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Improve Courier deliver Services Using OR Techniques

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Abstract

There are numerous courier services available locally or worldwide. However, the most services only applicable at their respective company's whereby the pricing information is often hidden and customers usually need to call the company or visit their respective website or application to get quote, then make a price comparison with other company's courier services quotes for them to get their preferable quotation. This could be very time consuming mainly due to the inflexibility services whilst with certain terms and conditions apply only customers able to enjoy the door-to-door delivery service. Hence, the main objective of this project is to integrate a few of the courier services price and information in one stop whilst providing a low-cost peer-to-peer service to assist customer in delivering their parcel. The application will be able to generate the quotes of all the selected courier services in one application to ease the customer and enable a price comparison for each of the selected courier services company. The usability study was conducted and analysis of respondents' feedbacks shows positive interest of having this application and would opt to use the low-cost peer-to-peer services. With Parcel2Go Mobile Application, the problem of inconveniency of the customer and the inflexibility of services that have in the current courier services will be solved as this application will ease the people who wants to deliver their parcels.

Keywords: Mobile agents · Dijkstra's algorithm · Polynomial-time algorithm time-dependent shortest paths

Introduction

We focus on two algorithms for these problems that are:

a. A pseudo-polynomial dynamic programming algorithm, suggested in different papers such as [8], in which at every step, the maximization process is re-assessing the current status limit-wise, and optimizing the result, by picking the best item for the current stage.

b. Dijkstra's algorithm, that is an algorithm for finding the shortest paths between nodes in a graph, which is optimized in many researches.

The research combines the two problems and algorithms to a two-step problem that is described in the next part of this paper. There have been papers about dynamic programming solutions for the knapsack problem, using shortest path problem, with the creation of a knapsack graph but these papers gave a solution to the knapsack problem using the shortest path problem, thus considering two aspects of weight and value, as opposed to the complex problem presented here, taking into consideration three properties: item weight, item value and edge weight (that connects two items, but its weight is not depended on its vertices).

The process of booking a courier has changed, it is no longer a lengthy task of making numerous calls to different courier companies to request a quote. Booking a courier is predominantly carried out online. The courier industry has been quick to adapt to our ever-changing digital landscape, meeting the needs of mobile and desktop consumers as well as e-commerce and online retailers. Offering end users access to instant online payments, parcel tracking, delivery notifications, and the convenience of door-to-door collection and delivery to almost any destination in the world.

Courier services are a huge comfort to eCommerce sellers since they help in the seamless delivery of parcels upon charging a small amount for the job. The charges levied by the courier service in a parcel depend upon several factors such as weight and dimensions of the package being shipped, the geographical area of delivery, etc. A courier service owns transport across different mediums and hires a delivery fleet to deliver the packages.

Review Table

Sr No	Title	Abstract	Techniques	Future scope	Conclusion
1	A Review and Evaluations of Shortest Path Algorithms	Nowadays, in computer networks, the routing is based on the shortest path problem. This will help in minimizing the overall costs of setting up computer networks. New technologies such as map-related systems are also applying the shortest path problem. This paper's main objective is to evaluate the Dijkstra's Algorithm, Floyd-Warshall Algorithm, Bellman-Ford Algorithm, and Genetic Algorithm (GA) in solving the shortest path problem. A short review is performed on the various types of shortest path algorithms. Further explanations and implementations of the algorithms are illustrated in graphical forms to show how each of the algorithms works. A framework of the GA for finding optimal solutions to the shortest path problem is presented. The results of evaluating the Dijkstra's, Floyd-Warshall and Bellman-Ford algorithms along with their time complexity conclude the paper.	- Dijkstra's Algorithm - Floyd-Warshall Algorithm - Bellman-Ford Algorithm - Genetic Algorithm (GA)	the proposed GA framework will be extended and improved in finding the shortest path or distance between two places in a map that represents any types of networks. In addition, other artificial intelligence techniques such as fuzzy logic and neural networks can also be implemented in improving existing shortest path algorithms in order to make them more intelligent and more efficient.	The computed time complexity for each of the Dijkstra's, Floyd-Warshall and Bellman-Ford algorithms show that these algorithms are acceptable in terms of their overall performance in solving the shortest path problem. All of these algorithms produce only one solution. However, the main advantage of GA over these algorithms is that it may produce a number of different optimal solutions since the result can differ every time the GA is executed.
2	Computing a fuzzy shortest path in a network with mixed fuzzy arc lengths using α-cuts	We are concerned with the design of a model and an algorithm for computing a shortest path in a network having various types of fuzzy arc lengths. First, we develop a new technique for the addition of various fuzzy numbers in a path using α-cuts by proposing a linear least squares model to obtain membership functions for the considered additions. Then, using a recently proposed distance function for comparison of fuzzy numbers, we present a dynamic programming method for finding a shortest path in the network. Examples are worked out to illustrate the applicability of the proposed model.	- An algorithm for fuzzy shortest path in a network - An algorithm for computing a shortest path	-	A novel practical approach was proposed for computing a shortest path in a fuzzy network having mixed fuzzy arc lengths. In doing this, an α-cut method was presented to compute the addition of various fuzzy numbers as arc lengths. To obtain an approximation of the corresponding membership function for the addition, we proposed a linear least squares model. Finally, using a recently proposed distance function, we showed how to decide distances for comparison of fuzzy arc lengths to be used in our proposed dynamic programming algorithm for finding an optimal (shortest) path. The effectiveness of our approach was shown by working out illustrating examples. The proposed model, while being practically simple, has the

					flexibility to consider a mixture of various types of fuzzy arc lengths in a general network. We also gave a comparative case of fuzzy and crisp fuzzy cases to point out a possible effectiveness of a fuzzy network
3	Distance Closures on Complex Networks	To expand the toolbox available to network science, we study the isomorphism between distance and Fuzzy (proximity or strength) graphs. Distinct transitive closures in Fuzzy graphs lead to closures of their isomorphic distance graphs with widely different structural properties. For instance, the All-Pairs Shortest Paths (APSP) problem, based on the Dijkstra algorithm, is equivalent to a metric closure, which is only one of the possible ways to calculate shortest paths. Understanding and mapping this isomorphism is necessary to analyse models of complex networks based on weighted graphs. Any conclusions derived from such models should take into account the distortions imposed on graph topology when converting proximity/strength into distance graphs, to subsequently compute path length and shortest path measures. We characterise the isomorphism using the max-min and Dombi disjunction/conjunction pairs. This allows us to: (1) study alternative distance closures, such as those based on diffusion, metric, and ultra-metric distances; (2) identify the operators closest to the metric closure of distance graphs (the APSP), but which are logically consistent; and (3) propose a simple method to compute alternative distance closures using existing algorithms for the APSP. In particular, we show that a specific diffusion distance is promising for community detection in complex networks, and is based on desirable axioms for logical inference or approximate reasoning on networks; it also provides a simple algebraic means to compute diffusion processes on networks. Based on these results, we argue that choosing different distance closures can lead to different conclusions about indirect associations on network data, as well as the structure of complex networks, and are thus important to consider.	- Metric Closure - Generalized Metric Closure with APSP/Dijkstra - Ultra-Metric Closure	-	We mapped and explored the isomorphism between distance and fuzzy (proximity or strength) graphs. More specifically, we formalized the isomorphic constraints between transitive closure in fuzzy graphs and the distance closure in distance graphs. In complex networks, the computation of path length and shortest paths is essential for structural analysis of graphs. However, given the isomorphism we explored, it is clear that there is an infinite number of ways to compute indirect distances, or distance closures, which are isomorphic to transitive closures in fuzzy graphs. Therefore, the canonical shortest path (the metric closure typically computed via the APSP/Dijkstra algorithm) is just one way of looking at indirect associations in network data. We have characterized the set of generalized metric closures, which includes all possible shortest path variations, where the length of each path can be computed in an infinite variety of ways—including the ultra-metric closure we also exemplified. In addition to generalized shortest paths, there are many other ways to compute indirect distances or closures, leading to widely different properties useful for network science. In particular, we identified a diffusion distance closure which is isomorphic to the transitive closure of fuzzy graphs based on the Dombi T-Conorm/T-Norm pair h∨, ∧i = hDT1 ∧, DT1 ∨ i. While this distance closure, in the limit, is trivial, the intermediate steps towards closure, which we named n-diffusion, are useful for

					analysis of communities and diffusion processes on networks. It also offers a simple algebraic means to compute diffusion processes on networks (via matrix products), rather than the traditional stochastic simulations commonly used in the literature.
4	Formation-Based Pathfinding with Real-World Vehicles	A number of papers and articles have been written about formation-based pathfinding. Many of them, however, make the assumption that the units involved can move in any direction and can turn on a dime. This paper presents our solution in Force 21 to the problem of controlling real-world vehicles in formation, what we learned from it, and what we will do differently the next time. An alternative algorithm is presented, which makes use of a pre-computed visibility graph and Dijkstra's shortest path for the broad movement strokes, per-platoon morphing formations for moving along that path, individual vehicle AI for moving to formation position and Reynolds' steering behaviours for avoiding dynamic objects in the world. The tricky cases of maintaining temporary bridges and roads (faster, shortcut paths) in this environment are also covered.	Platoon-level pa Vehicle-Level Vehicle-Level Pathfinding -	-	We have presented a system for high-level and low-level pathfinding, using visibility graphs, vector offsets for formations, and steering behaviours for vehicles. The algorithms cover roads, Figure 10: special collision avoidance case bridges, swamps, formations, and natural vehicle movement in a physically-simulated environment. While in general we are quite pleased with the results, there are some lessons to be learned, and things that we would definitely do differently the next time.
5	MPR-based Pruning Techniques for Shortest Path Tree Computation	Multi-Point Relaying (MPR) is a well-known relay pruning algorithm that has proved to be useful for efficient dissemination in Mobile Ad hoc Networks (MANETs). But this technique may be useful for other tasks in MANET link-state routing as well. In particular, the approach is attractive for the selection of topology information to be flooded across the network. Requirements for such topology selection are however different from those applying for efficient dissemination, so approaches in such direction need to address these requirements and adapt or complement the MPR mechanism accordingly. This paper analyzes the main asymptotic properties of MPR and MPR-based topology selection algorithms, and provides sufficient conditions for the correctness of MPR-based topology selection. It examines as well in detail the MPR-based topology selection algorithm of MPR-OSPF, Path MPR, and shows that this algorithm may be	- The Path MPR Algorithm	-	This paper has explored the use of MPR as a basis for topology pruning algorithms for MANETs, addressed to reduce the amount of topology information required for enabling every node to build its SPT. MPR properties makes it appropriate for optimizing the control traffic dedicated to topology diffusion while preserving essential information for the nodes. But it needs to be adapted in order to fulfil the various requirements that such a topology pruning algorithm imposes. This paper has presented several analytical results in this domain, both characterizing inner asymptotic properties of MPR and providing sufficient conditions for the correct operation of an MPR-based topology pruning algorithm. The paper has examined as well the correctness of the Path

		unable, in certain conditions, to preserve optimal routes in its topology selection. The paper concludes by proposing and validating a modification of the Path MPR algorithm to overcome this sub-optimal performance.			MPR algorithm in various link cost models. It has shown that such algorithm may lead, in asymptotic conditions, to sub-optimal relay elections which may prevent nodes to select valid shortest paths. Finally, it has thus proposed and validated formally a modification that overcomes this sub-optimal behaviour
6	Pectoral muscle detection in mammograms based on the shortest path with endpoints learnt by SVMs	Automatic pectoral muscle removal on mediolateral oblique view of mammogram is an essential step for many mammographic processing algorithms. However, the wide variability in the position of the muscle contour, together with the similarity between in muscle and breast tissues makes the detection a difficult task. In this paper, we propose a two-step procedure to detect the muscle contour. In a first step, the endpoints of the contour are predicted with a pair of support vector regression models; one model is trained to predict the intersection point of the contour with the top row while the other is designed for the prediction of the endpoint of the contour on the left column. Next, the muscle contour is computed as the shortest path between the two endpoints. A comprehensive comparison with manually-drawn contours reveals the strength of the proposed method	- Dijkstra algorithm	-	We have presented a method for identification of pectoral muscle contour based on the estimation of the endpoints with a supervised learning algorithm, followed with the delineation of the contour using a shortest path technique. The model learning the endpoints was based on a SVR model, fed with information from a thumbnail of the mammogram. Initial investigations performed support further work in this direction, as the method achieves a good accuracy. An initial observation is that, since the SVR is using only a thumbnail of the mammogram, the accuracy of the predictions will always be limited by the amount of scaling. Instead of assuming that the shortest path has to start and end on the detected endpoints, we plan to use a window centered on the endpoints or a probabilistic approach to guide the position of the endpoints of the shortest path. Another, more simple solution, is to learn the shortest path between two full margins of the image, after a convenient coordinate transformation [15]. Although the accuracy obtained with this simpler approach is lower, it has the advantage of simplicity and the potential of generalizing better for equipments from different manufacturers. Further investigation is necessary to assess the trade-offs involved.

Conclusion

The analysis of shortest path in a packet tracing mechanism is the common thread running through this paper. With a packet trace system, we have monitored and displayed packet transferring in a telecommunication network, especially so that faults or errors in the network can be detected quickly and easily. It also allows us to find the shortest path for the router to
transfer packet. In this paper, the routing protocols that have been analysed are the formulas used by routers to determine the appropriate path onto which packet should be forwarded. The routing protocol also specifies how routers report changes and share information with the other routers in the network that they can reach. The changing conditions of the network can be dynamically adjusted by the routing protocols, otherwise all routing decisions have to be predetermined and remain static. Critical terms have been proved by using simulation software in this paper. A user interface has been used to input acceptable packet transfer characteristics. Packet transfer from network to network has been monitored at each step in the simulation which allows us to understand the trace route and find the shortest path in transmission.

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