Register Allocation in Synthesis
- Polynomial solution for chordal graphs
- In SSA Form, interference graph is chordal
- Only if definition of each variable dominates each use (a Regular Program)
- Contribution: Polynomial algorithm to convert irregular SSA Form program to regular form
  - Ensures a polynomial solution to the problem for all applications, since any procedure can be converted to SSA Form

SSA Form
- Each variable is defined once
- Each use corresponds to one definition
- $\phi$-functions merge variables defined along converging paths

Dominance Relation
- $A \text{ dom } B$ if every path from the entry node (r) of a flowgraph to B passes through A
- $A \text{ sdom } B$ (strict dominance) if $A \text{ dom } B$ and $A \neq B$
- $A = \text{idom } B$ if $A \text{ sdom } B$ and there is no node C such that $A \text{ sdom } C \text{ sdom } B$

Non-Strict Use
- The definition of $v$ does not dominate the use
- Must Fix!

Non-Initialized Use
- No path from the definition of $v$ to the use
- Replace the use with NULL

Algorithm to Fix Non-Strict Uses
- Place a $\phi$-function $v' \leftarrow \phi(v, ..., v)$ in block $m'$ s. t.:
  - (1) $m' \text{ dom } m$
  - (2) there is a path from $n$ to $m'$
  - (3) there is no path from $n$ to idom $m'$
- Replace the use of $v$ in $m$ with a use of $v'$
- Recursively process the $\phi$-function parameters, which are uses in a predecessor block $m''$ of $m'$

Non-Initialized Use
- Strict use if $n \text{ dom } m''$
- Non-strict otherwise