Sequencing Problems: A Review

Abstract:

Sequence is the order that commands are executed by a computer, allows us to carry out tasks that have multiple steps. The paper consists of a review of the sequencing problems including the generic applications in the real world. It also proposes several ideas as to how to apply the concept of sequencing everywhere around us. The most common application is in the field of machine and machine automation. It also opens up into the field of biology which is also discussed further in the paper.

Introduction:

One of the three basic logic structures in computer programming. The other two logic structures are selection and loop.

In a sequence structure, an action, or event, leads to the next ordered action in a predetermined order. The sequence can contain any number of actions, but no actions can be skipped in the sequence. The program, when run, must perform each action in order with no possibility of skipping an action or branching off to another action.

All logic problems in programming can be solved by forming algorithms using only the three logic structures, and they can be combined in an infinite number of ways. The more complex the computing need, the more complex the combination of structures.

Assembly sequencing of machine parts:

The principal results in single machine problems, classifying them according to the optimality criterion chosen and also discusses problems related to parallel machine, open shop, flow shop and job shop problems[1]. The most recent advances being in parallel machine scheduling.

There is also an approach for assembly sequence planning by genetic algorithms. This strategy allows to minimize the number of reorientation and tool changes, to decrease the tool operations during an assembly process[2]. The main contribution of this work is the inclusion of a reduced disassembly matrix is the solution of the present problem, by genetic algorithms.

The problem of automatically finding all the feasible assembly sequences for a set of a parts that construct a mechanical object is presented. A novel method proposed here is feasible and practical in generating all the feasible assembly sequences when the number of parts is greatly increased. An efficient method coupled with a pattern matching operation to generate all the feasible assembly sequences is proposed. Acquisition of the precedence knowledge is derived from the terminology of the state constrained traveling salesman problem (SCTSP)[3]. The SCTSP method is to prohibit generation of next valid states during states expansion. The solution of the assembly schedule can be easily obtained by solving SCTSP as well. The proposed method shows feasibility and economy for a large number of parts to be assembled.

A novel programming-free automated assembly planning and control approach based on virtual training is also proposed to give solutions for the future industry which uses the 3-D models of the products[4]. This feature is used in a search-based planner to generate assembly sequence, and to plan assembly path.

Disassembly Sequence Planning aims to look for the best disassembly sequences economically as well as environmental-friendly. Its cost and time problems are also discussed.

We have also considered an experience-based assembly sequence planner for mechanical assemblies which presents an approach to the assembly sequence planning problem based on a “plan reuse” ideology.

Max-Min Ant System based approach for assembly sequence planning. It proposes a metaheuristic for minimizing the number of reorientation and tool changes, to decrease the total operations during an assembly process. The work considers six possible assembly operations along the positive and negatives axes. To guarantee the validity and feasibility of sequences a disassembly matrix is used in the proposal. It is also used to construct dynamically the disassembly completed graph of the problem and for saving memory in its representation.[7] The main contribution of this paper is the resolution of the problem by the Max-Min Ant System considering four constraints: number of reorientations, tool changes, precedence and geometric constraints.

Algorithms for the generation of all mechanical assembly sequences for a given product is also discussed. It employs a relational model of assemblies. The model also includes a representation of the attachments that bind one part to another.

This sequencing technique is also used in nuclear fusion reactors. A four series connected central solenoid converter sequence control of a nuclear fusion convertor to reduce reactive energy power by using a digital simulator is described.

Incorporating the time into the recommendation algorithm greatly enhances the performance. There is a proposal of a time aware model based recommendation system[10].There is a hidden network structure among the items and each user tracks a sequence of items in this network.

General sequencing problems:

There are also some generic sequencing problems discussed in the papers. The most common algorithm used here is the recommendation algorithm. “Learn as you go” is an assembly of off-the-shelf components. This has reduced both the costs and time to develop new capabilities which in turn has helped in the rapid growth of e-business[11]. “Efficient mobile sequential recommendation” has a method to solve the mobile sequential recommendation problem in two separate stages: an offline pre-processing stage and an online search stage. “Cluster Validation” is the process of evaluating the quality of cluster results and plays an important role for practical machine learning systems. “Genome Sequence Assembly” are the algorithms that can assemble millions of small DNA fragments into gene sequences underlie the current revolution in biotechnology[14]. Genome represents a set of instructions that controls the replication and function of each organism. Recommendation Algorithm has a numerous number of applications which include deep learning, personalized travel sequence recommendation and book recommendation algorithm for digital libraries which is pretty helpful in colleges and universities.

There are two main challenges for automatic travel recommendation: Point of interests are different for all the users, it is important to recommend a sequential travel route rather than individual point of interest.

Personalized course sequence recommendation is a very important variable in student’s learning. So as to make such tailor made courses sequencing can be of great help.

The framework for personalized live channel recommending via deep learning from a historical switching sequence with a long short-term memory (LSTM)[17] neural network is also discussed.

Conclusion

So this is a small study of the variety of paper in these fields which provide us with ample amount of information in the field and justify the importance, versatility and value of this topic. We also saw how universally the concept is being used and further studies will have greater impact on the amount of its applications.

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