# Precision On Demand: An Improvement in Probabilistic Hashing

*Igor Melatti, Robert Palmer, and Ganesh Gopalakrishnan*

UUCS-07-002

School of Computing
University of Utah
Salt Lake City, UT 84112 USA

1 February 2007

## *Abstract*

In explicit state (enumerative) model checking, state vectors are often represented in a compressed form in order to reduce storage needs, typically employing fingerprints, bit-hashes, or state signatures.

When using this kind of techniques, it could happen that the compressed image of a non-visited state $s$ matches that of a visited state $s' \neq s$, thus $s$ and potentially many of its descendants are omitted from search. If any of these omitted states was an error state, we could also have *false positives*. We present a new technique which reduces the number of omitted states, by requiring a slightly higher computation time, but without employing any additional memory.

Our technique works for depth-first search based state exploration, and exploits the fact that when a non-terminal state $t$ is represented in the hash table, then one of the successors of $t$ (the first to be expanded next, typically the left-most) is also represented in the visited states hash table. Therefore, instead of backing off when the compressed state images match, our algorithm persists to see if any of the left-most successors also matches (the number of successors which are considered for each state is user-defined, thus we name our approach Precision on Demand or POD).