Software Instructions for Use

This tutorial makes it easy to use the Dgis program and the data it outputs. The demonstration is carried out taking as an example a random sector of the city of Cali, to represent how it works anywhere on the planet:

1. Double click on the file named Dgis.exe Figure 1 double click on the icon of the program



Figure 1 Double Click on the Program Icon

2. Once the program starts on your computer you will see something like Figure 2 program view

ellene los valores , puede revisar el man	Manual de usuario Recomendaciones	DE VALENC
limite inferior 0	% area alcanzada	0
limite superior 0	lado 1, metros	0
area de influencia en metros	lado 2, metros	0
OpenStreetMap	Histori Area estudiada metros cuadrados	0
Buscar ,Dande esta esta 1	Numero de paradas con al menos otra en rango	0
	Numero de paradas sin al menos otra en rango	0
Exportar	numero paradas/nodos a evlauar	0
y1 0.0000 Y1	area blanca de influencia nodos/paradas	0
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iniciar cargar imagen encontr	ar coordenadas Medidas Topologicas de Accesibilidad	
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- 3. Now we should get coordinate data, for this example we will use the base OpenStreetMap data, as it is free to use.
- 4. We enter the web address https://www.openstreetmap.org/
- 5. We select the export button, then we click on select manually Figure 3 catch



6. The area to be studied is chosen and the database file is downloaded by clicking on export and an image file as seen in Figure 4 capture



Figure 4 Capture

7. It is very important that you save the coordinate information of the image crop, which is located in the upper left corner Figure 5 capture



Figure 5 Capture

- 8. You will obtain two files, one with an .osm extension and the other with a .png extension, you can rename these files as you wish as long as you respect the extension, do not use spaces and make use of letters or numbers contained within the English alphabet, that is say do not use accents, umlauts, quotation marks, apostrophes, matches or special letters such as Ñ.
- 9. Now we enter the downloads folder and proceed to open the file with .osm extension with Excel, Libre office Calc, Open Office, Google Sheets, numbers or any other program for spreadsheets, in this example it will be explained how to use Excel because despite being paid it is an application with which many people they are familiar.
- 10. Right click on the .osm file that I downloaded from

<u>https://www.openstreetmap.org/, remember</u> that you can rename the file as you wish with English characters and without spaces, choose to open with your favorite spreadsheet program Excel is used for this example Figure 6 screenshot



Figure 6 Capture

11. When opening with the spreadsheet program, we give it to take the data as a table XML, we accept Figure 7 capture

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12. Once the program opens, we will see that there are several columns each with a title, we are interested in the column that is named with: "v" (corresponds to the name),

"Ion" (corresponds to longitude), "lat" (corresponds to altitude), once these columns have been identified we will use the filter to extract all the data that we need, for this example we need the public transport stations and stops, in the city in which we are, the public transport stops have a name that begins with the word "MIO", then we locate ourselves in the name column "v" and there we select the filter "MIO". Figure 8 catch

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927170	3.4330517 -7	6.5281573 name	Parada MIO - Calle 13 entre Carrera 23D y Diagonal 23	71
927170	3.4329578 -7	6.5278992 name	Parada MIO - Calle 13 entre Diagonal 23 y Carrera 23D	A Ordenar de Z a A
226189	3.4259733 -7	6.5169571 name	Parada MIO - Calle 27 entre Carrera 31 y 31B	Ordenar por color
927170	3.4141012 -7	6.5322045 name	Parada MIO - Carrera 44 entre Calle 13 y 13A	
927170	3.4132041 -7	6.5212801 name	Parada MIO - Calle 25 entre Carrera 42C y 42B	Nista de Hoja
927170	3.4147463 -7	6.5212291 name	Parada MIO - Calle 25 entre Carrera 42 y 41E	Se Borrar filtro de "v"
927170	3.4200984 -7	6.5090573 name	Parada MIO - Carrera 39 entre Diagonal 40 y Calle 34C	
927170	3.4193326 -7	6.5304345 name	Parada MIO - Carrera 39 entre Calle 13A y 13	
927170	3.4191612 -7	6.5226856 name	Parada MIO - Carrera 39 entre Calle 19 y 18	Filtros de texto
927170	3.4195618 -7	6.5180319 name	Parada MIO - Carrera 39 entre Calle 26D y 26C	Inicial
927170	3.4194799 -7	6.5200061 name	Parada MIO - Carrera 39 entre Calle 26 y 25	
927170	3.4197733 -	76.514478 name	Parada MIO - Carrera 39 entre Calle 31A y 31	eleccionar todos los resultados de
927170	3.4199018 -7	6.5121552 name	Parada MIO - Carrera 39 entre Calle 32A y 32	Agregar la selección actual al filtro
927170	3.4191972 -7	6.5076382 name	Parada MIO - Carrera 39 entre Calle 37 y 36	Estación MIO - Amanecer Estación MIO - Conquistadores
927170	3.4186178 -7	6.5074345 name	Parada MIO - Carrera 39 entre Calle 37 y 38	Estación MIO - Nuevo Latir
463504	3.4172711 -7	6.5061631 name	Parada MIO - Carrera 39 entre Calle 39 y 40	Estación MIO - Troncal Unida
927170	3.4174853 -7	6.5059834 name	Parada MIO - Carrera 39 entre Calle 40 y 39	Estación MIO - Villanueva
927170	3.4131446 -7	6.5021961 name	Parada MIO - Carrera 39 entre Calle 45A y 46	Hernán autos;Estación MIO - Santa
927170	3.413158 -7	6.5019253 name	Parada MIO - Carrera 39 entre Calle 46 y 45A	Merca mio
927170	3.410971 -7	6.5001202 name	Parada MIO - Carrera 39 entre Calle 48 y 49	MIO
927170	3.4120227 -7	6.4916586 name	Parada MIO - Calle 55 entre Carrera 30 y 29	Parada MIO - Calle 10 entre Carrera
927170	3.4146176 -7	6.4889863 name	Parada MIO - Calle 83 entre Carrera 28E3 y 28E	Parada MIO - Calle 10 entre Carren
927170	3.4187462 -7	6.5249977 name	Parada MIO - Carrera 39 entre Calle 17 y 16	Provide table Calle to entire Callert
606974	3.4121893 -7	6.5258832 name	Parada MIO - Carrera 44 entre Calle 15 y 15Bis	<pre></pre>
927170	3.4266255 -7	6.5285806 name	Parada MIO - Calle 13 entre Carrera 32 y 31	\cap
321532	3.4291025 -7	6.5167687 name	Parada MIO - Calle 27 entre Carrera 28 y 29	ACEPTAR Cancelar
006839	3.4347968 -7	6.5141764 name	Hernán autos; Estación MIO - Santa Monica	
927170	3.4321028 -7	6.5101736 name	Estación MIO - Villanueva	
606974	3.4271533 -7	6.5053988 name	Estación MIO - Conquistadores	

Figure 8 capture

13. Now we simply transfer by copying and pasting the column named "v", "lon" and "lat", to a spreadsheet document and save it as an .xlsx extension, it is important not to put accents, spaces, umlauts, apostrophes or non-English language symbols Figure 9 screenshot

This document is very important because it is the document from which the program will take the necessary data to return the results, in fact you will be able to put new coordinates for existing points or future points from points of longitude and latitude that you can obtain from topographic stations, from Google maps, google erath, bing maps, OpenStreetMaps or any other coordinate provider.

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melo				2 4220517	76 529157 Parada MIO - C	alle 12 entre Carera 220 y Dissonal 22	
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000005		\sim	6	3 4141012	-76 532205 Parada MIO - C	arrora 44 entre Calle 13 y 134	
			7	3.4132041	-76 52128 Parada MID - Ca	alle 25 entre Carrera 420 y 428	
Nueva carpeta			8	3 4147463	-76 521229 Parada MIO - Ci	alle 25 entre Carrera 42 y 41F	
				3.4200964	-76 509057 Parada MIO - C	arrora 20 entre Diagonal 40 v Calle 24C	
			10	3.4193325	-76.530435 Parada MIO - Ca	arrera 39 entre Calle 13A y 13	
			11	3.4191612	-76.522686 Parada MID - Ci	arrera 39 entre Calle 19 y 18	
			12	3.4195618	-76.518032 Parada MIO - Ca	arrera 39 entre Calle 26D y 26C	
			13	3.4194799	-76.520006 Parada MIO - Ca	arrera 39 entre Calle 26 y 25	
and the second se			14	3.4197733	-76.514478 Parada MIO - Ca	arrera 39 entre Calle 31A y 31	
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Ejempio.osm	Ejempio.prig	ejempio.xisx	22	3.410971	-76.50012 Parada MIO - Ci	arrera 39 entre Calle 48 y 49	
			23	3.4120227	-76.491659 Parada MIO - Ca	alle 55 entre Carrera 30 y 29	
			24	3.4146176	-76.488986 Parada MIO - Ca	alle 83 entre Carrera 28E3 y 28E	
			25	3.4187462	-76.524998 Parada MiO - Ca	arrera 39 entre Calle 17 y 16	
			26	3.4121893	-76.525883 Parada MIO - Ca	arrera 44 entre Calle 15 y 158is	
			27	3.4266255	-76.528581 Parada MIO - Ca	alle 13 entre Carrera 32 y 31	
			28	3.4291025	-76.516769 Parada MIO - Ca	alle 27 entre Carrera 28 y 29	
			29	3.4347968	-76.514176 Hernán autos;Er	stación MIO - Santa Monica	
			30	3.4321028	-76.510174 Estación MIO - 1	Villanueva	
			31	3.4271533	-76.505399 Estación MIO - 1	Conquistadores	
			32	3.4185984	-76.486987 Estación MIO - 1	Nuevo Latir	
			33	3.4218167	-76.490946 Estación MIO - /	Amanecer	
			34	3.4248689	-76.494516 Estación MIO - 1	Troncal Unida	

Figure 9 Capture

14. Now the program must be started, once it finishes loading, some data must be entered for its operation, which are the longitude and latitude coordinates that were obtained from the openstreetmap and can be seen in Figure 5 capture, The size of the buffer to be measured in meters must also be entered, in addition to the lower limit and upper limit that denote the range to be evaluated between stops, the range is important to eliminate stops that are very close to each other, then the evaluation of the program is shortened, however it is possible to set the program to evaluate between 1 meter and 400 meters following the example described. Figure 10 Capture

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ellene los valores , puede revisar el manual 🚺	fanual de usuario Recomendaciones		
limite inferior	% area alcanzada		94.46
limite superior 450	lado 1, metros		3151
area de influencia en metros	lado 2, metros		5567
OpenStreetMap	Area estudiada metros cuadrados		17545273
	Numero de paradas con al menos otra	en rango	212
Buscar ¿Donde esta esto?	Numero de paradas sin al menos otra	en rango	37
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15. Now you should click on the "start" button, once clicked the program will ask you to choose the .xlsx file that was generated in point 13, select the file and click on open, then you just have to wait for let the program work

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16. Now the program will process the information and display the results in its menu, in a window where you can see a graphical representation of the data and buffers, representing in black the area of influence reached and in white the area not reached and therefore The latter will throw a file with the name results.xlsx containing the results to be analyzed by the urban planner. Figure 12 Capture

Figure 12 Capture

17. The results.xlsx file returns information that can be seen in Figure 13 capture

By David Alejandro Ramirez C	Cajigas	UNIVERSITAT POLITECNICA			
rellene los valores , puede revisar el manual	anual de usuario Recomendaciones	DE VALÊNCIA			
limite inferior 200	% area alcanzada	94.46			
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area de influencia en metros 400	lado 2, metros	5567			
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Figure 13 Capture

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10 Parado MiO - Carrera 39 entre Calle 134 y 13 11 Parado MiO - Carrera 39 entre Calle 19 y 18	-36.5356345 3.4195326 -1355.0 -36.5236456 3.4195682 -13331.0	105279 703.0408730 802176 8576.138962	Parada MIO - Calle 16 antre Carrera 46A y 46	.76 525527	3.41081	1 0	0	0 0	0 0	0	0	3 0	0	0
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14 Parado MICI - Cartona 30 entre Calle 21A y 35	-76.534478 2.4197723 -1.299.3	167075 2488.200540	Parada MiO - Carrera 428 entre Calle 44 y 43	-/6.5104/6	3.408055	5 0	0	0 1	3 0	0	0	3 0	0	0
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25 Parade MtO - Carrera 35 entre Calle 17 y 16	-36.5249677 3.4167402 -1265.7	92224 1515.209065	Parada MIO - Carrera 46 entre Calle 39 y 40	-76.516399	3.407689	9 0,	0	0 1	0	0	0	2 0	0	0
26 Parado MrD - Carrora 48 entre Calle 15 y 153in 87 Parado MrD - Calle 13 entre Carrora 32 y 81	-36.5258812 3.425853 -560.74 -36.5285886 3.4266255 -2157.0	120402 1220.808725 171017 921.0427546	Parada MIO - Carrera 29 entre Calle 53 y 55	-76,491596	3.412963	3 0	0	0 (s 0	0	0		0	0
28 Parada 560 - Calle 27 antire Carriera 28 y 29	PLISTERS 3.4295825 -2430.5	73212 2233.648906	Parada MIO - Carrera 31 entre Calle 46 y 48	-76.498008	3.416272	2 0	0	0 1		0	9		0	0
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11 Estavision M4D - Computationess 3D Estavision M4D - Numeri Latio	- 16 SECOND 8 4971593 - 2215 4 - 16 4867849 5 41019844 - 1296 4	134180 3497.128052 48767 5541.1218	Parada Milo - Carrela 27 entre Calle 52 y 54	-70,435333	3.431.044		0	0 4	a a	8	a	3 0	0	0
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34 Estador MEC - Trancal Unida 35 Parado MIO - Calle 10 entre Camera 31 y 32	-36.5322531 3.4262006 -2332.5	127363 457,8996/91	Parada MIO - Diagonal 24C entre Transversal 25 y	29 -76.511834	3.43446	6 0,	0	0 0	0	0	0) (0	0
86 Parada MD - Centra 23 entre Calle 25 y Transur 87 Banda MD - Danna 23 entre Calle 25 y Transur	sal 254 -36.5387478 3.4854999 -1137.2	22205 2013 723215	Parada MIO - Carrera 39 entre Calle 33 y 34	-76.51039	3.41976	6 0	0	0 1	0	0	0		0	0
38 Parada MPO - Transversal 29 entre Carrers 248 y	HB -76.5128256 3.4852067 -3006.2	296383 2783.946058	Parada MIO - Calle 10 entre Carrera 30 y 31	-76,533085	3.428547	7 0	0	0 1		0	a 1	1 0	0	
39 Parado MIO - Calle 9 entre Carrera 33A y 32 46 Parado MIO - Calle 9 entre Carrera 25A y 39	-36.5368652 3.4277876 -2276.7 .36.5358837 3.4366767 .3438.6	727084 1.354796-1.3 Honool 0.08.432437	Parada MIO - Calle 96 con Carrera 2866	.75 487371	3 412155	e 0	0	0 1	0 0	0		-	0	0
41 Par Death Sector Carries 27 x 25	-N.STELMS 3.4313887 -2904.3	18019/2 387.5442219	paradas si campier estradas no cumplera dunte distancia completa	matriz distancia cone	ion matriz p	aradas en turgo 🔄	Sheet1	paractac el ci	autoriau brauargar uo	overgener tined	riz distancia compl	ta easil de	Cancia conecio	n matrix para
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Parada MIO	- Carrera 25 entre Calle 58A y 18	-26.5249196 3.4310572	14 422.0101685 392.179287 0 0 0 0 0 0 0	0 0	00	0 0 00	0 1	FALSO FE	LSD FALSO F	ALSO FALSO	FALSO FALSO	MALSO /	AUSO FALSO	ALSO
Parada Mito Parada Mito	Calle 13 entre Carrora 23D y Diagonal 23 Calle 13 entre Diagonal 23 v Carrora 21D	-76.5283573 3.4330517 -36.5278993 3.4330578		0 0	0.0	0 0 00	0	FALSO RA	USO FALSO F	ALSO FALSO	FALSO FALSO	FALSO 7	ALSO FALSO	7ALSO
Parada MID	Calle 27 entre Carrora 33 y 358	26.5369573 3.4259733	7 0 00000000	0 0	00	0 0 00	0	MLSO TA	USO MALSO P	ALSO FALSO	FALSO FALSO	1/630	AUSO FALSO	2 #ALBO
Parada MO	- Carrera 44 entre Calle 13 y 13A	-76.5822045 3.4141012		0 0	00	0 0 00	0 7	FALSO II	UND HALSO I	ALSO FALSO	FALSO FALSO	FALSO 1	ALSO FALSO	ALSO
Parada MO	- Calle 15 entre Carrera 43 y 426	-26.5212291 3.4142463	11 0 00000000	0 0	0.0	0 0 0 0	0	FALSO IN	ALSO FALSO F	ALSO FALSO	FALSO FALSO	FALSO F	ALSO FALSO	ALSO FALSO
V Perede Mil	Carrera 38 entre Diagonal 40 y Calle 34C	26.5090573 3.4300984	10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 144	836/9234 0 24 0 0	41506385 4485294792 447.4069225 6 0 0 0 0	0 30	FALSO FA	LLSO FALSO F	ALSO FALSO	FALSO FALSO	FALSO /	AUSO FALSO	ALSO
A B Parada Mil	- Carrera 39 entre Calle 53A y 13 - Carrera 38 entre Calle 79 x 18	-26.5308345 3.4193326 -26.5326864 3.4193812	B 0 0 0 0 0 0 0 0 0 299.435123	a 0	0.0	0 0 0 0	0 11	FALSO FA	USO FALSO F	ALSO FALSO	FALSO FALSO FALSO FALSO	FALSO F	ALSO FALSO ALSO FALSO	ALSO VE
Parada MIO	- Carrera 28 entre Calle 26D y 26C	76.5180819 3.4195618	13 0 0 0 0 0 0 0 0 0 0 0 19 567933	0 0	00	0 0 00	0 33	FALSO FA	USD FALSO F	ALSO FALSO	FALSO FALSO	FALSO P	ALSO FALSO	FALSO
Parada MIO	- Carrera 38 entre Calle 26 y 25	-26.5300061 3.4194299	12 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	0 0 258	5097358 0	0 0 00	0	FALSO FA	LISO FALSO F	ALSO FALSO	FALSO FALSO	MUSD 1	ALSO FALSO	FALSO
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cump	e in anno Carrera 2013 y 28	-26.4916938 3.4120227 -26.4991961 3.4146378	5 0 00000000	0 0	00	0 0 00	0 25	FALSO TA	relaciones	entre .	2 paradas	individu	alesias	ALSO
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Parada MiO	- Carrera A4 entre Calle 15 y 158is	76.5358832 3.4121893 N.S. S.		0 0	00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 28	MISO 14	USQ HALSO I	ALSO FALSO	FALSO FALSO	FALSO /	ALSO FALSO	FALSO
Parada Mito	- Calle 37 entre Carrera 26 y 29	-76.5167687 3.4291025	5 0 00000000	0 0	0.0	0 0 00	0 29	FALSO IN	LINO FALSO F	ALSO FALSO	HALSO FALSO	FALSO I	ALSO FALSO	FALSO FALSO
Hernán aut	cEstación MID - Santa Monica	26.5343764 3.4347968	4 0 00000000	0 0	0.0	0 0 00	0 11	FALSO EA	LISO MALIO I	ALSO FALSO	FALSO FALSO	RALSO I	ALSO FALSO	FAUSO
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Parada MID	Calle 10 entre Cartera 31 y 32	76.5327531 3.4282086	5 0 00000000	0 0	0.0	0 0 00	0 14	HAUSO IN	USD TALSO F	ALSO FALSO	FALSO FALSO	FALSO S	AUSCI FALSO	FAUSO
Parada MIO	- Carrera 23 entre Calle 23 y Transversal 258	-76.5187478 1.4354830	3 0 00000000	0 0	00	0 0 00	0 35	FALSO FA	150 14150 1	ALSO FALSO	FALSO FALSO	NALSO N	ALSO FALSO	5 FA:50
Parada Mito Parada Mito	- Transversal 29 entre Carrera 26 9 25	-76.5118256 1.4352097	4 0 00000000	0 0	0.0	0 0 0 0	0 12	FALSO FA	USO RALIKO R	ALSO FALSO	FALSO FALSO	FALSO /	ALSO FALSO	FALSO
Parada MID	- Calle 9 entre Carrera 32A y 83	-76.5368692 3.4277076	4 0 00000000	0 0	00	0 0 0 0	0 28	MUSO PA	USD HALSD H	ALSO FALSO	FALSO FALSO	RALSO P	ALSO FALSO	ALSO
Parada Milo Receipt Milo	- Calle S entre Camera 25A y 29 - Calle S entre Camera 27 y 26	-76.5358927 3.4309797 -76.5353849 3.4338837	5 0 00000000	0 0	00	0 0 00	0 40	IALSO EA	ILSO IALSO I	ALSO FALSO	FALSO FALSO	FALSO F	ALSO TALSO	ALSO FALSO
Parada MIO	- Calle 9 entre Carrera 230 y 23C	-76.5347021 3.4349999	4 0 00000000	0 0	00	0 0 00	0 41	MUSO N	LIND FALSO F	ALSO FALSO	FALSO FALSO	RALSO A	ALSO FALSO	FALNO
Parada Mil	Calle & entre Camera 22 y 28	265364751 84822978			212		421	1/LSO E #	MAN NALSO J	TLEU FALSO	FRLSO FALSO	MALSO /	mag #ALSO	

18. The file generated in point 13, the data entry file can be modified at the user's whim by removing or adding coordinates and points according to the study to be done, these coordinates could be obtained in various ways as seen above Even so, the program has a function to find points automatically, the button is called "Find Coordinates". Clicking on this button will display a window where the program requests the .osm file and the .NPG file that was downloaded in point 6. See Figure 14 capture

y David Alejandro Ramirez C	ajigas		Change of an internal states	- 0 ×
ellene los valores , puede revisar el manual M	anual de usuario Recomendaciones	DE VALÈNCIA	e = + + + = + E + Exte equips + Descarges + Nueve carpeta (2) Organizar - Nueve carpeta	v 6 // terre or have repeted
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area de influencia en metros 400	lado 2, metros	5567	Objetos ID Videos Videos	
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iniciar cargar imagen encontrar coorde	Medidas Topologicas de Accesibilio	dad	-76.50127 ¥1 -76.50127 ¥1 -76.49491 X2	
	0		3.42975 Y2	ervontrar coordenadas

Figure 14 Capture

19. The program will process (this takes time according to the size of the file), the information and will display a map, with a pointer where the user clicks with the pointer will save a coordinate, when finished taking the necessary number of points, just close the window and a file will be automatically generated with the coordinates taken, these coordinates can be saved to be evaluated as those obtained in point 13. See Figure 15 capture



Figure 15 Capture

20. There is also a button where you can view the study map. The same data from point 18 must be loaded, but first clicking on the "load image" button, see Figure 16 capture

ellene los valores , puede revisar el manu	A Manual de usuario Recomendaciones	DE VALENCIA
limite inferior 200	% area alcanzada	94.46
limite superior 450	lado 1, metros	3151
area de influencia en metros 400	lado 2, metros	5567
OpenStreetMap	Area estudiada metros cuadrados	17545273
	Numero de paradas con al menos otra e	en rango 212
Buscar (Donde eda esta? Ir	Numero de paradas sin al menos otra e	n rango 37
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iniciar cargar imagen encontra	velocidad maxima 0 Lo n sea coordenadas Medidas Topologicas de Accesibi	ormal es que el valor 50km/h o 60 km/H Ildad

Figure 16 Capture

- 21. The accessibility topological measure meter has been implemented to measure routes, for this the user must know the transport route to be evaluated and its nodes.
- 22. The average speed with which the system to be evaluated moves in the traveled, in general this speed does not exceed 15km/h, but this can vary and must be entered by the researcher 23. It can measure an urban or interurban route, the minimum number of nodes must be 2

(origin and destination), there is no limit of nodes, however, the researcher can eliminate repetitive nodes or those that are on the same street, in parallel, thus avoiding evaluating the same node twice.

24. For this example, data from an urban public transport route within the city of Santiago de Cali will be used. The researcher needs data that is not publicly accessible in many cases.



Figure 17 Capture of the route, using AutoCad Civil and Google Earth

25. Once the investigator has the route in mind, he must measure the distance that exists between each node you want to evaluate and the next one, always using kilometers, for this you can use multiple programs, AutoCad, Arcgis, Qgis, Google maps, Freecad, LibreCad, Qcad, Dragsight, BricsCad, etc. Figure 17 Capture of the route, using AutoCad Civil and Google Earth 26. You will need to create an .xlsx file like the one seen in Figure

18 Capture													
A	8	C	υ	Ł	F	G	н	1	J	K	L	M	N
ruta km	ESTACI ON MELEN DEZ	Kr 94 entre Cl 4D y 4C	Kr 95 entre Cl 4 y 3D	Kr 95 entre Cl 3 y Kr 95A	Kr 94B entre Cl 2B y 2	Kr 94C entre Cl 2 y 1A Oe	Kr 94C con Cl 1C	Kr 95 entre Cl 1A Oe y 1A	Kr 96 entre Cl 1 Oe y 2 Oe	Cl 4 Oe entre Kr 94B y 94A	Cl 4 Oe entre Kr 94A y 94	Cl 4 Oeste con Kr 91	CI 4 Oeste con Kr 89
ESTACION MELENDEZ	0.00	1.66	1.99	2.20	2.49	2.82	2.95	3.15	3.35	3.58	3.88	4.25	4.48
Kr 94 entre Cl 4D y 4C	1.66	0.00	0.33	0.54	0.83	1.15	1.29	1.49	1.69	1.92	2.21	2.58	2.82
Kr 95 entre Cl 4 y 3D	1.99	0.33	0.00	0.21	0.50	0.82	0.96	1.16	1.36	1.59	1.88	2.25	2.49
Kr 95 entre Cl 3 y Kr 95A	2.20	0.54	0.21	0.00	0.29	0.61	0.75	0.95	1.15	1.38	1.67	2.04	2.28
Kr 94B entre Cl 2B y 2	2.49	0.83	0.50	0.29	0.00	0.33	0.46	0.66	0.86	1.09	1.39	1.76	1.99
Kr 94C entre Cl 2 y 1A Oe	2.82	1.15	0.82	0.61	0.33	0.00	0.14	0.34	0.54	0.77	1.06	1.43	1.67
Kr 94C con Cl 1C	2.95	1.29	0.96	0.75	0.46	0.14	0.00	0.20	0.40	0.63	0.92	1.29	1.53
Kr 95 entre Cl 1A Oe y 1A	3.15	1.49	1.16	0.95	0.66	0.34	0.20	0.00	0.20	0.43	0.72	1.10	1.33
Kr 96 entre Cl 1 Oe y 2 Oe	3.35	1.69	1.36	1.15	0.86	0.54	0.40	0.20	0.00	0.23	0.52	0.89	1.13
Cl 4 Oe entre Kr 94B y 94A	3.58	1.92	1.59	1.38	1.09	0.77	0.63	0.43	0.23	0.00	0.29	0.66	0.90
Cl 4 Oe entre Kr 94A y 94	3.88	2.21	1.88	1.67	1.39	1.06	0.92	0.72	0.52	0.29	0.00	0.37	0.61
Cl 4 Oeste con Kr 91	4.25	2.58	2.25	2.04	1.76	1.43	1.29	1.10	0.89	0.66	0.37	0.00	0.24
Cl 4 Oeste con Kr 89	4.48	2.82	2.49	2.28	1.99	1.67	1.53	1.33	1.13	0.90	0.61	0.24	0.00
							_						
Nombre	^		Fe	echa de r	modificad	ión	Tipo			Tamañ	0		
🔯 coordenada	as.xlsx		22	2/8/2021	14:59		Hoja d	le cálculo	de M		10 KB		
K distancia.xl	sx		22	2/8/2021	14:59		Hoja c	le cálculo	de M		12 KB		

Figure 18 Capture

C24

27. Now you must generate an .xlsx file with the coordinates identical to the one in steps above, which columns are named v (for the name), lon (longitude) and lat (latitude), it will be very important that you respect the order you entered in the distance matrix. The coordinates can be obtained using the special function of the program for it or any other software or database. Figure 19 Capture

1	A	В	C	[jicas
1 v	9	lon	lat	
2 E	STACION MELENDEZ	-76.54267282440000000	3.37703278363586000	
3 K	r 94 entre Cl 4D y 4C	-76.54527513010000000	3.37562980769475000	7
4 K	r 95 entre Cl 4 y 3D	-76.54758968780000000	3.37428560619548000	Nombre
5 K	r 95 entre Cl 3 y Kr 95A	-76.54943834880000000	3.37416176426338000	
6 K	r 94B entre Cl 2B y 2	-76.55139867830000000	3.37541723096119000	The second secon
7 K	r 94C entre Cl 2 y 1A Oe	-76.55338946640000000	3.37424108641294000	coordenadas.xisx
8 K	r 94C con Cl 1C	-76.55460310700000000	3.37443062930965000	distancia ylay
9 K	r 95 entre Cl 1A Oe y 1A	-76.55471356630000000	3.37347622752640000	
10 K	r 96 entre Cl 1 Oe y 2 Oe	-76.55558343770000000	3.37338029083596000	
11 C	l 4 Oe entre Kr 94B y 94A	-76.55756234760000000	3.37343968912371000	
12 C	l 4 Oe entre Kr 94A y 94	-76.55918292130000000	3.37529697753465000	
13 C	l 4 Oeste con Kr 91	-76.56085275480000000	3.37803604125961000	
14 C	l 4 Oeste con Kr 89	-76.56124356480000000	3.37984140753706000	
15				
16				

Figure 19 Capture

28. Now you must mark the average speed at which the transport moves on the route to be evaluated, fill in the fields of the past steps, optionally fill in the coordinates field and after that you must click on topological accessibility measures Figure 20 Capture

By David Alejandro Ramirez Caj rellene los valores , puede revisar el manual	igas de usuario Recomendaciones	By David	Alejandro Ramirez		~ D	Buscar en topologicas	<u>SITAT</u>
inite superior inite superior area de influencia en metro OpenStreetMap Euscar (Dande cost ante 10 10 10 10 10 10 10 10 10 10	% area alcanzada 0 lado 1, metros 0 lado 2, metros 0 Area estudiada metros cuadrados 0 Numero de paradas con al menos otra en rango 0 Numero de paradas sin al menos otra en rango 0 numero paradas/hodos a evisuar 0 area blanca de influencia modos/paradas 0	Organizar - Entraig tesis (Reset tesis (Tesis (Tesi	Nueva carpeta enes * 1 Scoreta desatas b experime 2 Scoreta desatas a carpeta 2 Scoreta desatas b emestria ve c	Primero cool	Fecha de modificación rdenadas 22/9/2021 1459	Tipo Hoja de cálculo de M. Hoja de cálculo de M. (*also) Abrir Cance	Tamañ
y2 0.0000 Y2	velocidad media 13.11 o pormal es que el valor sea 13km/h liocidad maxima 0 Lo normal es que el valor sea 50km/h o 60 km/H s Meddaa Topologicas de Accesibildad	y2	0.0000 y2	velocidad media velocidad maxima oordenadas Medidas Tor	13.11 Lo norma 0 Lo norma sea 50kr cologicas de Accesibilidad Instagrad	il es que el valor sea al es que el valor m/h o 60 km/H Linked in Link	13km/h edin



- 29. When clicking on Topological accessibility measures, a load menu is displayed, where you must first load the coordinates and then the distance matrix, the load order is very important.
- 30. Now the program will make the necessary calculations and then present the results on the screen and in a file named Topologicas.xlsx Figure 21 Capture

By David Alejandro Ra	mirez Cajigas			
rellene los valores , puede revisar e	I manual Manual de usuario Recomendaciones	DE VALENCIA		
limite inferior	50 % area alcanzada	0		
limite superior 3	00 lado 1, metros	0		
area de influencia en metros	300 lado 2, metros	0		
	Histori Area estudiada metros cuadrados	0		
	Numero de paradas con al menos otra e	n rango 10		
Buscar 200nde está esto	Numero de paradas sin al menos otra er	rango 3		
Exportar	× numero paradas/nodos a eviauar	13		
x1 0.0000 x2 x1	area bianca de influencia nodos/paradas (0.0000 X2	1844481		
y2 0.0000 Y2			coordenadas.xlsx	22/8/2021 14:59
	velocidad media 13.11 Lo no	rmal es que el valor sea 13km/h	distancia.xlsx	22/8/2021 14:59
	velocidad maxima 0 Lo no	ormal es que el valor 50km/h o 60 km/H		23/8/2021 16:48
iniciar cargar imagen	encontrar coordenadas Medidas Topologicas de Accesibili	dad		

Figure 21 Capture

31. The generated file is made up of 13 pages, which contain useful arrays for the researcher to analyze the route, now the researcher can compare many routes or modify their nodes and evaluate their performance, the last page is a summary where, among other things, data such as travel time can be observed Figure 22 Capture

uma_tiempo_recta Sur	ma_tiempo_ruta	Suma_Indice_TrazadoTv	Suma_Shimbe	Suma_Factor_ruta	uno_dividido_n_menos_1	Ri	uno_dividido_n	suma_tiempos_ruta_tiempos_recta	trazado_velocidad_nodo	Absoluto_Tiempo_Global	Tiempo_viaje_hasta nodo min F	Factor_ruta_tota
72.69691194	168.455913	30.90434343	7 7	8 30.9043434	7 0.012987013	0.40135511	0.012820513	2.31723616	0.029708156	6 168.45591	3 20.52234783	2.317236
57.31270485	84.78210984	19.65111511	1 6	7 19.6511151:	1 0.015151515	0.297744168	0.014925373	1.479289977	0.022078955	5 84.78210984	12.91563844	1.4792899
46.94617646	71.14597712	17.80835755	9 5	8 17.80835759	9 0.01754386	0.312427326	0.017241379	1.515479694	0.0261289	6 71.1459771	11.40051259	1.5154796
40.52064316	64.39916247	18.05006608	8 5	1 18.05006604	8 0.02	0.361001322	0.019607843	1.589292702	0.031162603	64.39916243	7 10.43668192	1.58929270
35.74895601	57.84675973	18.09790051	1 4	6 18.0979005:	1 0.022222222	0.402175567	0.02173913	1.618138435	0.03517692	2 57.8467597	9.126201373	1.6181384
32.85754883	53.38381693	18.86258729	9 4	3 18.8625872	9 0.023809524	0.449109221	0.023255814	1.624704789	0.037783833	2 53.38381693	3 7.638553776	1.62470478
32.70352306	52.75875515	19.41057352	2 4	2 19.41057352	2 0.024390244	0.473428622	0.023809524	1.61324378	0.03841056	52.7587551	5 7.013491991	1.613243
33.72723734	53.6689611	19.51326229	9 4	3 19.51326225	9 0.023809524	0.464601483	0.023255814	1.591264667	0.037006155	5 53.668961	6.103286041	1.5912646
35.16815478	56.4646865	19.75693201	1 4	6 19.7569320	0.022222222	0.439042933	0.02173913	1.605562955	0.03490354	2 56.4646865	5 5.171377574	1.60556295
40.72397073	61.66644851	17.0314677	7 5	1 17.031467	7 0.02	0.340629354	0.019607843	1.514254318	0.02969126	1 61.6664485	4.131025172	1.5142543
45.67777901	71.08710297	17.25375609	9 5	8 17.25375609	9 0.01754386	0.302697475	0.017241379	1.556273193	0.02683229	5 71.08710293	2.785217391	1.55627319
56.19462528	86.3415881	17.04167317	7 6	7 17.0416731	7 0.015151515	0.258207169	0.014925373	1.536474132	0.02293245	5 86.341588	1.0902746	1.53647413
63.0144054	98.3346087	17.49122294	4 7	8 17.49122294	4 0.012987013	0.22715874	0.012820513	1.560509983	0.020006531	8 98.334608	7 0	1.56050998

Figure 22 Capture

32. It is important to note that this feature is for researchers with access to route data and broader mathematical knowledge.