PACKAGE ID - 000820SGIIP00 SANDROS

KWIC TITLE - A Collision-Free Motion Planner for Robot Manipulators

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LIMITATION CODE -COPY **AUDIENCE CODE -** LIM

COMPLETION DATE - 09/01/1991 **PUBLICATION DATE -** 09/01/1991

DESCRIPTION - SANDROS computes a collision-free motion to move a robotic manipulator from one configuration to another. Given the geometric descriptions of the manipulator links and obstacles in the surrounding environment, the SANDROS code finds a collision-free path if it exists, which is outputted in the form of a sequence of joint angles.

PACKAGE CONTENTS - Media Directory; Software Abstract; Media Includes Source Code, User Guide, Executable Module, Compilation Instructions, Linking Instructions, Object Modules, Sample Problem Input Data;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - Motion planning is done by first computing the set of joint angles that do not cause a collision between the robot and the obstacles (map building), and then searching for a sequence of joint angles from the collision-free set that connects the starting and target configurations of the robot. Since the map building takes many hours of compilation time, the SANDROS code interleaves the search with map building, and finds a solution path with minimal map building. It computes intermediate subgoals, which correspond to a set of robot configurations with a locally maximal distance between the robot and the obstacles. These subgoals are used as landmark points in finding a collision-free course.

COMPUTER - SILICON GRAPHIC

OPERATING SYSTEMS - IRIX 4.0.5.E

PROGRAMMING LANGUAGES - C

SOFTWARE LIMITATIONS - The number of joints of the robot should be less than 17. This limit could be increased by changing the constant MAX DOF. The number of discretization points of a joint angle which is given by dividing the joint range by the joint step size should be less than HEAP SIZE which has to be less than 65534. The shapes of the obstacle and the robot links should be polyhedral. Curved objects must be approximated with polyhedra. The robot manipulators

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SOFTWARE LIMITATIONS -(CONT) need to be serially linked. SANDROS does not work with parallel manipulators.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - Traditional motion planners either take hours of computation time, or fail to find a solution even if one exists. The SANDROS code finds a solution for a typical industrial robot with 6 joints in about a few minutes, while guaranteeing the solution at a user-specifiable resolution. For robots with less than 3 degrees of freedom, however, the SANDROS code offers no advantage over a simple brute-force grid search.

OTHER PROG/OPER SYS INFO - The SANDROS code consists of *.c and *.h files. The documentation files have the suffix .doc. The SANDROS code uses the forms library to display the search process and the collision-free motion found. The forms library is a low-level graphics library for SGI workstations, freely available on the internet. Version1.0 is used with the SANDROS code; a newer version is available from Mark Overmars at markov@cs.ruu.nl.

HARDWARE REQS - The SANDROS code is 105 Kbytes of C codes and the executable is 805 Kbytes. A Unix workstation with 100 MB of memory and 8Mbytes of RAM is sufficient

TIME REQUIREMENTS - The SANDROS running time is a function of the number of degrees of freedom and the number of obstacles. For a typical 6-degrees-of-freedom robot with 10 obstacles, the SANDROS takes on the order of 5 to 10 minutes, in both wall clock and computer time.

REFERENCES - Informal documentation.

ABSTRACT STATUS - Submitted 4/12/95. Released AS-IS 7/5/95.

SUBJECT CLASS CODE - T

KEYWORDS -
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SPONSOR - DOE/DP

PACKAGE TYPE - AS - IS