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(54) **HIERARCHICAL GEOMETRIC PLAN COMPOSITION (HGPC) FRAMEWORK FOR ROBOT TASK PLANNING**

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CPC ***B25J 9/1664*** (2013.01); *Y10S 901/02* (2013.01)

(58) **Field of Classification Search**
CPC B25J 9/1664; B25J 9/1671; B25J 9/1602; B25J 9/1628
See application file for complete search history.

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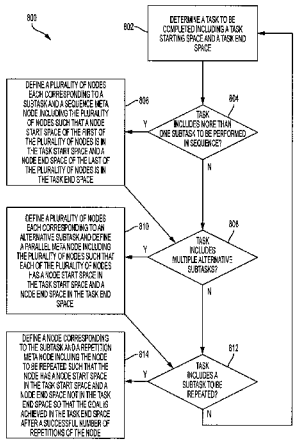
(57) **ABSTRACT**

A robot includes at least one actuator or motor and a processor configured to represent the task as a meta-node having a meta start space representing starting configurations and a meta end space representing ending configurations. The meta-node may be parallel including a first sub-node and a second sub-node each having a start space within the meta start space and an end space within the meta end space. The meta-node may also be a repetition meta-node including a third sub-node having a start space within the meta start space and an end space outside of the meta end space such that the meta end space is reached by multiple executions of the third sub-node. The processor may also simulate the task by executing the meta-node and instruct the actuator to actuate the portion of the robot based on the simulation.

20 Claims, 9 Drawing Sheets