

Lecture #17

ERDM

Prof. John W. Sutherland

Feb. 18, 2004

Disassembly Operations

- Collection, transportation, & handling
- Storage of products / components (pre- and post-disassembly)
- Positioning & fixturing
- Separation of fasteners / joints
- Fixturing

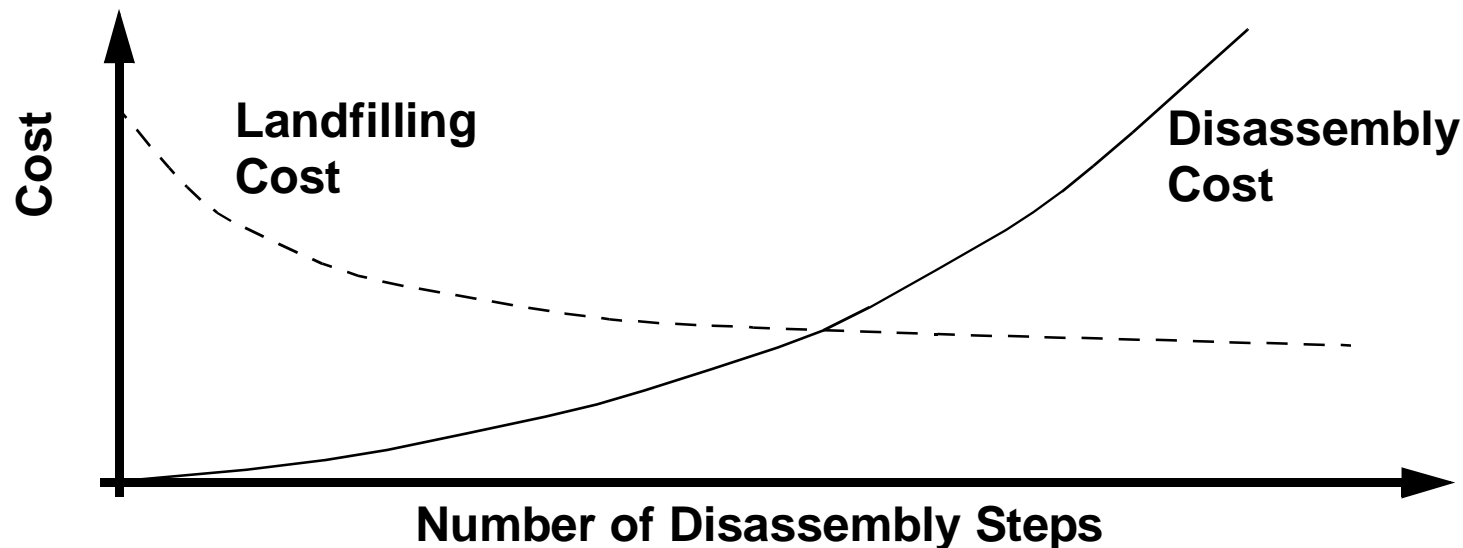
Remove hazardous materials & components as early as possible.

Separation & Part Control

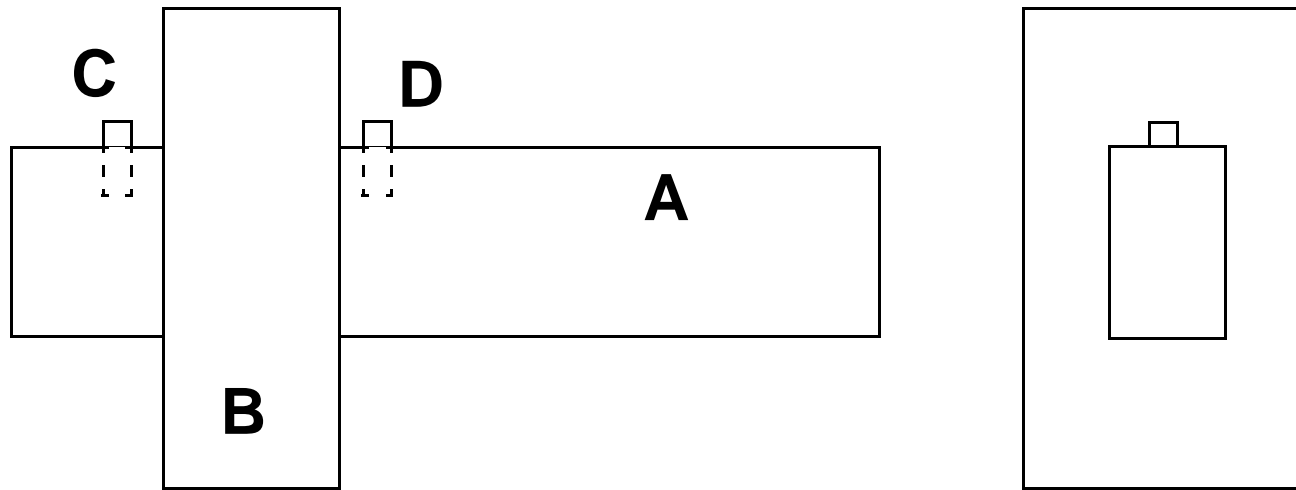
- **Design parts for quick identification - product labeling**
- **Provide for gripping surfaces / stacking surfaces**
- **Simplify fasteners - promote easy separation - minimum parts and minimum tools**
- **Modular designs preferred**
- **Quick removal (& replacement) of parts that are likely to have failed or seen excessive wear.**

Disassembly

Discussing role of geometry, fasteners, and materials on the environment. Disassembly focuses on the relationship between the parts within a product.



Modeling a Multi-Part Product



Pretty simple (fictional) product - can we describe how the components are related?

Modeling (cont.)

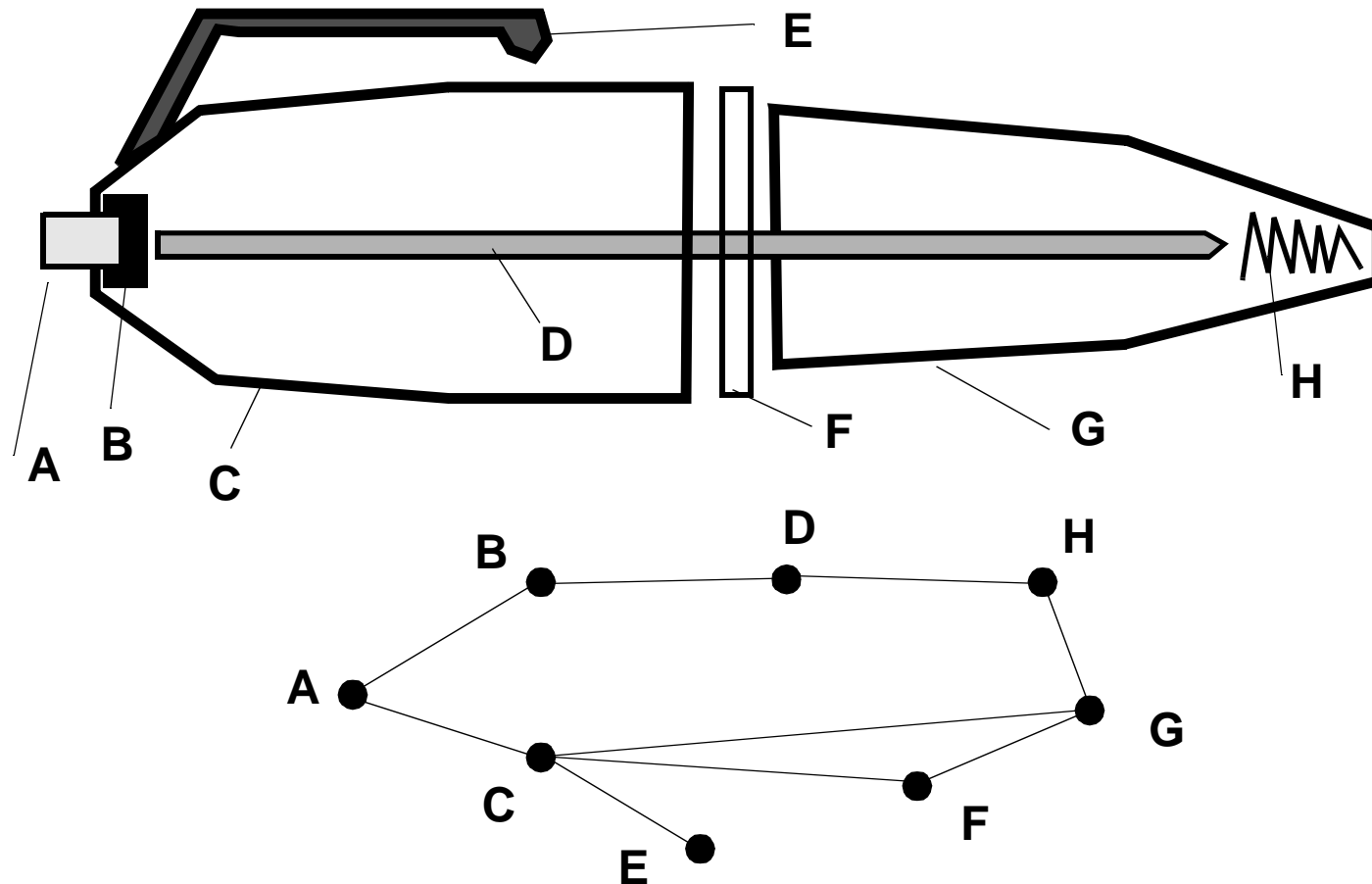


The diagram above shows which parts interact. Sometimes referred to as a liaison diagram.

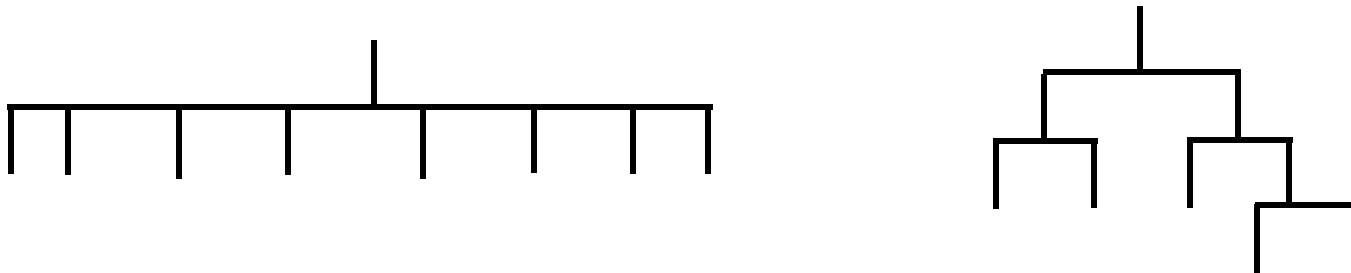
The hierarchy illustrated shows how the parts contact one another. Lines represent contacting surfaces.

For such a hierarchy what should we be looking for??

Another Product Hierarchy



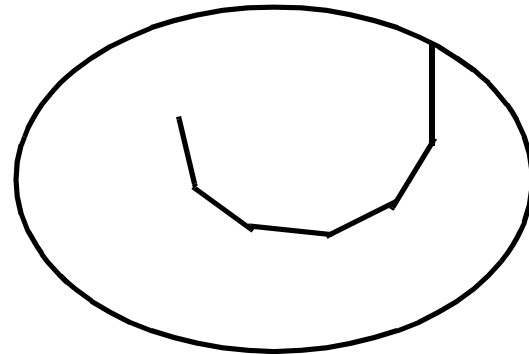
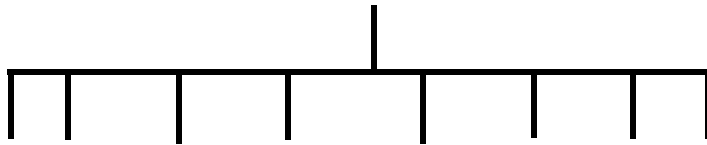
Product Hierarchy



Generally, from an assembly / disassembly standpoint, we are looking for taller hierarchies. Taller hierarchies represent more modular structures.

For the structure on the left, if the part at the top of the hierarchy is destroyed - the parts may be freed up.

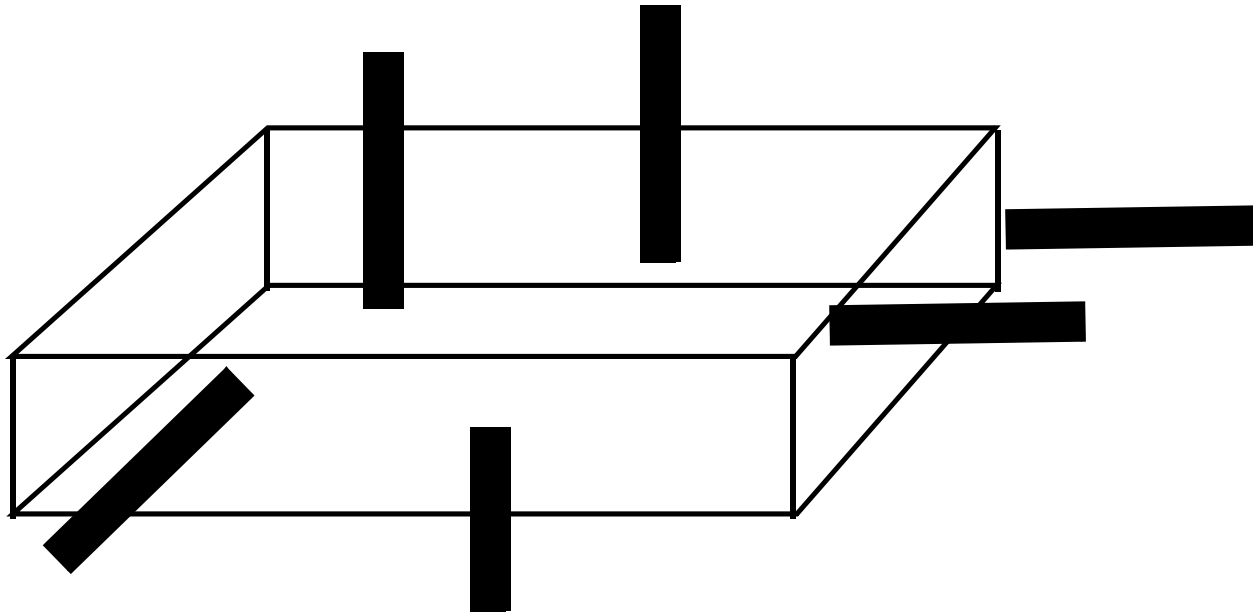
Addl. Product Hierarchies



The hierarchy on the left may be well suited to the replacement of individual components.

The structure on the right is, in principle, similar to the one on the left.

Assembly / Disassembly Principles



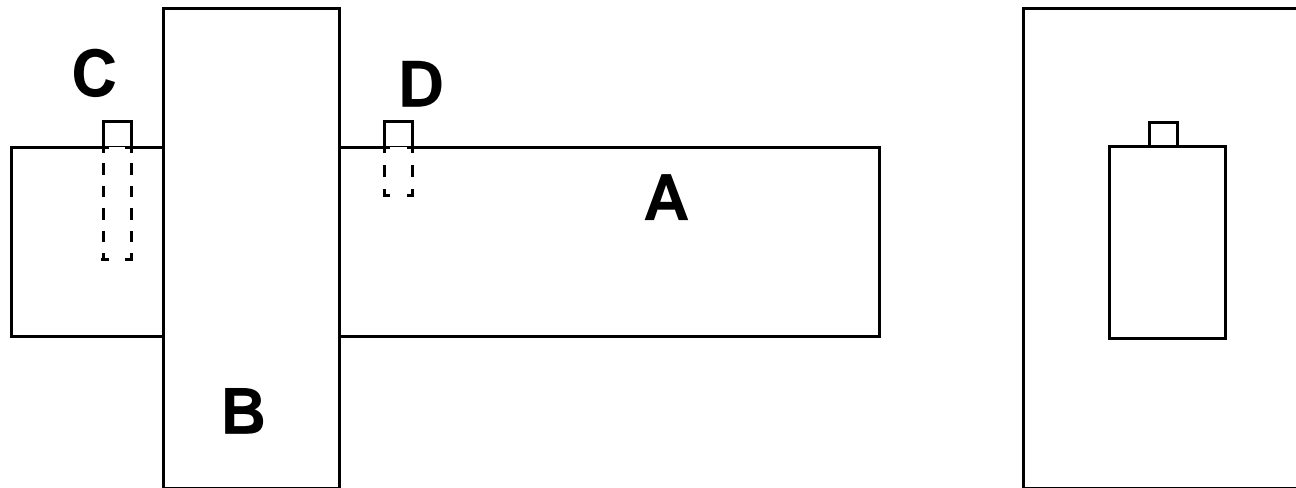
Avoid designs that require assembly from all different directions. Preferable to have parts (dis)assembled in the same direction. Promotes automation.

Virtual Disassembly



**Prof. Rajit
Gadh --
hard at work!**

Modeling Disassembly



- Identify steps required to disassemble product

Disassembly Process

Remove C from A

Remove A from B

Remove D from A

or

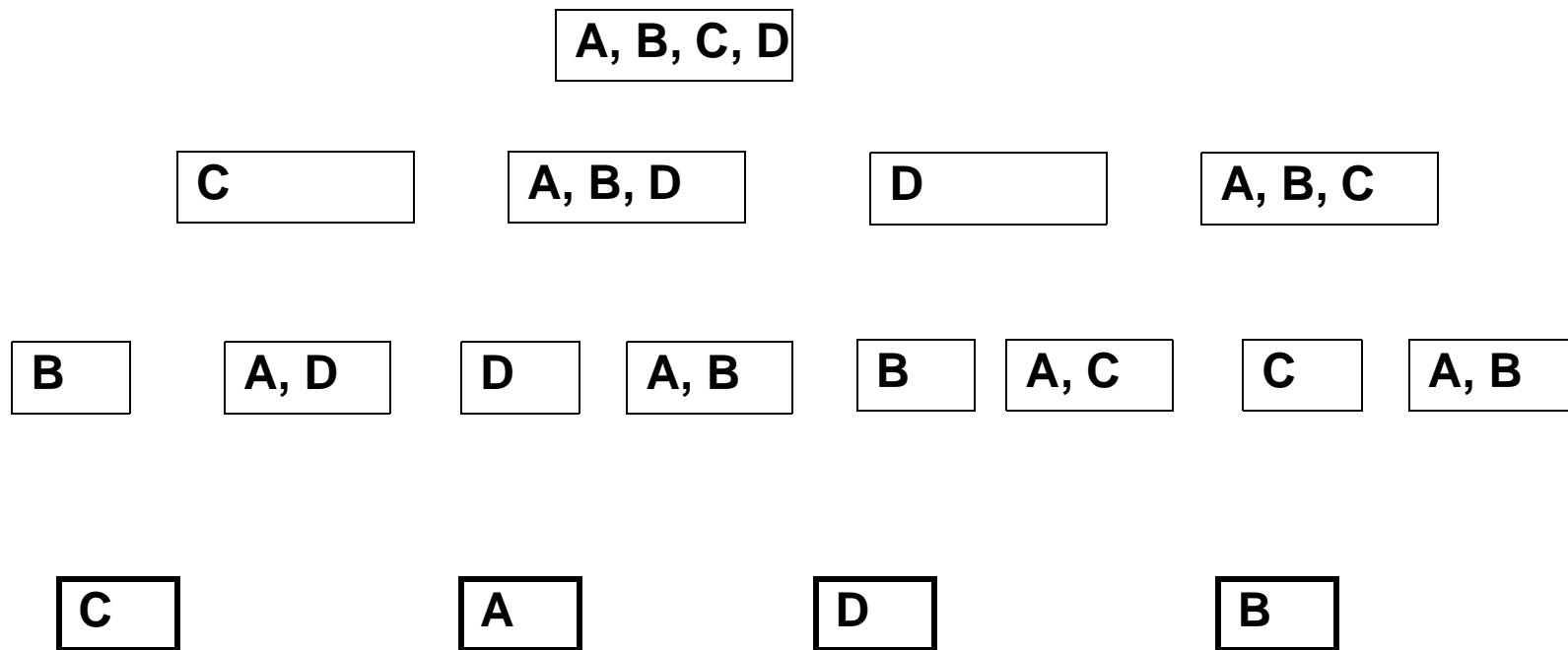
Remove D from A

Remove A from B

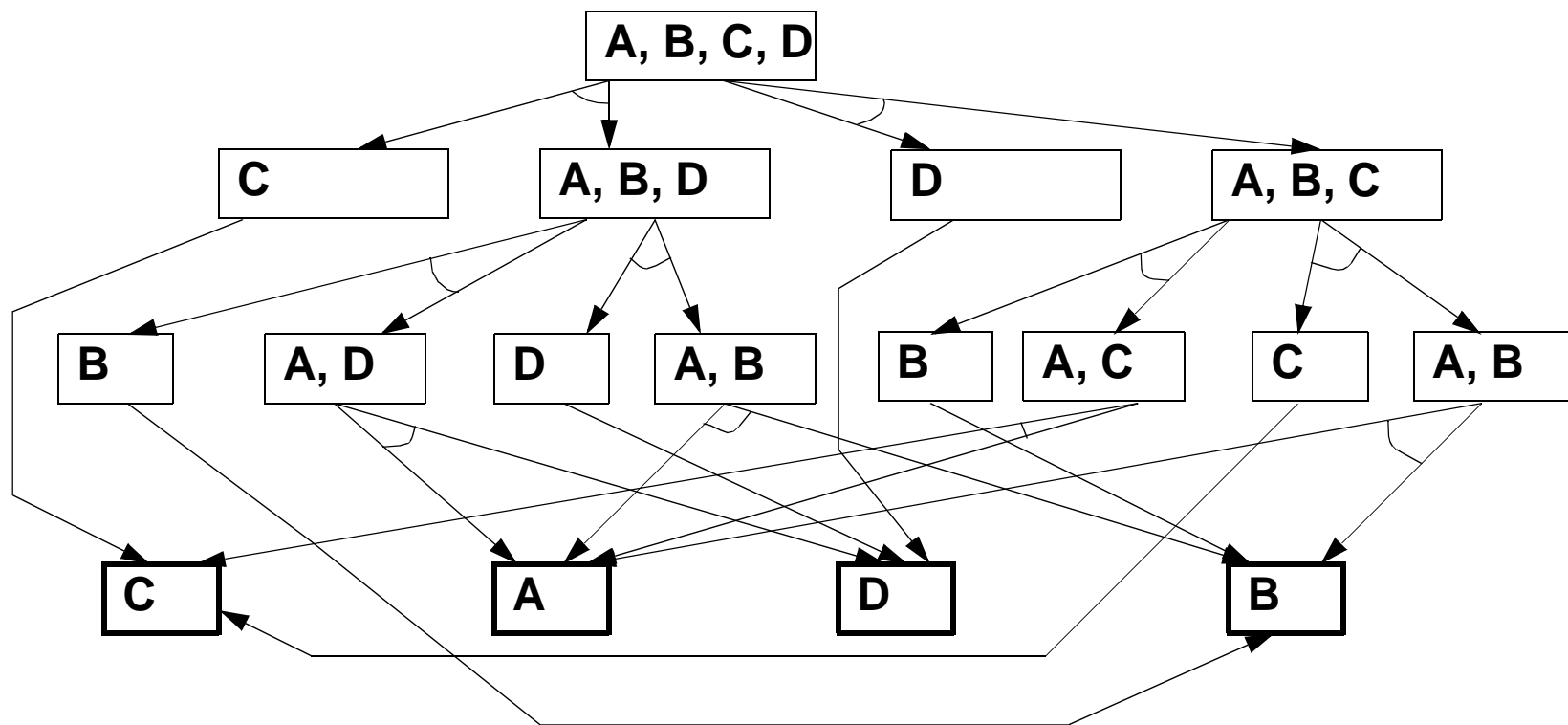
Remove C from A

For complex products, the number of alternatives is large.

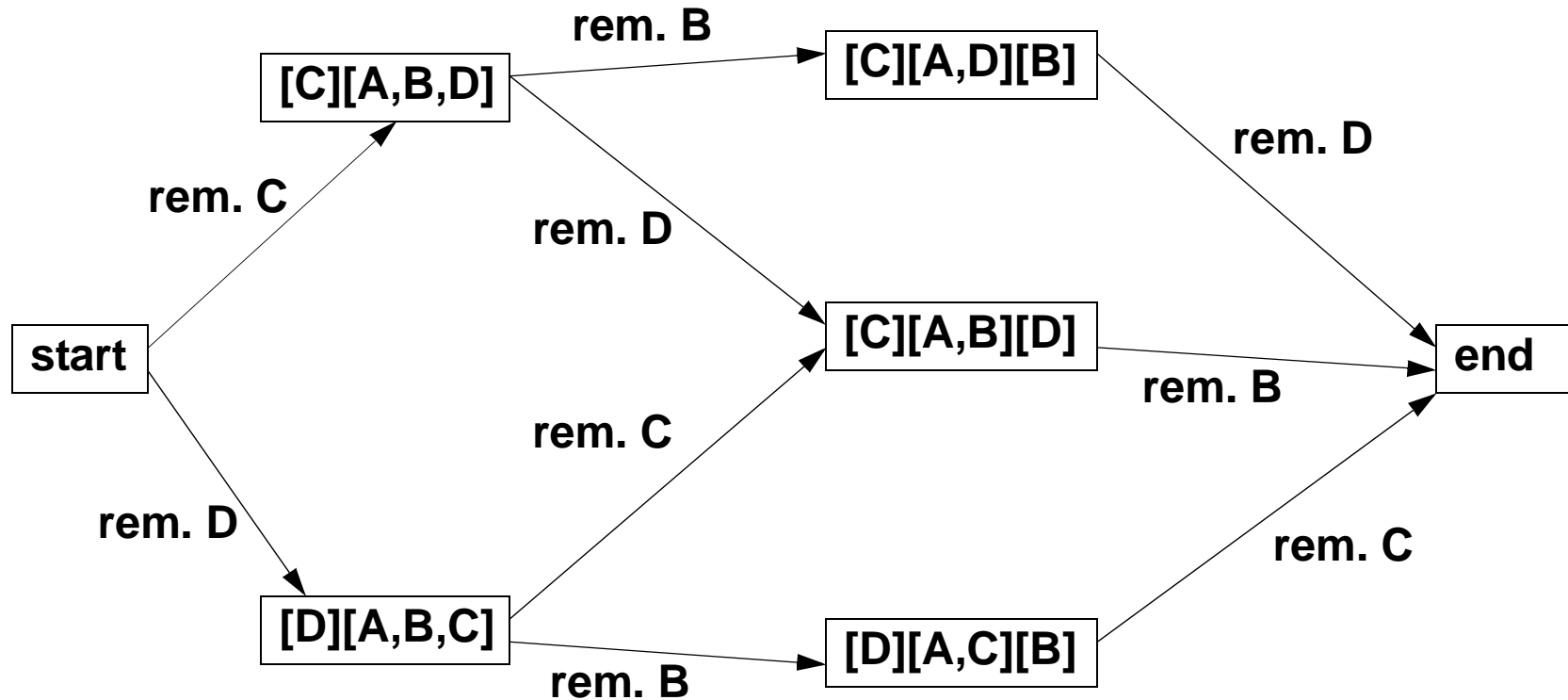
Disassembly Sequence ("and or" diagram)



Disassembly Sequence ("and or" diagram)



Disassembly Sequence (network model)



Separate subassemblies in []