Pairwise Testing

- Necessary condition
  - For each pair of input parameters, every combination of valid values of these two parameters be covered
- Example
  - Parameter A has values A1 and A2
  - Parameter B has values B1 and B2
  - Parameter C has values C1 and C2
- Discussion

Some Test Cases

- \{(A1, B1, C1), (A1, B2, C2), (A2, B1, C3), (A2, B2, C1), (A2, B1, C2), (A1, B2, C3)\}
- \{(A1, B1, C1), (A1, B2, C1), (A2, B1, C2), (A2, B2, C3), (A2, B1, C1), (A1, B2, C2), (A1, B1, C3), (A2, B2, C3)\}
- \{(A1, B1, C1), (A1, B2, C1), (A2, B1, C2), (A2, B2, C2), (A2, B1, C1), (A1, B1, C2), (A1, B1, C3), (A2, B2, C3)\}

Growth Terms

- Horizontal
  - Let T be a pairwise test set for parameters \(p_1, p_2, \ldots, p_{n-1}\)
  - Horizontal growth of T for parameter \(p_i\) is to extend each test in T by adding the value of \(p_i\).
- Vertical
  - After applying horizontal growth
  - Let T be a test set for \(p_1, p_2, \ldots, p_i\)
  - Let \(\pi\) be the set of tests not covered by T
  - The vertical growth of T according to \(\pi\) is to construct new tests for pairs in \(\pi\) and add them to T

Horizontal Growth

Algorithm: \(PGLH(T, p_i)\)

// T is a test set. But T is also treated as a list with elements in arbitrary order
// Assume that the domain of \(p_i\) contains values \(v_1, v_2, \ldots, v_m\).
\(\pi = \{\text{pairs between values of } p_i \text{ and values of } p_1, p_2, \ldots, p_{i-1}\};\)
if \(|T| \leq q\)
  \{ for \(1 \leq j \leq |T|\), extend the jth test in T by adding value \(v_j\) and remove from \(\pi\) pairs covered by the extended test; \}
else
  \{ for \(1 \leq j \leq q\), extend the jth test in T by adding value \(v_j\) and remove from \(\pi\) pairs covered by the extended test; \}
  { for \(q < j \leq |T|\), extend the jth test in T by adding one value of \(p_i\) such that the resulting test covers the most number of pairs in \(\pi\), and remove from \(\pi\) pairs covered by the extended test; \}
Vertical Growth

Algorithm IPO.V(T, π)
\{ let \( T' \) be an empty set: \}
for each pair in \( π \)
\{ assume that the pair contains value \( w \) of \( p_k \), \( 1 \leq k < i \), and value \( u \) of \( p_l \); \}
if \( T' \) contains a test with “-” as the value of \( p_k \) and \( \alpha \) as the value of \( p_l \)
modify this test by replacing the “-” with \( w \);
else
add a new test to \( T' \) that has \( w \) as the value of \( p_k \), \( \alpha \) as the value of \( p_l \),
and “-” as the value of every other parameter; \}
\};
\( T = T \cup T' \);