
FINDING SHORTEST PATH BASING ON DIJKSTRA'S ALGORITHM FOR BAGHDAD UNIVERSITIES BY USING GEOGRAPHIC INFORMATION SYSTEM APPLICATIONS

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ABSTRACT

As the population increases, the transport network becomes difficult and enormous. Finding demanded location is becomes a troublesome task. After finding, a location individual gets confused to access that location because of the routes contains several modes. This drawback is even more substantial for those who may have to go to strange parts of the city. Just in case of the universities, it is troublesome to find the specified university and it's the shortest path to access therefore takes longer to access it. In this paper solved this problem by find the shortest path from the user location to the university or between two universities. The area for study is Baghdad city and the coordinate for universities is obtained from Google earth program. The ArcGIS software system used and also the Dijkstra's algorithm to produce the shortest path from one location to a different and ArcGIS cloud publisher for publish map from ArcMp to ArcGIS cloud and then can be edited and updated

1. INTRODUCTION

UNESCO ask the Iraqi ministries of Education and Higher Education to build educational atlases for the Iraqi Education Systems. The ministry of education have its own Atlas system but in the Iraqi higher education, there is no such atlas system. This research is a part from the Atlas system, which we start to build it for the Iraqi higher education and the first step of the atlas is to complete the system for Baghdad universities only. UNESCO requirements for this atlas system are big and need huge quantity of data, but we have fix only some of the required data to start with. The Atlas system need for a special geographical system to be completed.

A geographic information system (GIS) may be a computer system designed to capture, save, treatment, analyze, manage, and display all kinds of spatial or geographical data [1]. Geographic information system (GIS) is a robust tool and has the capability to handle and treatment spatial data in a massive volume. GIS becomes a common technique that may produce maps, integrate info, visualize and solve issues, and develop valuable solutions [2].

Network analysis remains one in all the foremost important and protracted analysis and application areas in the geographic data system. Networks can perform an alternative datum for locations in the context of linear referencing and support a set of tools for the graphical

present. Many network location problems are the most troublesome to solve in terms of their combinatorial complication. The shortest path analysis is not only one of the major network operations in GIS analysis, transportation manufacture and many other fields but also the foundation of other network analysis, such as the most credible path problem, maximum capacity path problem etc. The shortest path problem is a problem of finding the shortest path or route from one point to another [3]. In this study describes how network analysis based on Dijkstra algorithm in ArcGIS can be found

Shortest path for Baghdad universities.

2. STUDY AREA BAGHDAD CITY

Baghdad is that the capital metropolis and a key cultural, instructional and economic center of Iraq. Geographically the metropolis is found right within the center of the country, and within the finish of the last century, the metropolis has been one in all the foremost developed big cities within the Middle East, with terribly advanced infrastructure, schools and universities, stadiums and different facilities for sports. Geographic coordinates of Baghdad, Iraq (Latitude: 33°20'26" N, Longitude: 44°24'03" E) [4].

3. LITERATURE REVIEWS

In route optimization of the school Busses advancement of the school transport and decrease of the transportation cost is potential by using the system dissection based mostly requisitions. numerous inquiries concerning have as of currently been Performed known with course improvement of school transports. various school overseers have perceived a substantial backlog once the route and calendars are overseen utilizing GIS. GIS programmings improve the abilities of school sheets to transfer a productive and effective transportation framework [5][6].

4.METHODOLOGY

Figure 1: Shows the steps of the methodology that proposed for this work

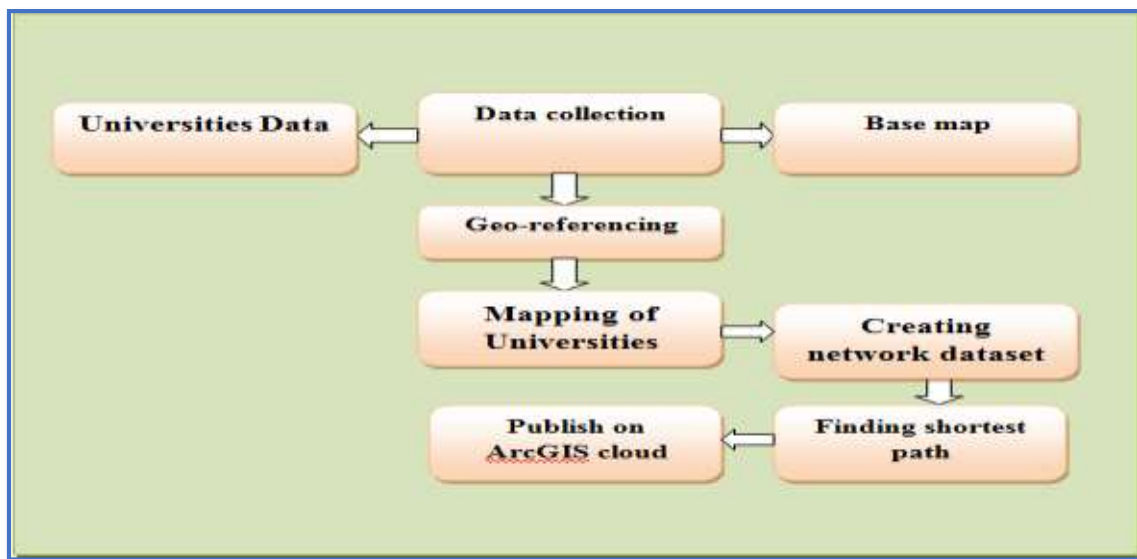


Figure 1: Methodology for proposed work

A. Data Collection

1. Base Map

It is the primary and necessary step towards the completion of the project. For this work, Bagdad city (33°20'26" N and 44°24'03" E) is taken into account because the study space that is located within the Iraq. Top sheet of Bagdad city is obtained from the Google earth application that is taken into account because of the base map for future work(Fig2).



Figure 2: Base map of Bagdad city

2. Universities Data

The university information will be obtained by visiting the required university and taking the necessary data concerning with the staff academic, relations, projects, researches and university ranking. The attribute data like the name of universities, email of universities, number of colleges, website address etc., can be obtained by visiting the website for each university. The data needed is in the form of spatial and attribute data. This spatial data is obtained through the method of digitizing base map of the Bagdad city. The coordinates of the universities were taken by using Google earth program. For universities spatial data, it should be connected to the information services provided at every university. Attribute data that require being saved within the database are universities name, Longitude, and Latitude as shown in (Table 1).

Table1: University information

A	B	C	D
ID	Name	X	Y
1	University of Baghdad	44.37829	33.27123
2	Al-Mustansiriya University	44.40224	33.36723
3	University of Technology	44.44768	33.31124
4	Al-Nahrain University	44.37921	33.2789
5	Middle Technical University	44.49062	33.26374
6	University of Information Technology and Communications	44.42798	33.3126
7	Al-Iraqia University	44.35957	33.36626
8	Al-Karkh University of Science	44.37423	33.34191
9	Baghdad University for Women	44.38217	33.27035

B. Geo-referencing

Geo-referencing of base map is an essential stage, as a result of geo-referencing permits to register base map with respect to the earth’s surface. Geo-referencing is often done by choosing the four management points on the corners of the scanned map and inserting that point by giving acceptable latitude and longitude [1].

C .Mapping of Universities

In this step, the coordinates of the university are taken by collected from Google earth software.

5. IMPLEMENTATION

The software used to implement this project:

- ArcGIS
- Dijkstra’s algorithm
- ArcGIS cloud publisher
- ArcGIS cloud

After the information gathering, it is necessary to locate it on the map. The university location is executed using the ArcGIS tool. Coordinates the universities are put on the map as a point feature and this point can be represented as a symbol. When university location is completed, it is necessary to locate a road map. It has as well done using the ArcGIS. When making a network routing system, all the roads at the network are connected, is vital as a result of it permits connecting through the system.

ArcGIS Network Analyst could be a powerful tool of ArcGIS that supply network-based special analysis together with routing, travel directions, closest facility, and service area analysis.

The Dijkstra's algorithm use for the network analysis and finding the shortest path. ArcGIS Network Analyst permits to unravel common network issues, like finding the most effective route across a metropolis, distinguishing a place around a location, service a collection of orders with a fleet of vehicles, or selecting the most effective facilities to open or close[7]. The commercial GIS software that was used to carry out the route analysis for this research is Esri ArcGIS Network Analyst. ArcGIS is appropriate for this type of research as a result of its commercially obtainable, and therefore the Network Analyst extension is contained within the student edition of ArcGIS. The route problem solver in Network Analyst to locate the shortest path is depended on Dijkstra's algorithm [8].

Dijkstra's algorithm is a graph search algorithm that solves the only supply shortest path drawback for a graph with non-negative edge path value, generates the shortest path tree. This algorithm is commonly utilized in routing and as a subroutine in different graph algorithms. For a given supply vertex (node) within the graph, the algorithm finds the route with the lowest value (i.e. the shortest path) between that vertex and each different vertex[9].

5.1. Dijkstra' algorithm

```
1. function Dijkstra(Graph, source):
2. dist[source] := 0 // Distance from source to source
3. for each vertex v in Graph: // Initializations
4. if v ≠ source
5. dist[v] := infinity // Unknown distance function from source to v
6. previous[v] := undefined // Previous node in optimal path from source
7. end if
8. add v to Q // All nodes initially in Q
9. end for
10. while Q is not empty: // The main loop
11. u := vertex in Q with min dist[u] // Source node in first case
12. remove u from Q
13. for each neighbor v of u: // where v has not yet been removed from Q.
14. alt := dist[u] + length(u, v)
15. if alt < dist[v]: // A shorter path to v has been found
16. dist[v] := alt
17. previous[v] := u
18. end if
19. end for
20. end while
21. return dist[], previous[]
22. end function
```

6. EXPERIMENTAL RESULT

6.1. Creation of Map for Universities

geo-referencing for the base map can be created by choosing the four management points on the corners of the base map and inserted that point by giving acceptable latitude and longitude, and then inserted the coordinates of the university are taken by collected from Google earth software as shown in Figure(3). Finally located road on the map as shown in figure (4).

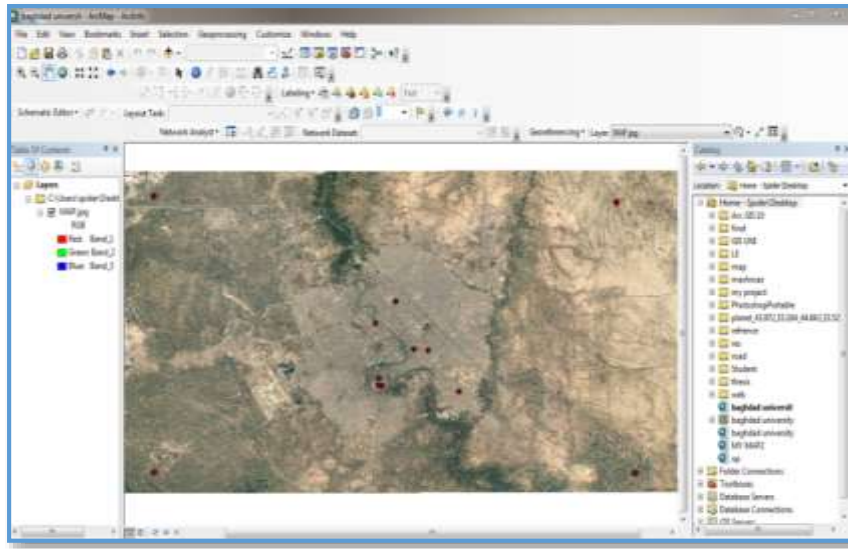


Figure 3: Geo-referencing and coordinate base map

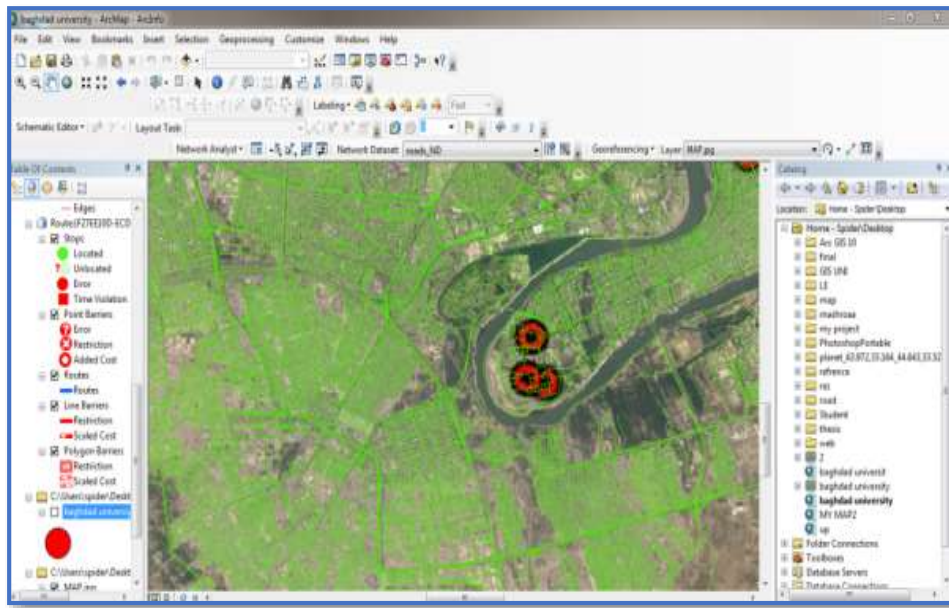


Figure 4: Located road on the base map

6.2. Shortest path analysis

The shortest path created by network analysis for finding the minimum distance path from the user location to the university or between two universities this will help the user to minimize traveling time to access a specified university. Figure(5) shows the shortest route from Al-Nahrain University to University of Baghdad and from University of Baghdad to Baghdad University for Women.

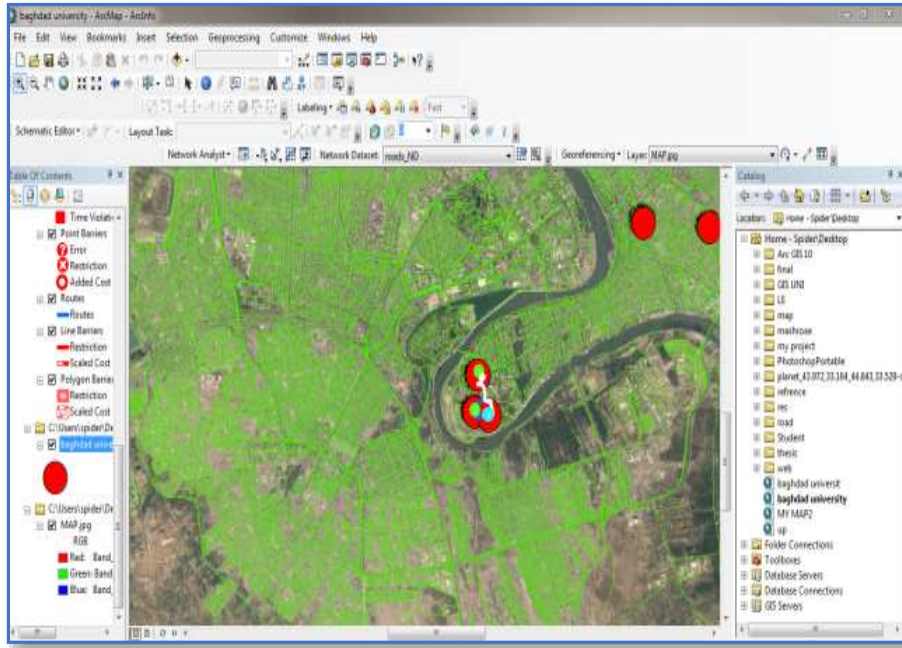


Figure 5: shortest path analysis

6.3. Publish map on the ArcGIS cloud

GIS Cloud Publisher for ArcMap extension used to publish map from ArcMap to GIS Cloud mechanically uploads data, symbology, layer structure and spatial references As Shown in figure (6).The idea is that what see in desktop GIS is immediately replicated on GIS Cloud account.GIS Cloud Publisher enable to publish a map to the general public or included into website/blog while not a desire for having own servers. After published map on ArcGIS cloud, map it's edited and updated the maps. as shown in figure(7).

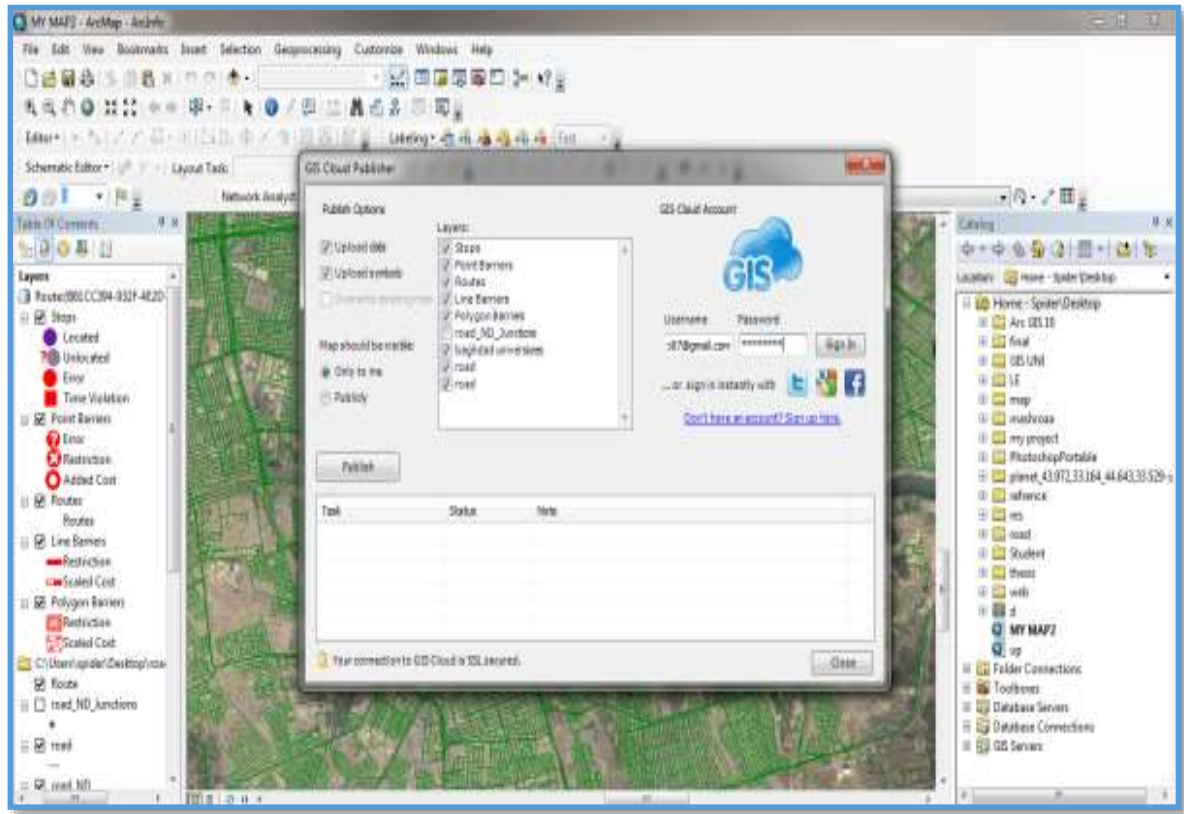


Figure 6: Using GIS cloud publisher

7. CONCLUSIONS AND FUTURE WORK

This study for find shortest path from the user location to the University for Help the user to minimize traveling time to access a specified university. This can be done by using ArcGIS and Dijkstra algorithm that calculate distant between two points depended on route length. And use GIS cloud publisher for publish the map on the ArcGIS cloud and then can be edit and update and modify.

As a future work, it can be performed measure distance between two universities or between user location and university; this can be accomplished by ArcGIS cloud.

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