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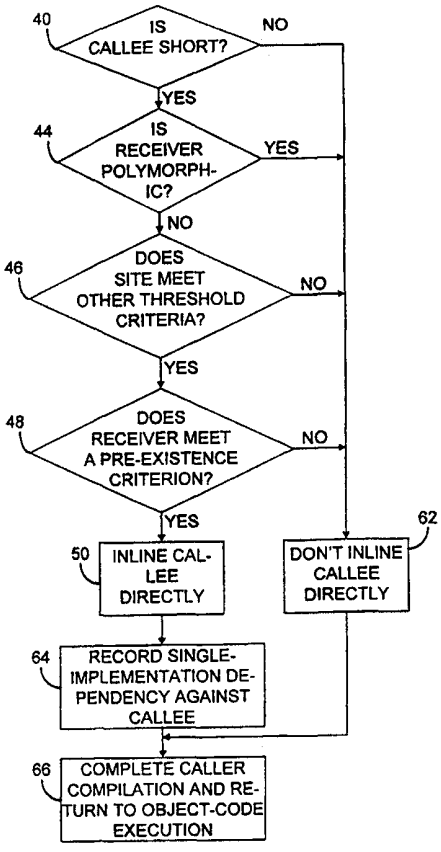
(54) **Title:** METHOD FOR DIRECTLY INLINING VIRTUAL CALLS WITHOUT ON-STACK REPLACEMENT

(57) **Abstract**

A dynamic compiler determines whether to inline methods in place of virtual method calls by inspecting such calls' receiver expressions. If a given call site meets other criteria for inlining, the method is inlined if its receiver expression can be proved to have a property called "pre-existence". One kind of expression whose pre-existence is easily proved is a calling-procedure argument to which the body of the calling procedure makes no assignment. One of the other criteria is that the argument's static type is a class whose definition of the callee method has not been overridden, and the compiler employs a dependency data structure to record against both the caller and the callee that the caller contains code whose validity depends on the assumption that this criterion has been met. If the compiler thereafter compiles another implementation of the callee method, it inspects the dependency structures in which dependencies have been recorded against the callee method, and it recompiles the callers whose object code's validity is indicated by such structures to depend on that callee method's not having been overridden. The restriction of inlining to pre-existing receiver expression allows currently running invocations of the original compilation of the caller method to continue without fear of error.



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INTERNATIONAL SEARCH REPORT

Inte .onal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F9/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 579 518 A (YASUMATSU KAZUKI) 26 November 1996 (1996-11-26) column 2, line 45 -column 7, line 27 ---	1-7, 9-15, 17-23, 25-31, 33-39
A	CHAMBERS C ET AL: "An efficient implementation of SELF, a dynamically-typed object-oriented language based on prototypes" LISP AND SYMBOLIC COMPUTATION, JULY 1991, NETHERLANDS, vol. 4, no. 3, pages 243-281, XP000299230 ISSN: 0892-4635 page 63 -page 64, paragraph 6 --- -/--	8,16,24, 32,40

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
31 March 2000	07/04/2000

Name and mailing address of the ISA	Authorized officer
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Inte .onal Application No
PCT/US 99/23349

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate. of the relevant passages	Relevant to claim No.
P,X	DETLEFS D ET AL: "Inlining of virtual methods" ECOOP'99 - OBJECT-ORIENTED PROGRAMMING. 13TH EUROPEAN CONFERENCE. PROCEEDINGS, PROCEEDINGS OF ECOOP'99: 13TH EUROPEAN CONFERENCE ON OBJECT-ORIENTED PROGRAMMING, LISBON, PORTUGAL, 14-18 JUNE 1999, pages 258-278, XP000901020 1999, Berlin, Germany, Springer-Verlag, Germany ISBN: 3-540-66156-5 page 271 -page 275, paragraph 5 ---	1-7, 9-15, 17-23, 25-31, 33-39
E	EP 0 950 947 A (SUN MICROSYSTEMS INC) 20 October 1999 (1999-10-20) column 8, line 6 -column 9, line 14; figures 6-8 -----	8,16,24, 32,40

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte ional Application No
PCT/US 99/23349

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