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Data Escape Analysis for Process-Oriented Systems

Fringe Presentation

Martin ELLIS and Frederick BARNES

School of Computing, University of Kent, Canterbury, UK
{M.C.Ellis, F.R.M.Barnes}@kent.ac.uk

Abstract. Escape analysis, the technique of discovering the boundaries of dynamically allocated objects, is a well explored technique for object-orientated languages (such as Java and C++) and stems from the functional programming community. It provides an insight into which objects interact directly (and indirectly) and can inform program correctness checking, or be used for directing optimisations (e.g. determining which objects can safely be allocated on a function-local stack). For process-oriented languages such as occam-π [1] and Google's Go, we have explored *mobile* escape analysis, that provides concise information about the *movement* of objects (mobiles) within networks of communicating processes [2]. Because of the distinction between *processes* (as execution contexts) and *objects* (dynamically allocated data, channels and processes), combined with strict typing and aliasing rules, the analysis is somewhat simpler then for less strict languages. This analysis is only concerned with dynamically allocated blocks of memory — it does not give any consideration for the data contained within these. However, knowing the extent to which *data* (statically or dynamically allocated) *escapes* within a network of communicating processes is arguably useful — and is not necessarily a superset of mobile escape. The fringe presentation describes an extension to the mobile escape model that seeks to capture semantic information about the *data escape* of a process-oriented system. This provides richer semantic information about a process's behaviour (that can be used in verification) and has clear application to security (e.g. by demonstrating that particular data does not escape a set of communicating processes).

Keywords. escape analysis, occam-pi, mobiles, security.

References

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