I. Modern Application Heavily Utilize Linear Algebra Operations
   a) Neural Network Models
   b) Image Process
   c) Signal Process
   d) GPS
   e) More

II. LLVM IR Applies GVNs to Simplify Linear Algebra Operations
   Front-End
   IR Optimizations
   GVNs
   IR Optimizations
   Back-End

III. New GVN Lacks Mechanism on PRE with Hoist Code Motion

   splendid GVN
   How about PRE with Hoist Code Motion with More Delicate Model

   GVN Hoist
   PRO Hoist Code Motion
   CON Less Accurate Model

   New GVNs
   PRO More Delicate Model
   CON Don’t Handle PRE

   GVN Sink
   Out of Domain

IV. Design for Splendid GVN
Splendid GVN traces instructions in RPO order. For each instruction, it detects PRE/FRE pattern with the following three steps.

1. Check safety
2. Check congruence
3. Only one layer

If PRE/FRE happens, Splendid GVN checks Safety for hoist code motion. Once it can be, Splendid GVN hoists it up and eliminates PRE/FRE case.

V. Experimental Results: Two BitCode Programs
local-pre.ll and pre-no-cost-phi.ll from llvm/test/Transforms/GVN/PRE

-18.37% to original
-7% to New GVN

Total Code Size for Splendid GVN

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