

The logo for CWI (Centrum Wiskunde & Informatica) is a red trapezoidal shape with the letters 'CWI' in white, bold, sans-serif font.

Centrum Wiskunde & Informatica

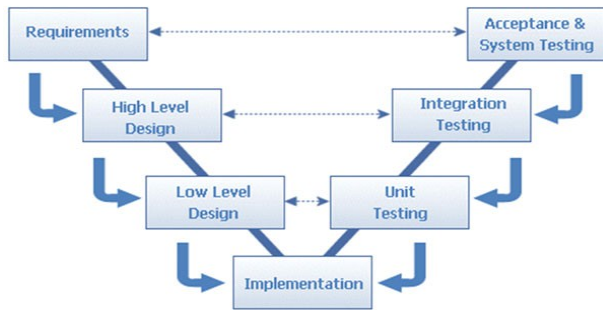
Managing clone mutations in Simulink models

Yanja Dajsuren

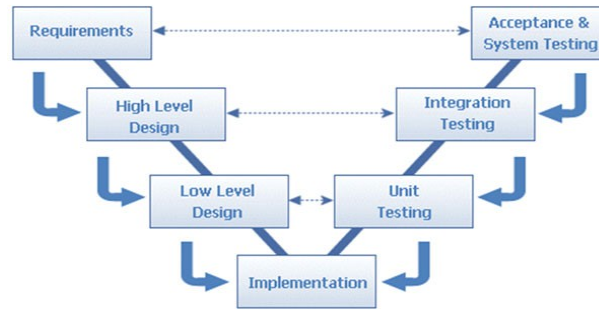
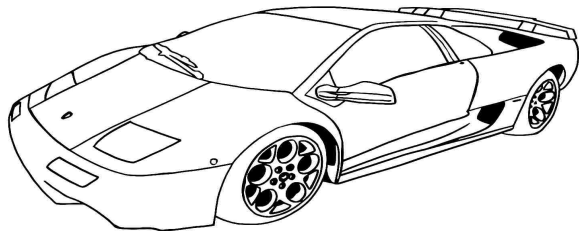
Research Meet on 'System Engineering'
High Tech Systems Center

December 3, 2015
Eindhoven, the Netherlands

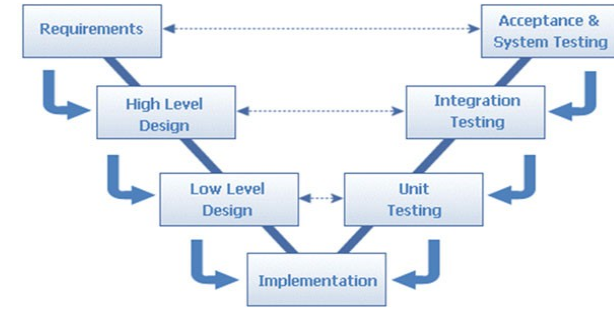
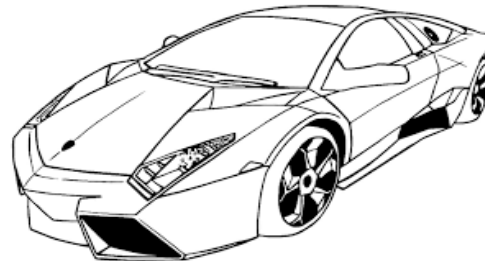
Independent Software Development



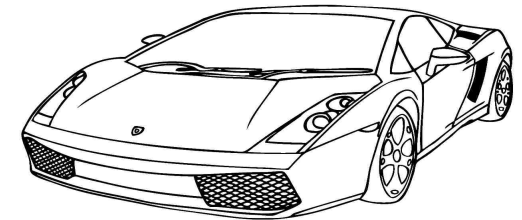
Software



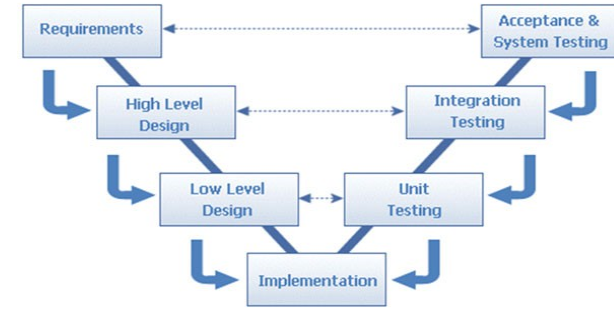
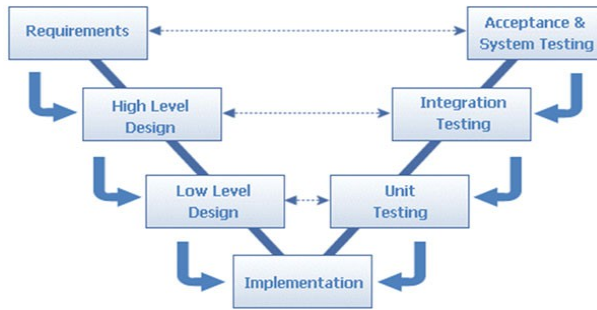
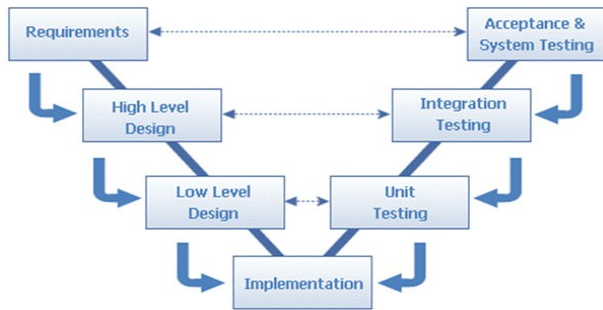
Software



Software



Software Development with Conventional Reuse

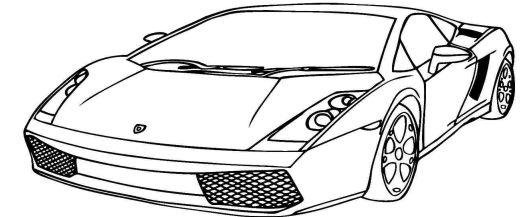
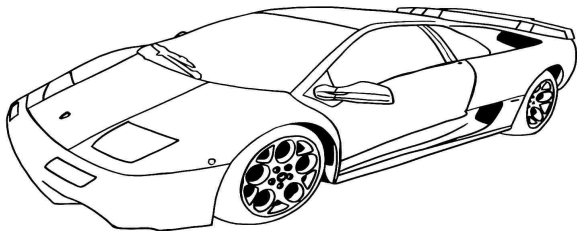


Software

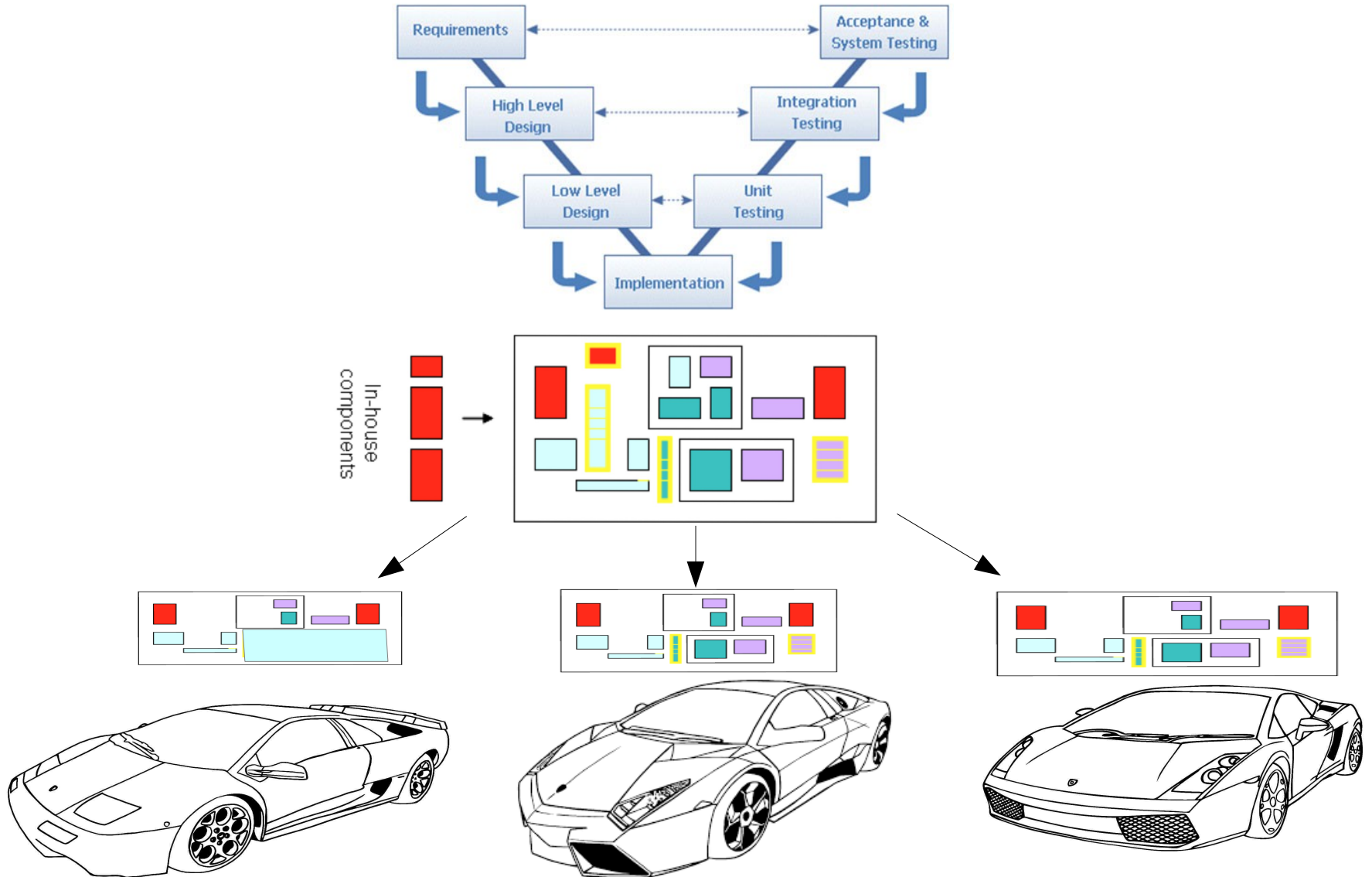
Software

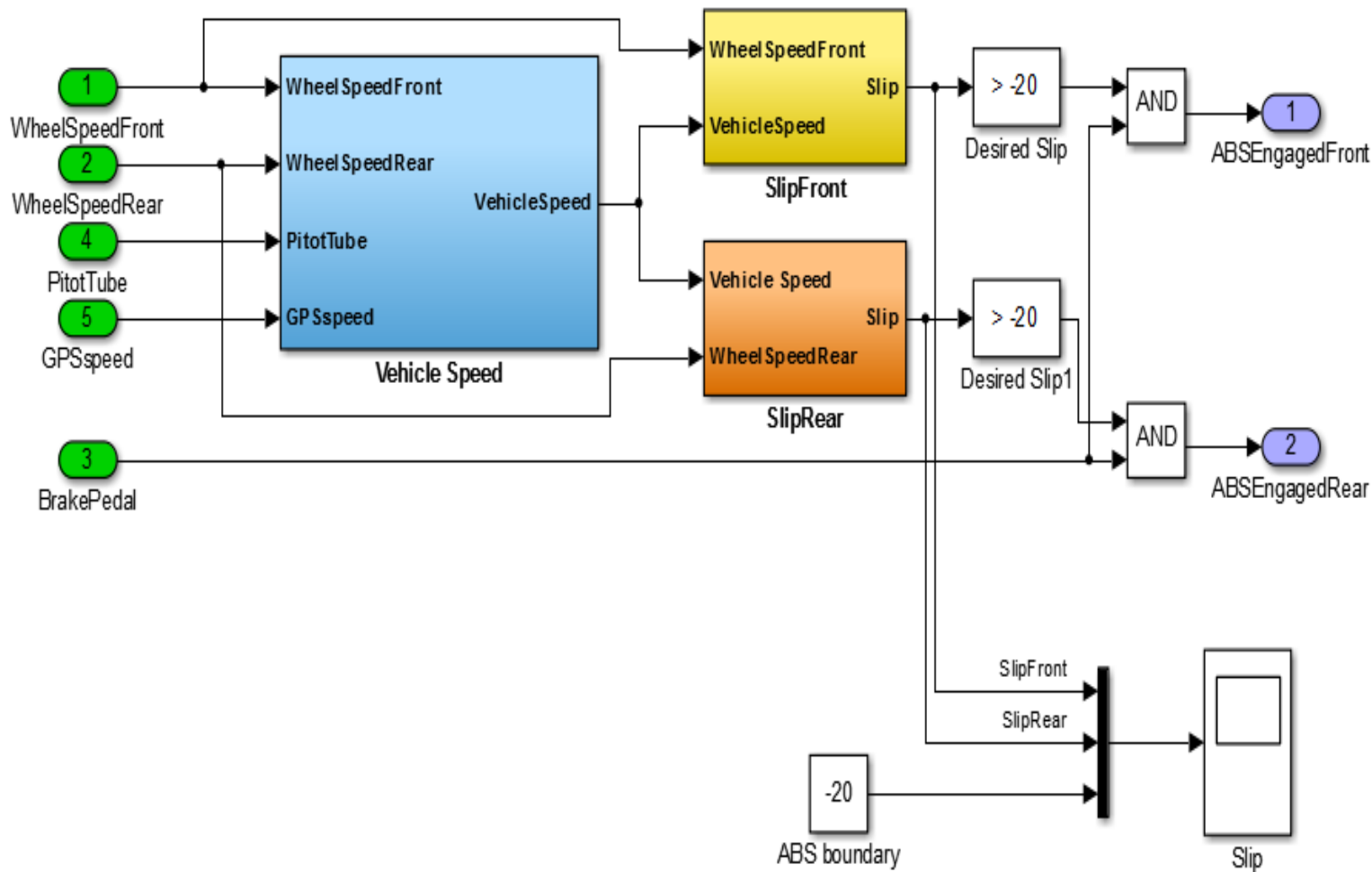
Software

Reusable Assets



Product Line Oriented Development





Software

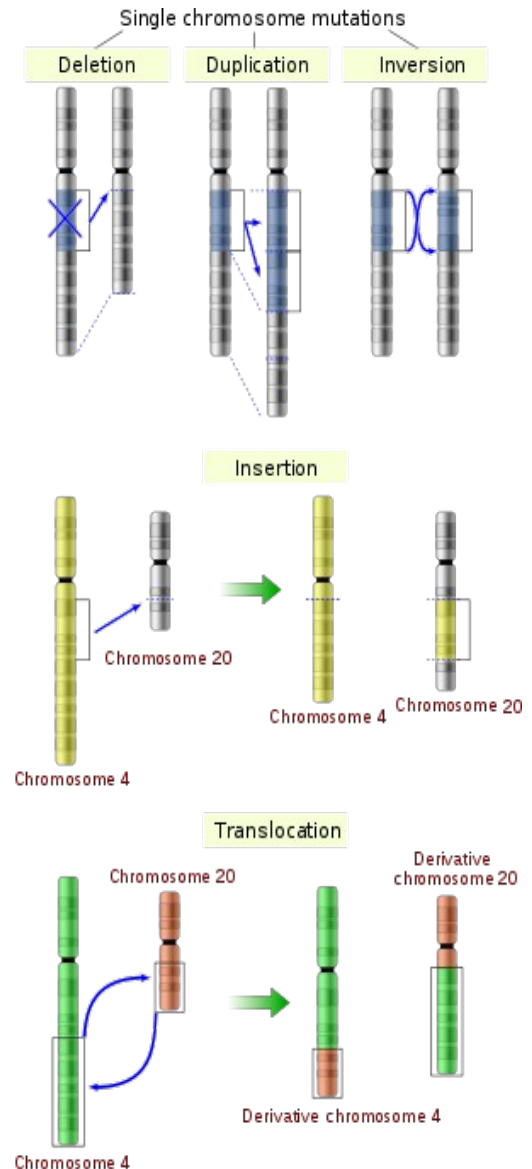
Software

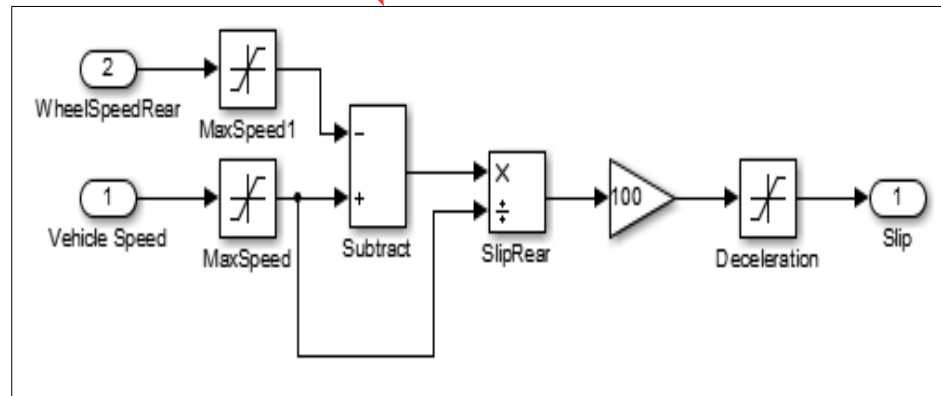
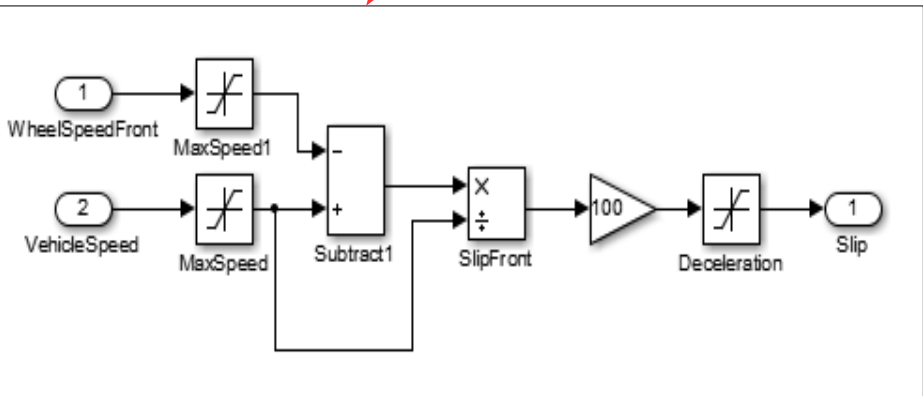
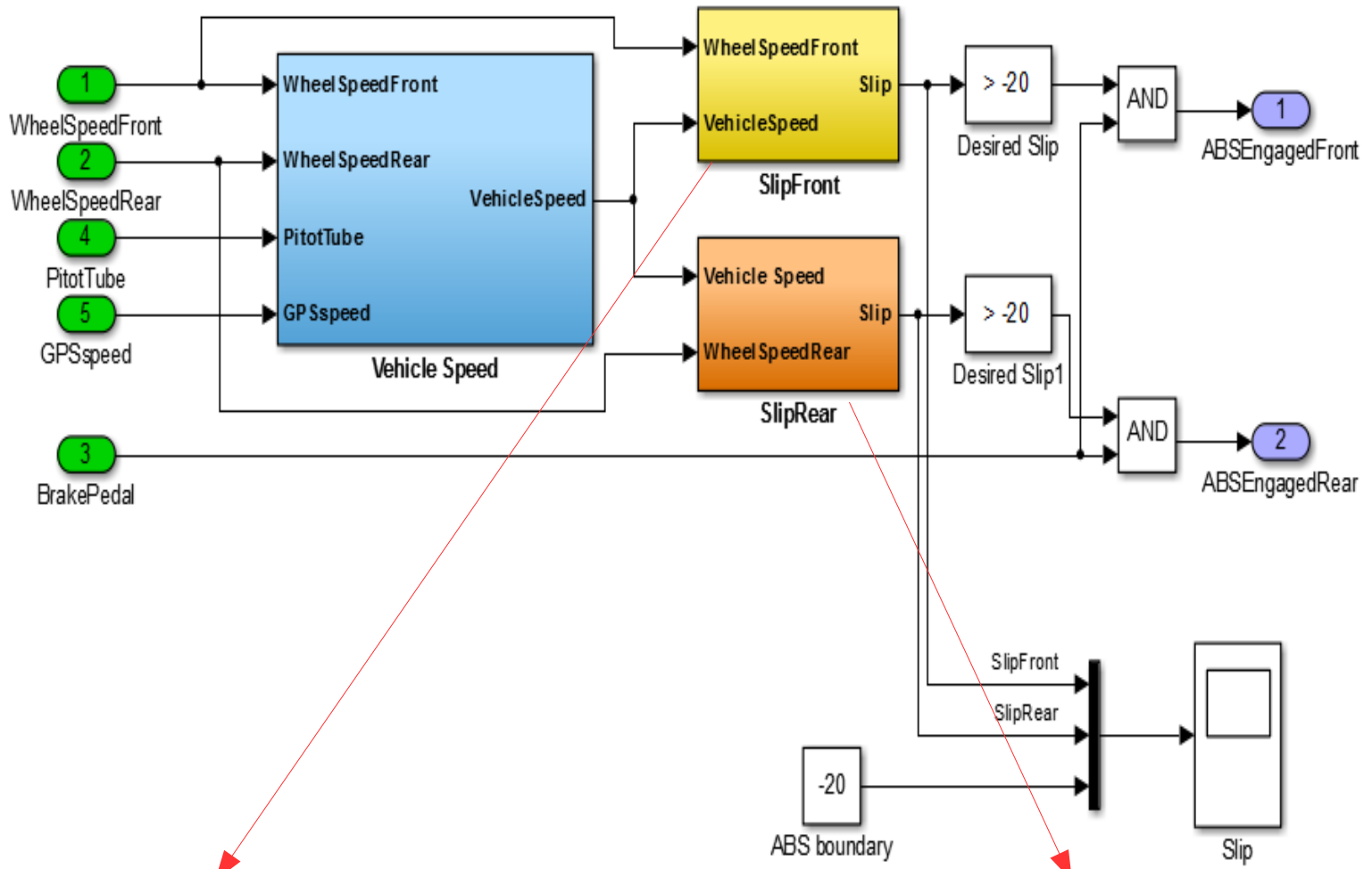
Software

Reusable Assets (Simulink Library Blocks)

Simulink Clone Mutations

- According to Stephan et.al:
 - Different layout (color, position, size, other attributes) of elements
 - Different ordering of elements (blocks, lines, ports, branches)
 - Different names of elements (blocks, lines)
 - Different values of elements (blocks)
 - Added or deleted block
 - Changed block type...





Simulink Clone (Textual Format)

```
Block {
  BlockType
  Name "SlipRear"
  SID "35"
  Ports [2, 1]
  Position [355, 110, 460, 170]
  ZOrder 62
  BackgroundColor "[1.000000, 0.886275, 0.000000]"
  FontWeight "bold"
  MinAlgLoopOccurrences off
  PropExecContextOutsideSubsystem off
  RTWSystemCode "Auto"
  FunctionWithSeparateData off
  Opaque off
  RequestExecContextInheritance off
  MaskHideContents off
  Port {
    PortNumber 1
    Name "SlipRear"
    RTWStorageClass "Auto"
    DataLoggingNameMode "SignalName"
  }
  System {
    Name "SlipRear"
    Location [1592, 0, 2888, 1000]
    Open off
    ModelBrowserVisibility off
    ModelBrowserWidth 200
    ScreenColor "white"
    PaperOrientation "landscape"
    PaperPositionMode "auto"
    PaperType "A4"
    PaperUnits "centimeters"
    TiledPaperMargins [1.270000, 1.270000, 1.270000, 1.270000]
    TiledPageScale 1
    ShowPageBoundaries off
  }
}
```

```
Block {
  BlockType
  Name "SlipFront"
  SID "29"
  Ports [2, 1]
  Position [355, 20, 460, 80]
  ZOrder 60
  BackgroundColor "[1.000000, 0.886275, 0.000000]"
  FontWeight "bold"
  MinAlgLoopOccurrences off
  PropExecContextOutsideSubsystem off
  RTWSystemCode "Auto"
  FunctionWithSeparateData off
  Opaque off
  RequestExecContextInheritance off
  MaskHideContents off
  Port {
    PortNumber 1
    Name "SlipFront"
    RTWStorageClass "Auto"
    DataLoggingNameMode "SignalName"
  }
  System {
    Name "SlipFront"
    Location [1592, 0, 2888, 1000]
    Open off
    ModelBrowserVisibility off
    ModelBrowserWidth 200
    ScreenColor "white"
    PaperOrientation "landscape"
    PaperPositionMode "auto"
    PaperType "A4"
    PaperUnits "centimeters"
    TiledPaperMargins [1.270000, 1.270000, 1.270000, 1.270000]
    TiledPageScale 1
    ShowPageBoundaries off
  }
}
```


Variant Configuration Language (VCL)

```
#set subsystem_name = "Layout2a_Position"  
#set subsystem_location = "[596, 16, 1412, 554]"  
#output "Layout2a_Position.mdl"  
#adapt "Position.vcl"
```

SPC file

<adapts>

```
System {  
  Name           ?@subsystem_name?  
  Location       ?@subsystem_location?  
  Open           on  
  ModelBrowserVisibility on  
  ModelBrowserWidth 200  
  ...  
}
```

Position.vcl

VCL Processor

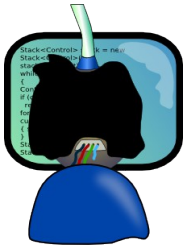
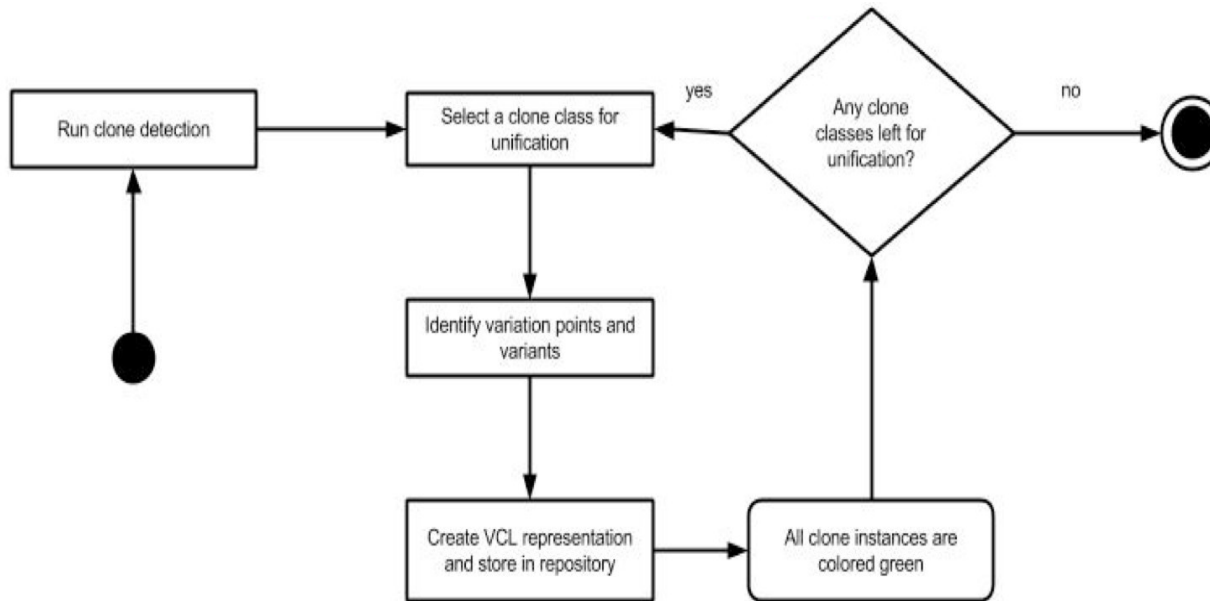
```
System {  
  Name           "Layout2a_Position"  
  Location       [596, 16, 1412, 554]  
  Open           off  
  ModelBrowserVisibility on  
  ModelBrowserWidth 200  
  ...  
}
```

Layout2a_Position.mdl

Approach



Workflow for the Model Manager:



Workflow for the Developer:

