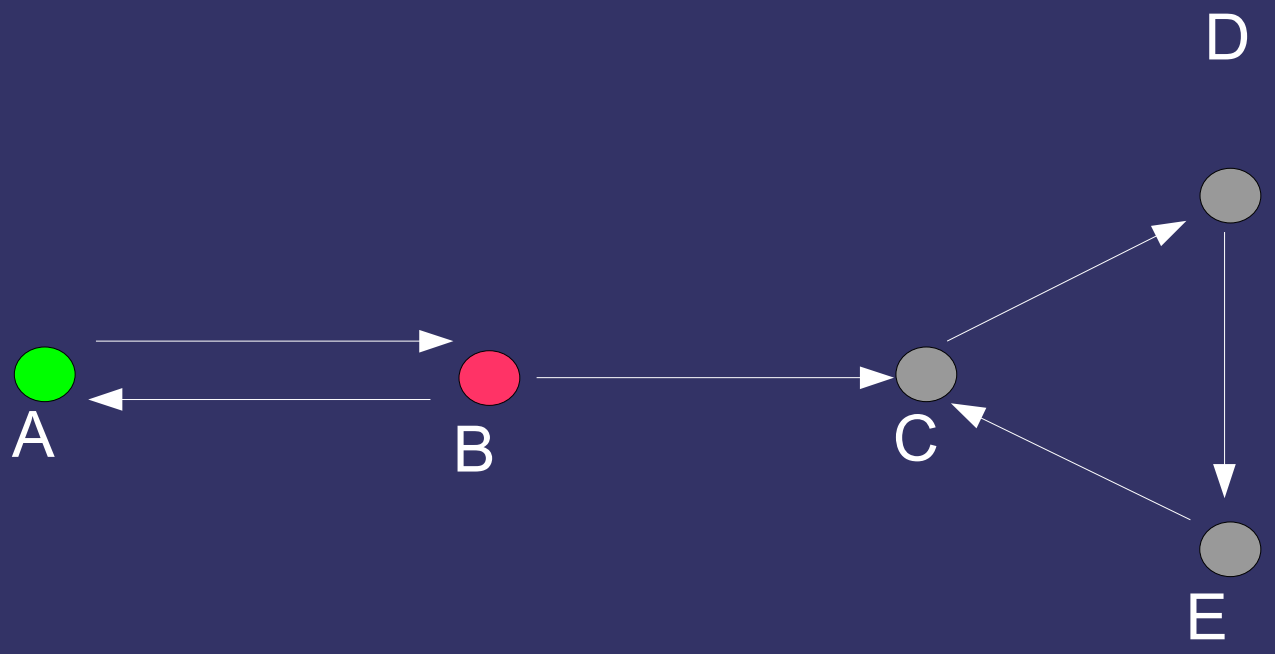
each stable is a semi-stable is a preferred

Argument Labellings

- A *labelling* assigns to each argument exactly one label: in, out or undec
- A *complete labelling* is a labelling that satisfies:
  - if an argument is in,
    then all its defeaters are out
  - if an argument is out,
    then it has at least one defeater that is in
  - if an argument is undec,
    then not all its defeaters are out
    and it does not have a defeater that is in

Example



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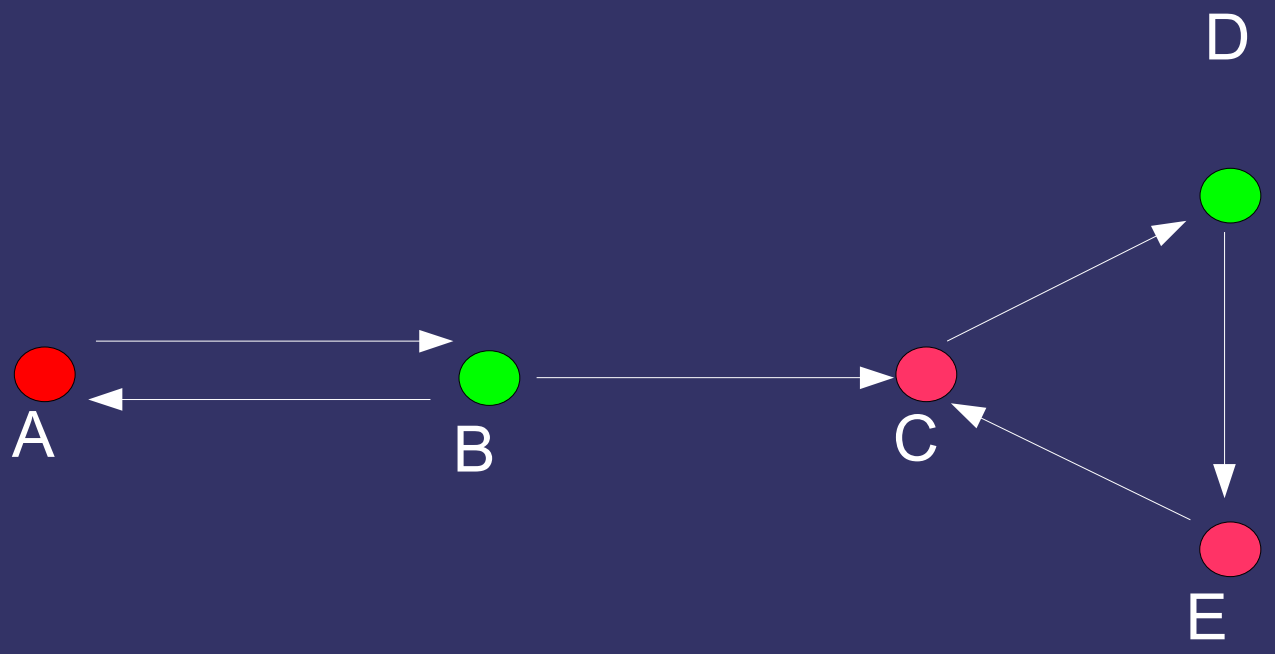

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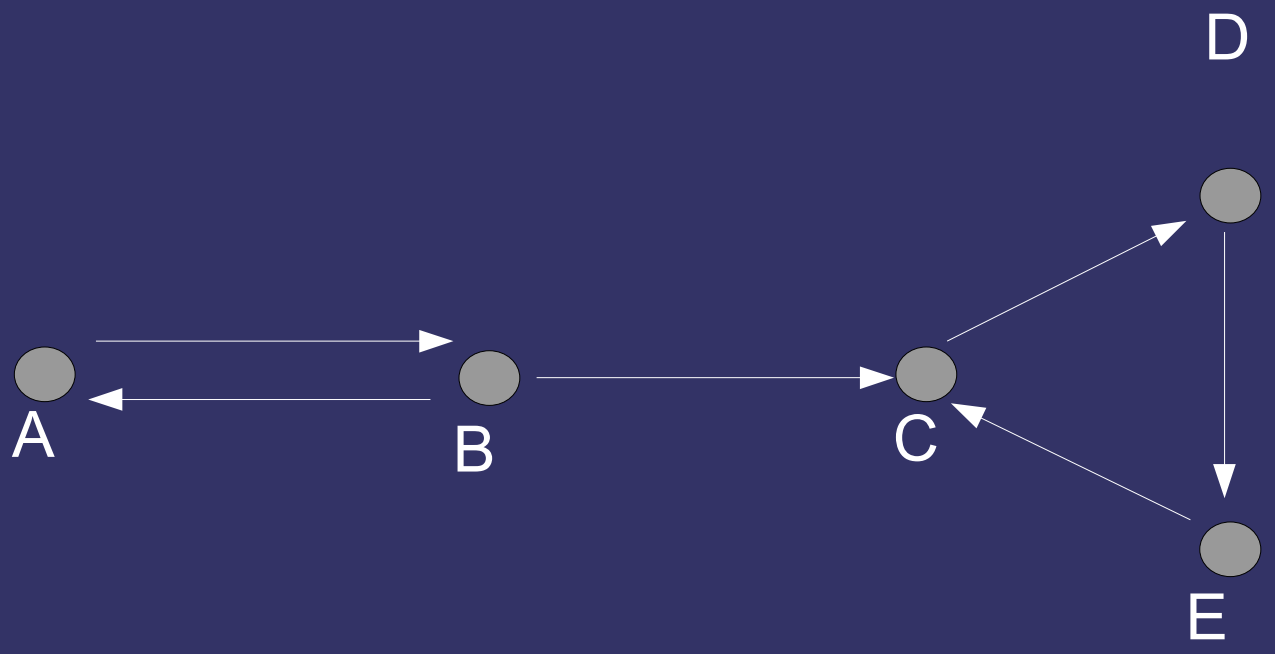

Semantics and Labellings

restriction on complete labeling	*Dung-style semantics*
no restrictions	complete
no undec	stable
maximal in	preferred
maximal out	preferred
maximal undec	grounded
minimal in	grounded
minimal out	grounded
minimal undec	semi-stable

Complete Labellings

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Admissible Labellings

- A *labelling* assigns to each argument exactly one label: in, out or undec
- An *admissible labelling* is a labelling that satisfies:
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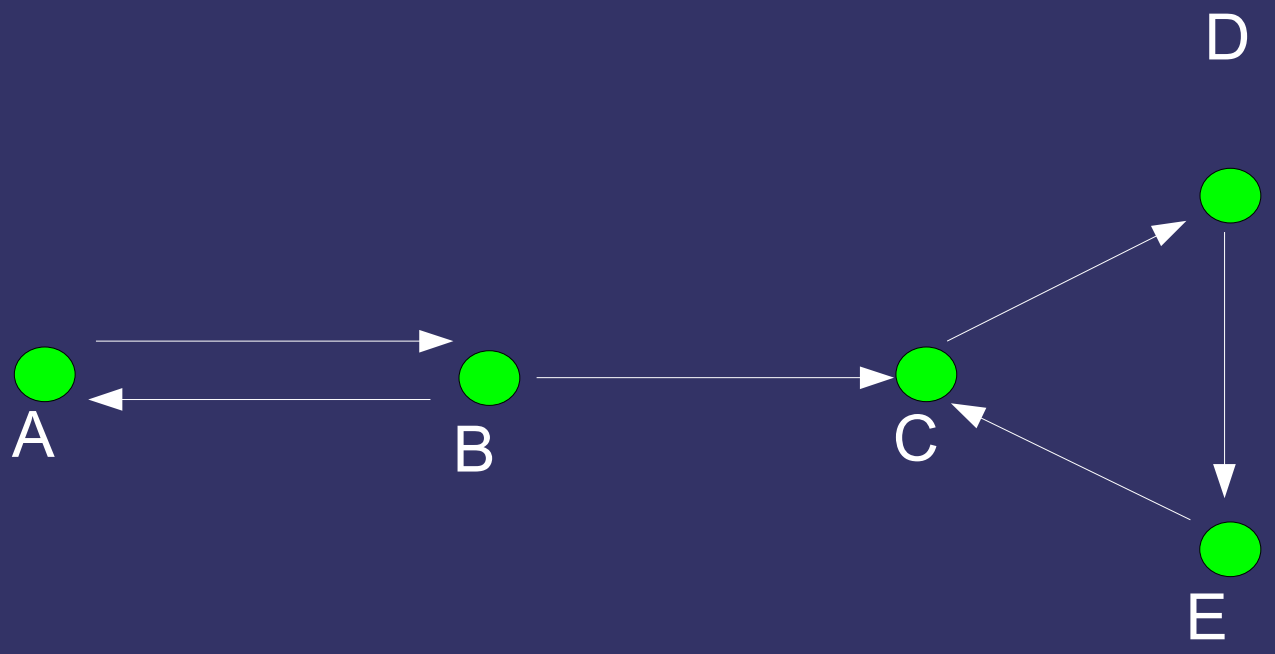
    then all its defeaters are out
  - if an argument is out,
    then it has at least one defeater that is in

Outline of the Algorithm

- start with the *all-in labelling*
- then, as long as there are illegal ins:
  - select an argument (A) that is illegally in
  - relabel it to out
  - check if {A} ∪ {A}+ contains any arguments that have become illegally out;
    if so, relabel them to undec
- If there are no illegal ins anymore,
  then we have an admissible labelling
  (don't forget to backtrack to other possibilities)

Example



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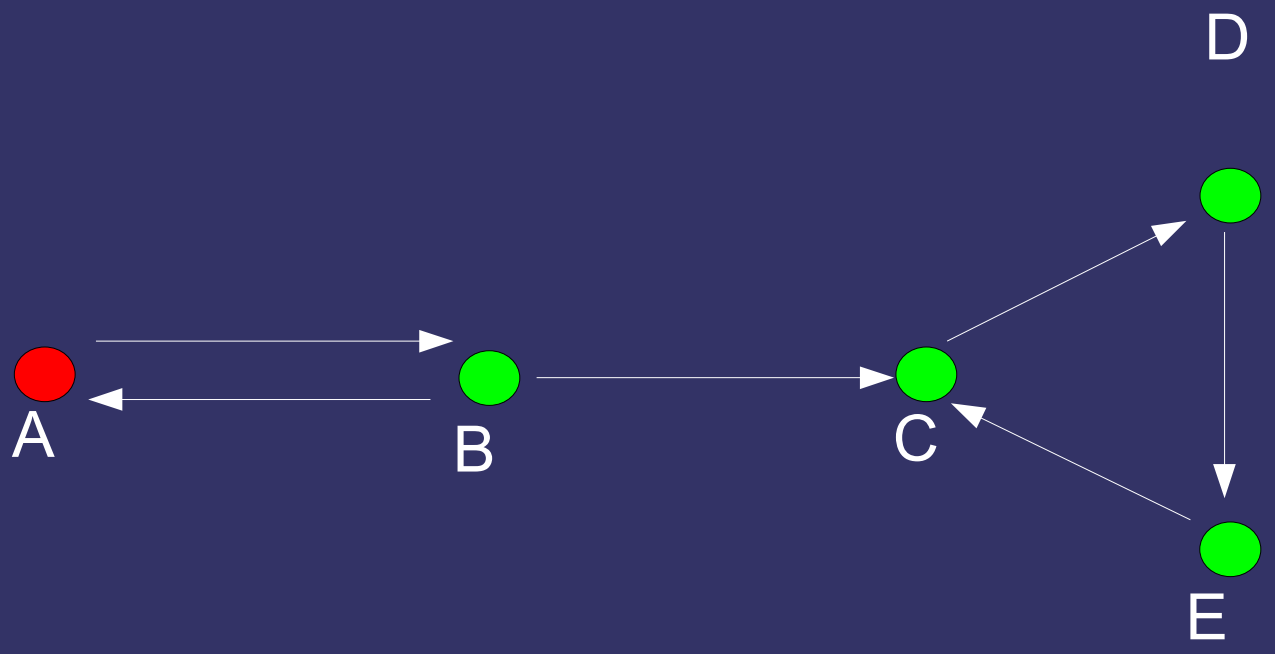

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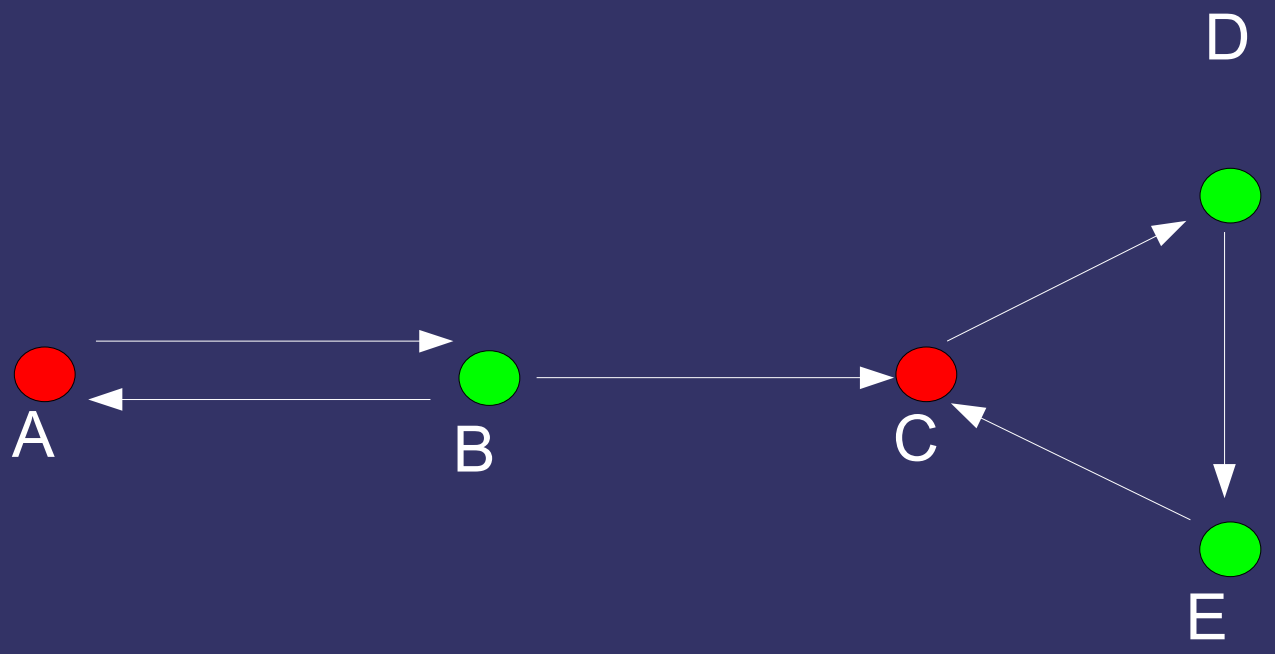

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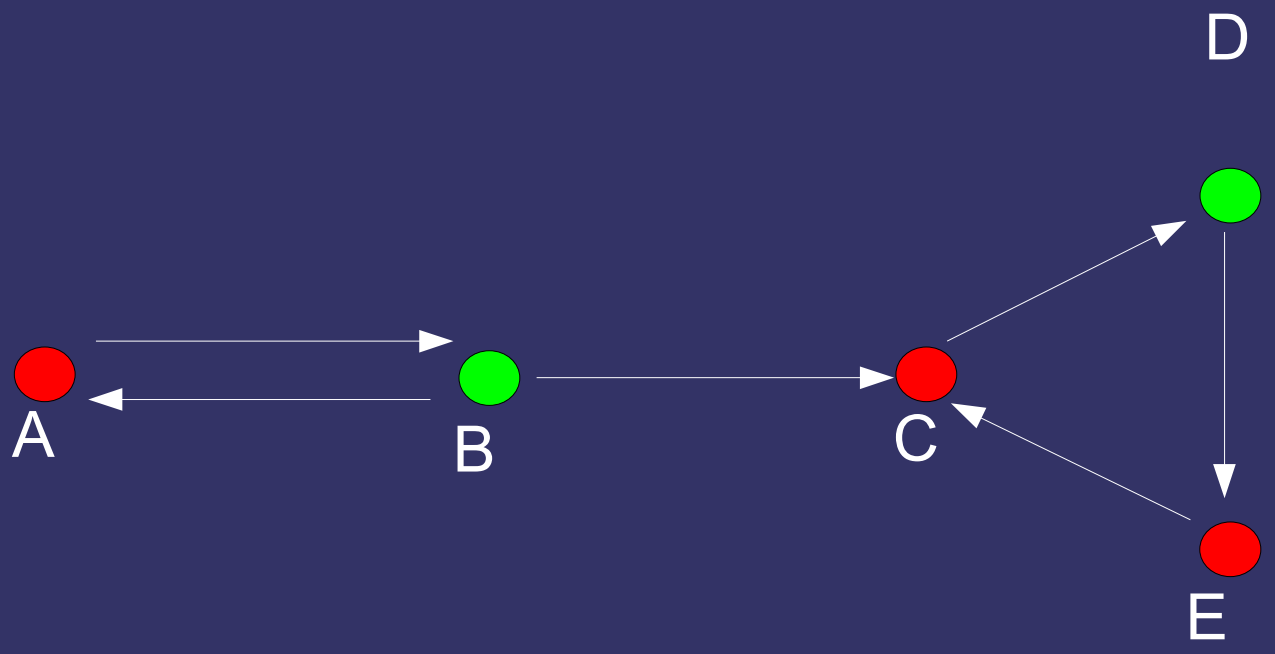

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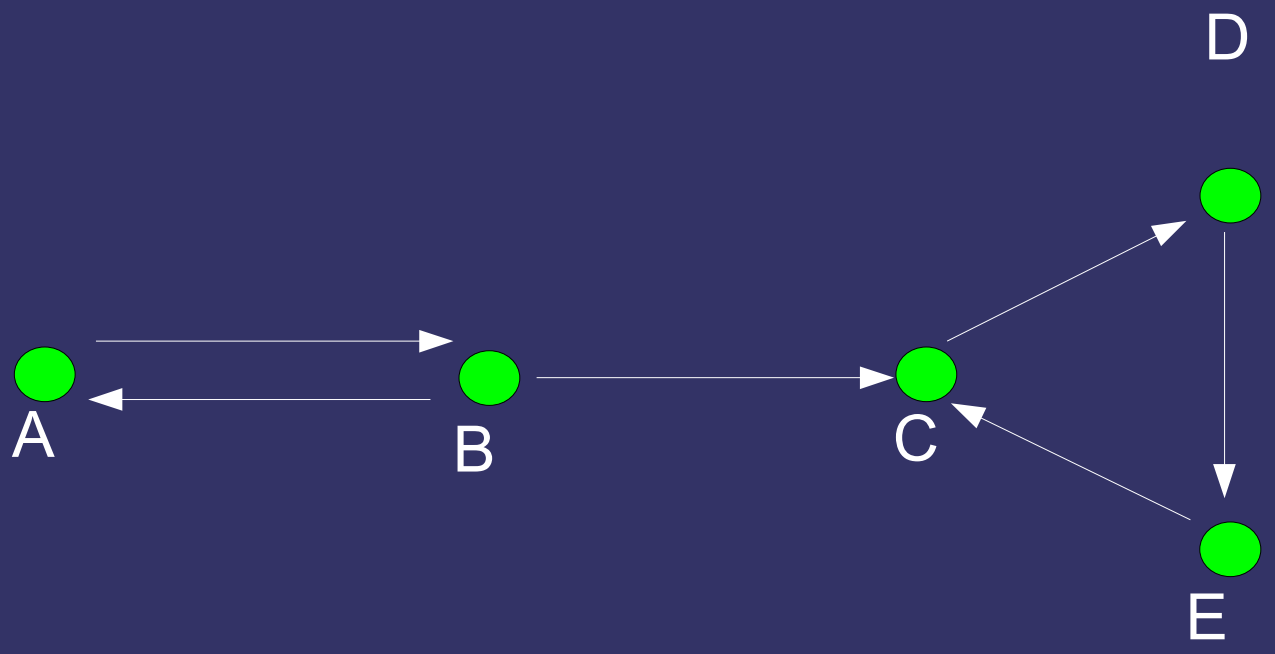

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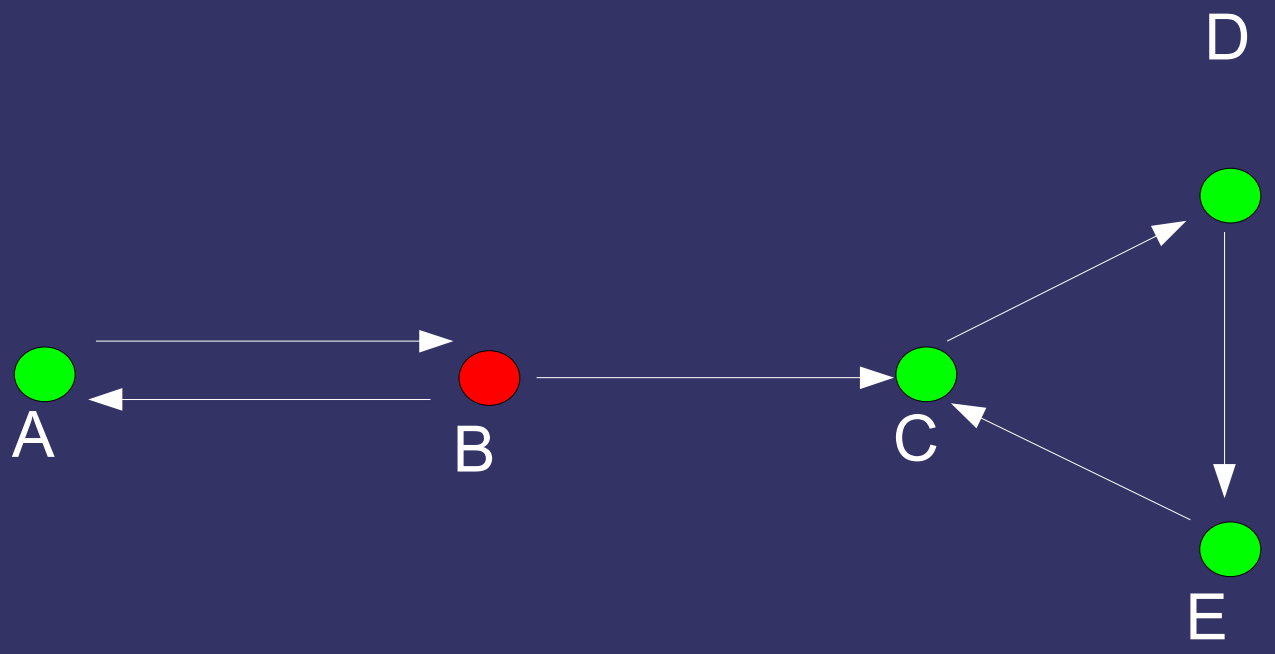

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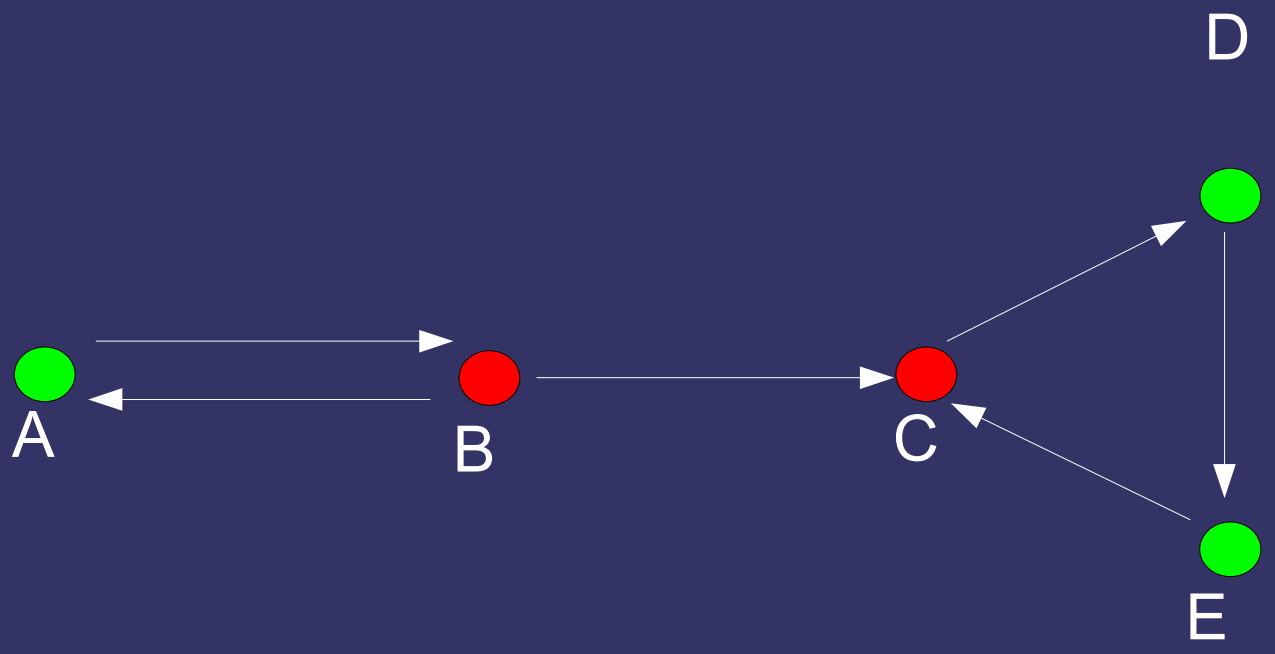

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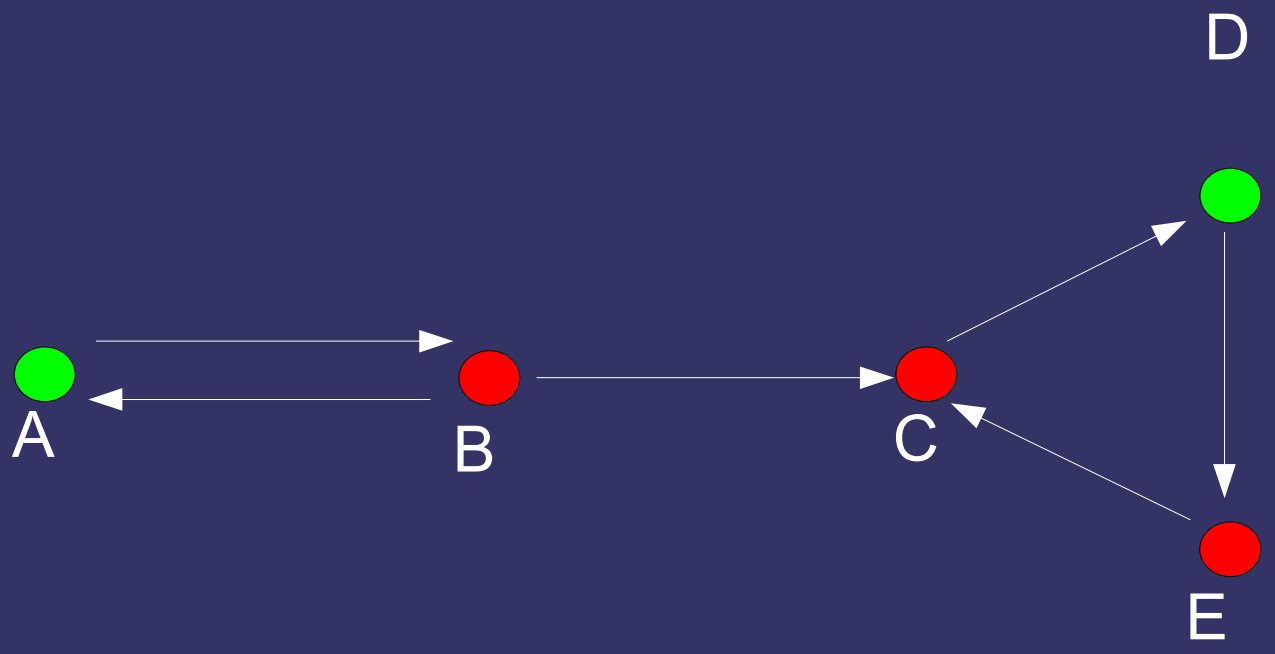

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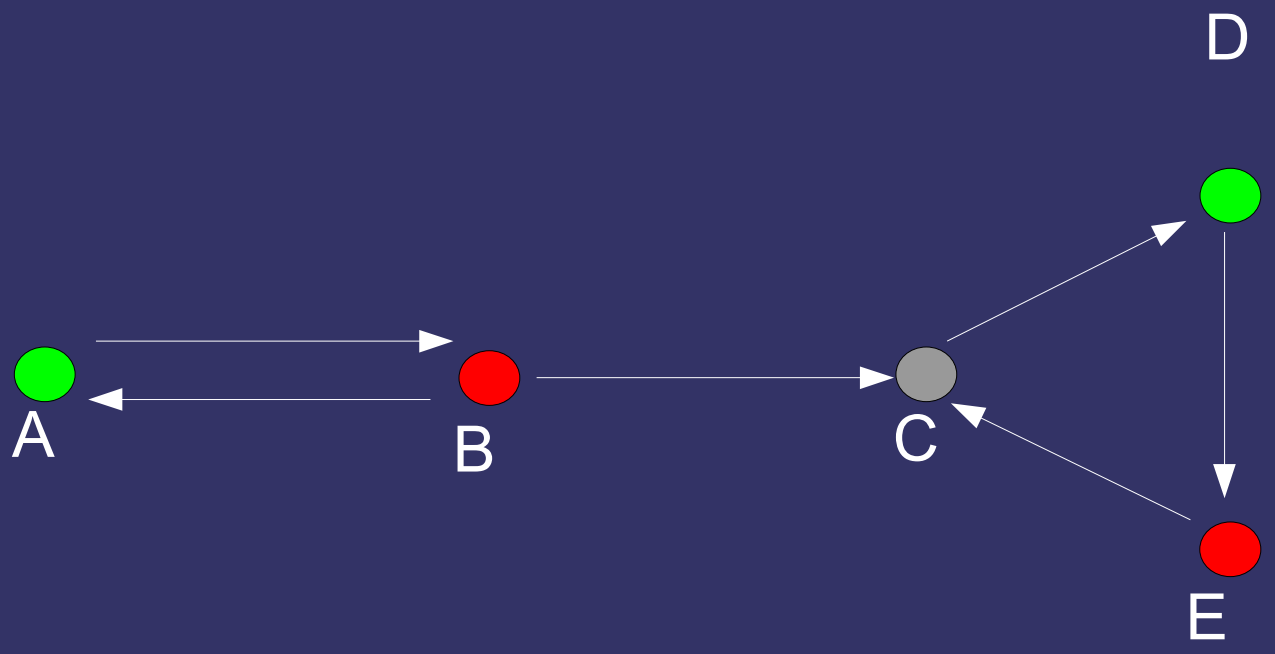

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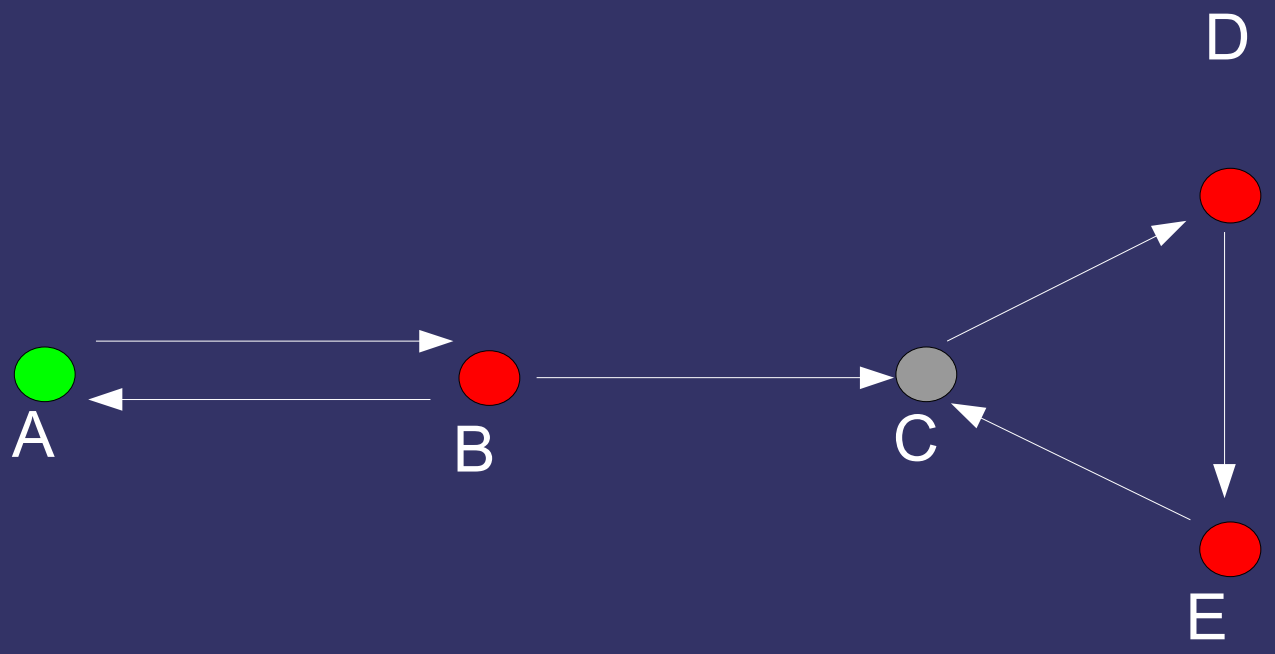

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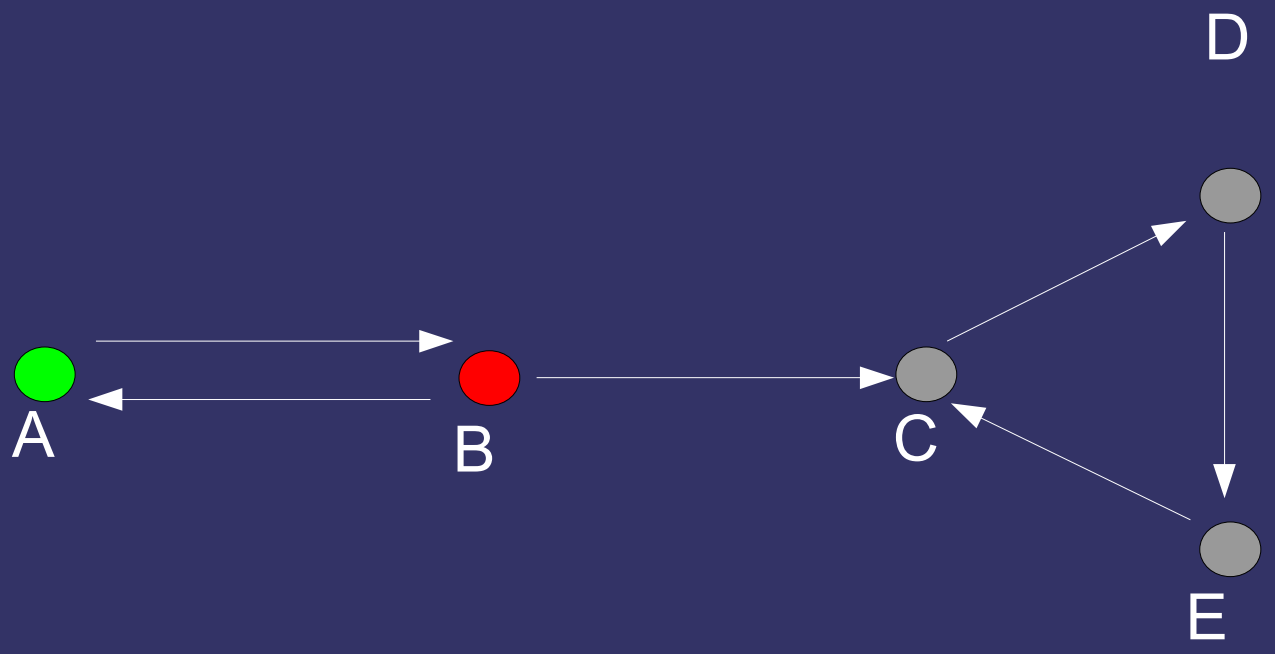

Final Remarks

- The trick of transition steps is:
  - they preserve the absence of illegal outs
  - the set of in-labelled arguments decreases
  - the set of undec-labelled arguments increases
- Several slightly different versions of the algorithm can be used for:
  - computing the stable extensions
  - computing the semi-stable extensions
  - computing the preferred extensions