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Research Article

Travelling Salesman Problem in Context of Supply Chain Management

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In today's business environment, supply chain management (SCM) is recognized as managing the flow of information and materials from supplies to customers. In usual sense, a supply chain may be defined as system of organization, individuals, technologies, activities, information and resource involved in moving a product or service from right supplier or right group of suppliers to end users .In real business situation, SCM have many issues , out of which logistics is also an important one.

Logistics cover issues related to the flow of physical goods between the original supplier and the point where goods distributed to the end user, overall focus of logistic planning is towards achieving profit with customer satisfaction. Logistics involves the integration of information, transportation, inventory, warehousing, material handling, packaging, and often security. It decides the channel for supply chain.

Definition of Supply Chain Management

Supply chain management (SCM) is the management is a set of approaches utilized to efficiently integrate a network of interconnected suppliers, products (manufacturing , inventory, packaging, loading/unloading of products) transportation utilities, warehouses, retailers, businesses involved in the provision of product and service packages required by the end customers .In tradition the chain is characterized as characterized flow of material in forward direction and backward flow of information.

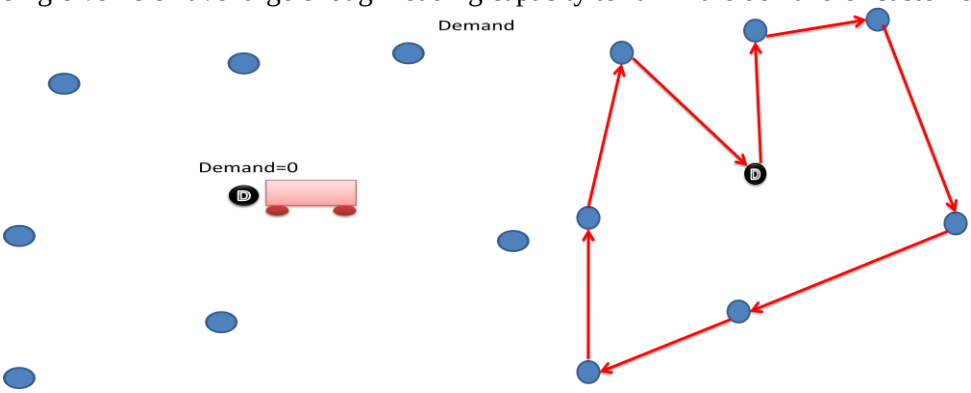
Logistics in Supply Chain Management

Logistics is the part of the supply chain where, planning, implementation, and control approaches are there for effective, efficient flow of goods in forward direction and related information flow in reverse direction between point of origin and end customers in order to meet requirements as distribution of goods plays an important role in SCM.

Travelling Salesman Problem

In travelling salesman problem there are list of cities (nodes) and their pairwise distances, find the shortest tour that visits each city exactly once, This idea is closely associated with our logistics design where decision making for selecting routes for movement of vehicles which started from depot and deliver the requirements at customer end afterwards it return back to place from where it started, vehicle

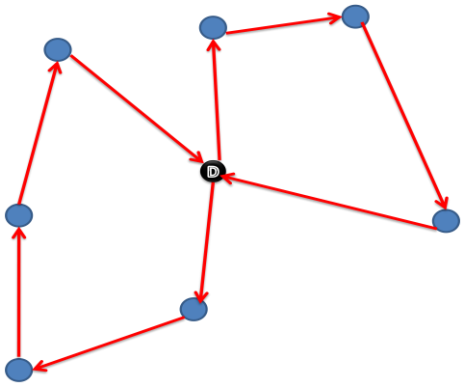
form a Hamiltonian cycle (every node visited once only except origin), here our assumption is that a single vehicle have large enough loading capacity to fulfill the demand of customers.

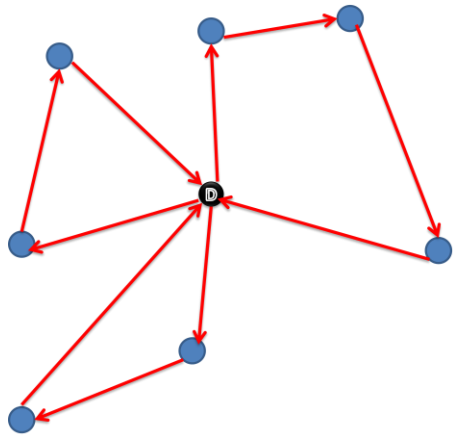


Vehicle Routing Problem

Vehicle routing problem is variation of travelling salesman problem (TSP) where in TSP single vehicle serve the nodes to meet the demands of customers and in VRP more than one vehicles required in order meeting customer's demand.

Sometime other restrictions also causes to required more vehicles to serve demand of customers (fig).





The literature in this field addresses situations with a variety of characteristics such as the travelling cost , time window ,customer visiting time, service start time, service time(fixed and variable),vehicle capacity limitation, maximum routing time and many others. The objective of solution can be stated as the minimizing cost costs, such as fleet size, total distance of tours. Vehicle routing problems are combinatorial in nature. This work addresses the variant of vehicle routing problem with time windows (VRPTW), which allows a number of deliverymen to be assigned to each route. This variant is particularly relevant to situations with long service times when compared with travelling times and it is derived from real life applications for which daily request must be served in same day and total operation must be completed in given maximum permissible time. Service time is also function of the vehicles crew size (deliverymen assigned to vehicle) rather than fixed for a given request. The reduction of service times due to extra deliverymen often impacts the number of vehicles used and total distance travelled. If we have multiple depots from where vehicle can start and end with meet the demand of customers also helped in travelling cost reduction and result in fewer vehicles used and also reduced the number of deliverymen.

This variant is particularly relevant to situations with long service times when compared with traveling time and it is derived from life applications for which daily requests must be delivered of the same day and the total operation must be completed within the maximum permissible time. Service time also function of the vehicle crew size (delivery men assigned to vehicle) rather than fixed for a given request. The reduction of service times due to extra delivery men often impacts the number of vehicle used and the total distance traveled. If we have multiple depots from where vehicle can start and end with meet demand of customers also helped in traveling cost reduction and result in less vehicles used also some time use relatively less deliverymen.

We call this variant the vehicle routing problem with time .Windows and multiple delivery men with multiple depots. This problem arises in situations faced by warehouse in India that deliver goods in when areas on regular basis. Typical example are soft drinks ,milk companies .They delivery products to meet the customer demands those customers are situated in area where traffic congestion is high ,most of the time and customer does to each others are seen as a demand site of a given cluster by vehicles deliver and assigned deliverymen. Hence goods are delivered in two phase approach. First the vehicle travel from depot to site and then deliverymen will service to customers in cluster on foot (because movement of the vehicles is not possible in this area). Since these markets are highly conjunctive and policy is to serve all demands in daily basis. The term competition have basis that a customer have more options. To buy same goods from other warehouse if delivery is not happening on time. The competition is implies as to make delivery on time and to reach more customers, as every cluster the delivery of goods by deliverymen took time. Our strategy is to increase the assigned delivery (that is limit in max deliverymen because sitting space problem with vehicle) so the service time reduce and this saved time help-s that servicing at remaining clusters in the given time window.

Therefore in addition to the usual vehicle routing and scheduling decisions, a selection for VRPTWMD-MDe must also include the decision of starting depot number of deliverymen in each route in order to serve maximum number of clusters with the regular working hours with the fleet and deliverymen available, as the minimum cost of vehicles and deliverymen

VRP's classification, solution methods and applications can be found in Golden and Assad [1988], Laporte and Souimis[1988], Laporte[1992], Osman[1993]. An exact algorithm was proposed by Nabil Azi, Potvin[2010] for VRPTW where fixed sized and fixed number of vehicles are available at depot to serve the demands of customers in a given time window and return back to depot. Pureza, Reimann[2012] made a comprehensive study on VRPTW with multiple deliverymen where service start at cluster(some combined customers) in given time window, this service did by deliverymen which are assigned to each vehicle, service time is inversely proportional to number of deliverymen, in practice this type of situation comes in long service time so these extra men reduce the serve time that help to serve large number of customers and return back the vehicle in permissible time. Other research areas include soft time window where waiting on early arrival is allowed (Ali, Ydashi[2010]), soft time window where late arrival is allowed but up to an extent (Charmenia, Maria[2004]). Some hard time windows models are proposed

where high penalty impose if delivery is not done in characterized window of customer. Another variation of VRP is VRP with split deliveries where each customer may served by more than one vehicle (Archetti and Speranza[2006]).

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