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)}
- {(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, …, 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, …, P_i
  - Let π be the set of tests not covered by T
  - The vertical growth of T according to π is to construct new tests for pairs in π and add them to T

Horizontal Growth

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

Vertical Growth

Algorithm *IPO_V*($\mathcal{T}, \pi$)
{ let $\mathcal{T}'$ 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_i;
    if ($\mathcal{T}'$ contains a test with "–" as the value of p_k and u as the value of p_i
      modify this test by replacing the "–" with w;
    else
      add a new test to $\mathcal{T}'$ that has w as the value of p_k, u as the value of p_i,
      and "–" as the value of every other parameter;
  };
  $\mathcal{T} = \mathcal{T} \cup \mathcal{T}'$;
};