

Application of GIS Evaluation for Air Quality in Chinese Culture University Campus

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ABSTRACT

Campus always have many open space where are filled with trees and grasses, plan... etc. However, the density of teachers and students being growth, there are more and more education building would be build. Therefore the trees and grasses are reducing. So, the air quality in Campus become into worse.

As a result of the global air quality get worse. We are respect for environmental quality more and more, including air quality. In this study, we presume to photosynthesis and CO₂ are absolute relation. And activities of people play the major role. For this reason, we will consider population, weather, plants, ...etc. as important factors to establish my database in this study.

We take Chinese Culture University (CCU) campus for an example. And application of GIS method, first we investigate database in the campus. Second, we build the digital map with 2D, which can easy to view the distribution of trees. Third, we measure the CO₂ in campus averagely by 8×8 squares grid over campus in order to find out location of value. Fourth, we put those data together into my geo-database. Fifth, we analysis the data to find out the relationship between CO₂ and environment condition by contours function.

Finally, we will to propose to improve campus's environment by this result. We will evaluation the plants where too crowd, where less trees, where grassless...etc. At those locality needs to add trees or spread population to make the air quality better. In the future, many planning of plant can be and improved by this method. we hope that plants not only having usefull to beautify but also improving campus's air quality..

KEY WORDS: Geographic Information System, Air Quality, Environmental Monitor.

1. INTRODUCTION

Campus always have many open space where are filled with trees and grasses, plan...etc. However, the density of teachers and students being growth, there are more and more education building would be build. Therefore the trees and grasses are reducing. So, the air quality in Campus become into worse. Therefore, these study in base of the theory about air quality. And , using in the air quality monitor at campus.

Geographic Information System including many function, and suit for the study of large district. Actually, it use in measure, planning, national defense, administration, land-use, land using, communications...etc. We hope that digitized campus build up not only help to campus planning but also monitor.

As a result of Geographic Information System have those huge ability. Thus, this study use the software Arc view GIS and Excel to reach my concrete results. We take Chinese Culture University (CCU) campus for an example. And application GIS method to establish the GIS of our campus, which about plant and air quality. We hope that system could provide suggestion about plan of campus.

2. REVIEW of THEORY

The CO₂ cause maximum damage is greenhouse effect. It means that a short wavelight and strength divergence. It through across glass greenhouse, and be absorb. It become low and a medium wave. These long waveleight couldn't through glass again. And to be stay in the glass which to be provided effect to keep warm. Presently, the CO₂ in global emission to be in possession of a greenhouse physics amount 55%. The Earth just like a big greenhouse, And the atmosphere lose ability of adjust warm. The warm are get rise.

People always feel comfortable as a result of tree. And tree to be provided with many function, like photosynthesis, produce fen-duo-jing. Besides, it could disinfect, parasitism, ...etc. to arrive at variety of animal and a plant. In our intelligent, could provide physical and mental relaxation. In this study, we presume to photosynthesis and CO₂ are absolute relation. And activities of people play the major role. For this reason, we will consider population, weather, plants, ...etc. as important factors to establish my database in this study. And doing environmental monitoring of campus also. Environmental monitoring is quite right in specified time and space facing on specific environment. (jin-teng -ci-lang, 1993)

In the past, the outdoor of pollution, CO₂, we can't find from environment protection section in Taiwan. Cause on records of abroad, the deepness of CO₂ get into dense. From BC. 1958 (320ppm) to BC. 1982 (340ppm) (Dong-rong Chen, 1993) . We can find out the environment is change of global. Therefore, in this study we take campus for an example to analysis and to prove. To find out the relationship between CO₂ and tree. And proceed to find out the place at campus where are need to improve air quality.

3. Design of Study

3.1 To Make Using of Tool

We take the machine of measure CO₂, and find out the value of CO₂ at every observe place. (unit: ppm / 1min.)

At the same time, we will consider the action of population in our observe place. Including cars, degree of temperature, wind velocity.

3.2 To make a base map

We take Chinese Culture University (CCU) campus for an example. And application of GIS method, first we investigate database in the campus. Second, we build the digital map with 2D, which can easy to view the distribution of trees.

Third, we measure the CO₂ in campus averagely by 8×8 squares grid over campus in order to find out location of value.

Fourth, we put those data together into my geo-database. we analysis the data to find out the relationship between CO₂ and environment condition by contours function. Finally, we will propose to improve campus's environment by this result. We will evaluation the plants where too crowd, where less trees, where grassless...etc. At those locality needs to add trees or spread population to make the air quality better. In the future, many planning of plant can be and improved by this method. we hope that plants not only having usefull to beautify but also improveing campus's air quality.

4. Environment investigate and analysize

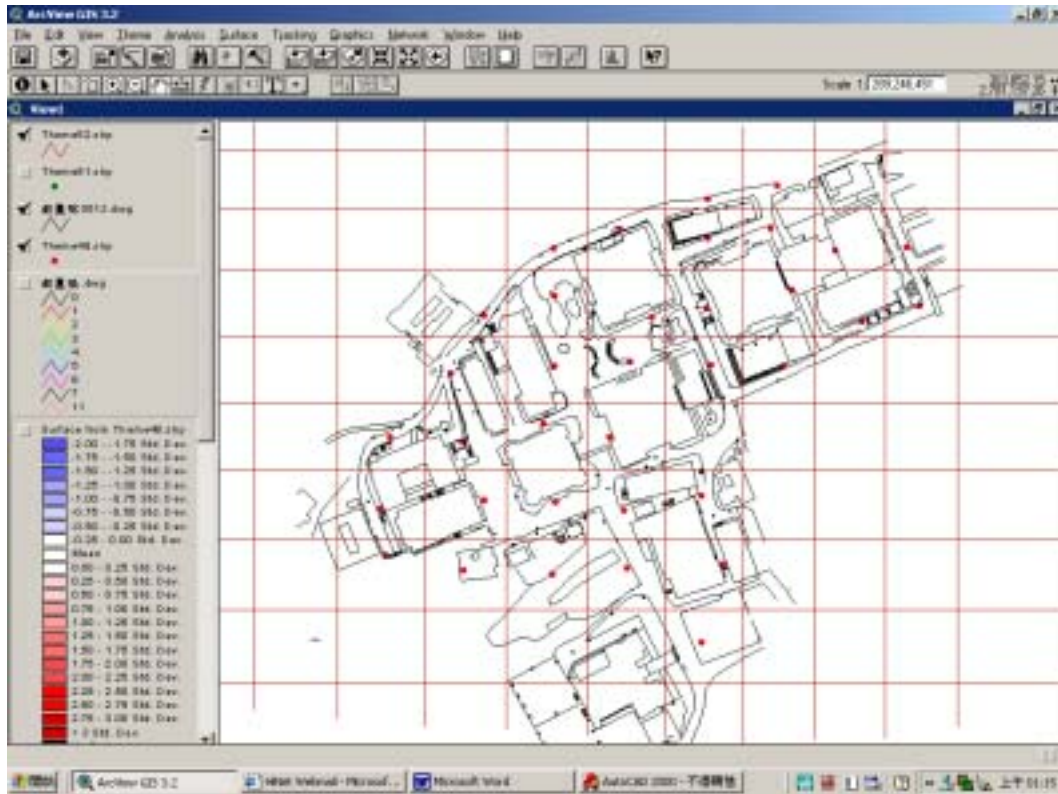
4.1 The measure of times and space

4.1.1. Times to Control

As a result think the action of teacher and student. This study will choose on class-time. And to use as (pm.3:00-pm.5:00) the most activities of population.

4.1.2. Space to Control

About weather, the 20°C-28°C and wind velocity between 4.5-8.8m/s,. And the observe location as follows:



(figure.1:the range of activity, measure)

4.2 Put those data together into my geo-database

Depends on the above-mentioned investigate result. We put on these data into my geo-database. Including the content of CO₂ (ppm/1min.) , population (people/1min.) . In addition, we also investigate into the tree which locate, type...etc, in the campus. In order to experiment more convenient. we add filed and put into this table. The condition as follows (figure.2) :

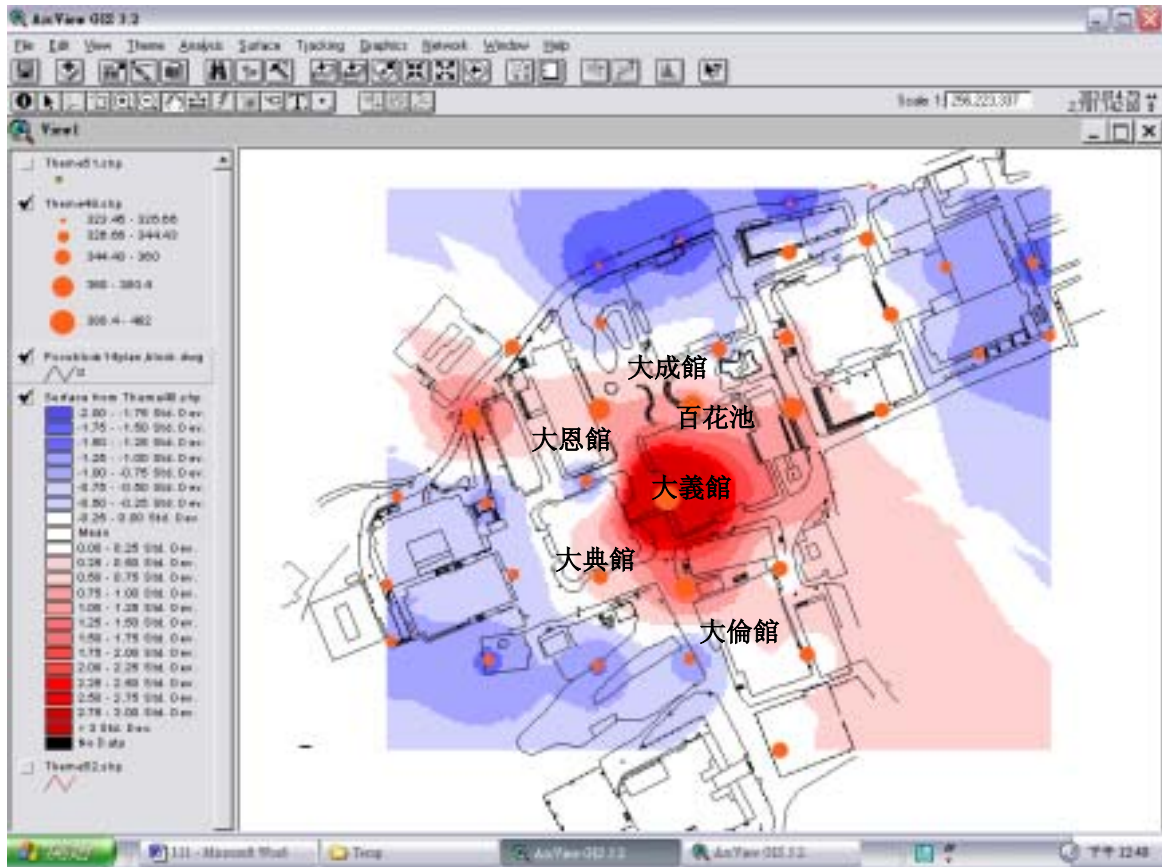
Stage	Code	Layer	Elevation	Distance	Code	elev	CO2	dir	count	dir
Part2	Part	Part01	0.0000	1.0000	0	0.0000	344.43	12	20	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	350.00	46	30	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	337.90	43	100	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	482.00	7	450	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	377.00	20	200	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	366.04	12	750	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	366.00	15	200	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	380.40	36	15	3
Part2	Part	Part01	0.0000	1.0000	0	0.0000	330.00	22	20	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	341.37	16	3	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	330.45	5	2	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	333.00	20	7	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	333.63	25	2	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	337.00	22	15	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	353.52	9	20	2
Part2	Part	Part01	0.0000	1.0000	0	0.0000	356.42	36	3	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	354.65	60	20	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	343.26	50	4	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	366.00	125	200	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	356.72	50	200	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	337.39	10	20	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	335.56	20	30	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	354.49	73	30	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	360.00	80	30	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	347.00	38	40	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	343.00	145	5	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	355.00	8	7	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	333.45	12	4	2
Part2	Part	Part01	0.0000	1.0000	0	0.0000	324.88	12	2	2
Part2	Part	Part01	0.0000	1.0000	0	0.0000	362.45	190	50	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	353.30	13	30	1
Part2	Part	Part01	0.0000	1.0000	0	0.0000	338.02	3	6	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	332.28	9	10	0
Part2	Part	Part01	0.0000	1.0000	0	0.0000	335.65	41	20	2
Part2	Part	Part01	0.0000	1.0000	0	0.0000	324.88	50	3	2

(figure.2:the geo-database)

4.3 To Analysis Data and Drawing

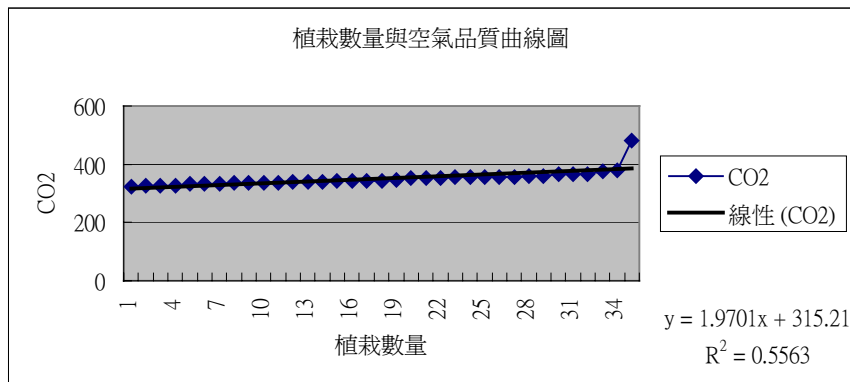
4.3.1. The State of CO2 Spread:

In the drawing color, we will find that red the more, CO2 the high. On the other hand, color blue the more, the air quality better. In this drawing the point of monitor size in the person value of CO2. detail to see the figure.3:



(figure.3:the result of air quality spread)

4.3.2. The relation between plan and air quality:



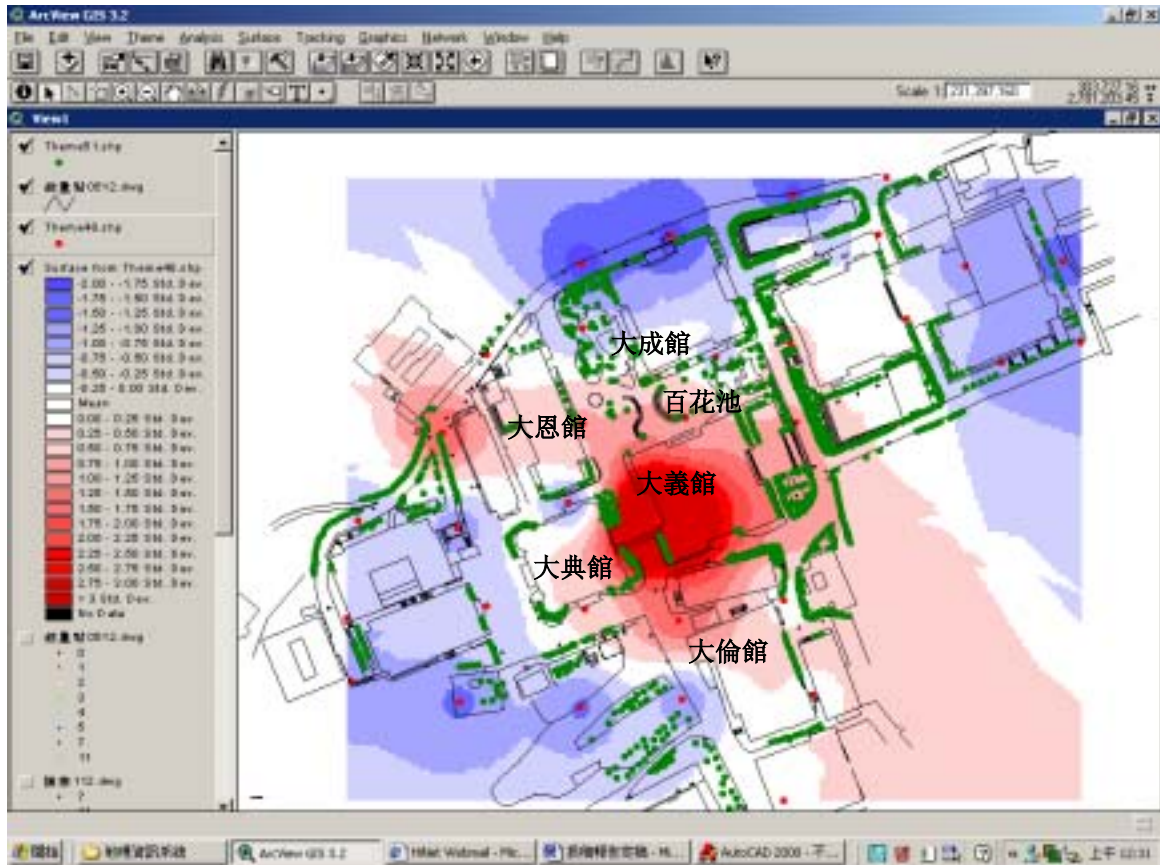
(figure.4:the relationship between tree and air quality)

In this point of view, air quality(the content of CO₂)and the number of tree are opposite. In this linear equation, it is obvious we can find out and to proved.

5. Results of Study

5.1. The relationship of analyze

In the result of study, we take compare with the location of tree and the spread of CO₂. We can find out the relation of tree and air quality.



(figure.5:the relation of tree and air quality)

The place between building of da-dian and da-ye are the most tight squeeze which always full of people. And the value of CO2 is the highest. Trees are small and less. The next the place between building of da-xian,da-lun and parking area. There are two place need to improve urgency. Besides, the place between da-zhong and da-gong are not well although don't have many people, but cause of less plant and terrain. Therefore, this study suggest that to increase plant or to degree population. Thus, we can add shade of green and provide place to rest.

Around located at bai-hua pool, the activities usually very frequently. Although the value of CO2 not well. But doesn't influence air quality in campus. It is a special result in this study. It maybe the huge open space, mist, plant. So, the air quality is not bad. Beside, the place between da-yi building and da-cheng building due to many tree, so can't be influence by many population and cars.

A frond and side door of da-en building usually collect many people. And plant is not many, besides a strong breeze too much. It can plant some check winds of plants to step up the student quality of the walk, still more can reform quality of the air degree and add the sense of sight and landscape.

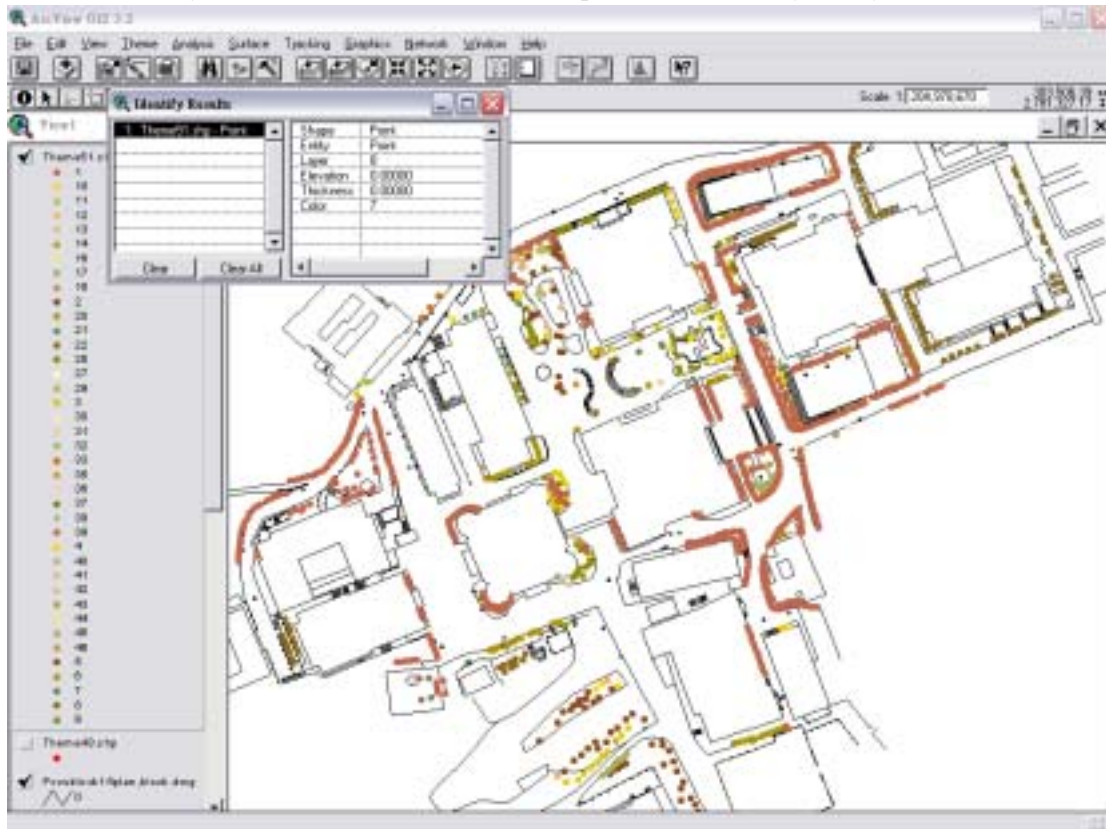
Finally, in this study, the air quality surround campus was well. Because of Chinese Culture University located in the yang-ming mountain national park. In the other hand, the CO2 in the center of campus are high and the population density are centralize.

5.2. Other specific result

Besides, the GIS of campus we established still provided with many function:

5.2.1

We can easy to find out the kinds of tree and spread of location by this system.



(figure.6: spread of the kind of tree in campus)

(table.1: number of the spread of tree)

編號 (no.)	數種 (kind)	編號 (no.)	數種 (kind)
1	龍柏 (Juniperus chinensis.)	24	裏 x 百日
2	相思樹	25	山黃麻
3	榕樹	26	尤加利樹
4	樟樹	27	木荷
5	構樹	28	大王椰子
6	青楓	29	亞歷山大椰子
7	楓香	30	金絲竹
8	山櫻花	31	杜英
9	羅比親王海藻	32	福木
10	蒲葵	33	茄冬
11	厚皮香	34	銀杏
12	大頭茶	35	黃槿

13	黃椰子	36	印度橡膠
14	樹杞	37	柃木
15	赤楊	38	羊蹄甲
16	山豬肉	39	垂葉榕
17	杏樹	40	豔紫荊
18	桃樹	41	饅頭果
19	木麻黃	42	竹柏
20	大葉山欖	43	梅花
21	黃蓮木	44	黃楊
22	森氏紅淡比	45	肯氏南洋杉
23	小花鼠刺	46	雪松 (Cedrus deodara Roxb. ex Loud)

5.1.2

We can take compare with the kind of tree and air quality. And find out which kind of tree has comparative effect in air quality. In this study we can also find the air near *Juniperus chinensis* are better.

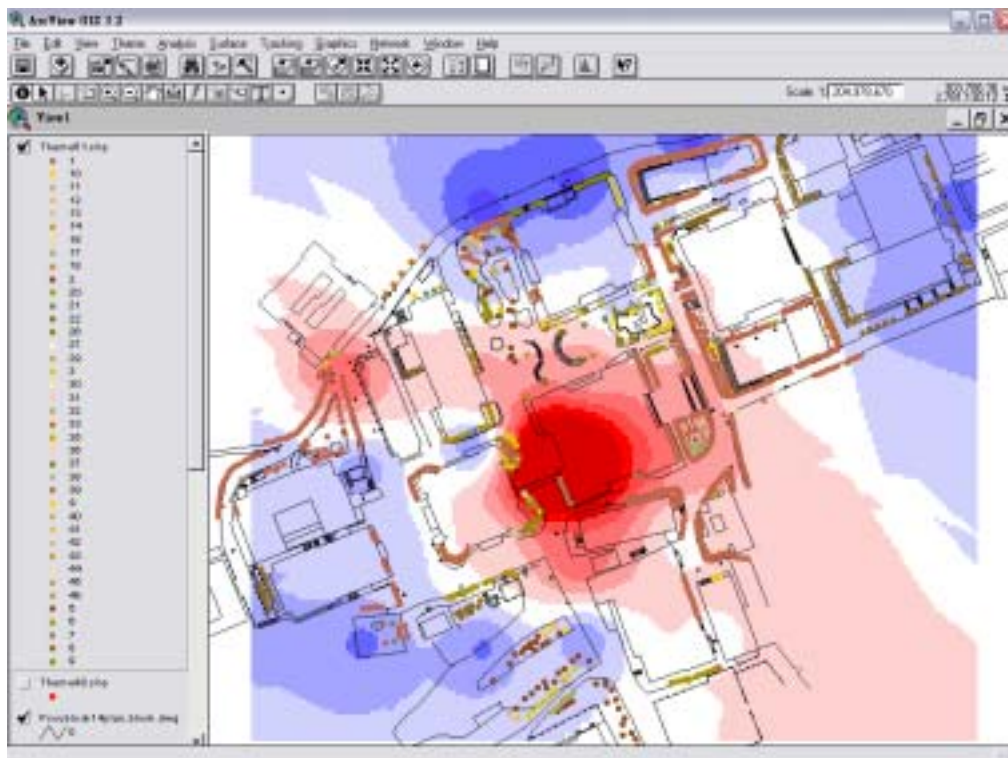


figure.6: relation between kind of tree and air quality in campus

6. Conclusion and Suggest

6.1 Conclusion

6.1.1

The location between da-dian building and da-yi building in campus is people to come in and go out the most constant, because of the space dispose relation. It is short of high trees around this place. This research suggest that it can add plant and green face to face in this area, and still more suggestion is to be ready to guide the population action to another space to arrange the movement.

6.1.2

To be located at bai-hua pool, the activities usually very frequently. Although the plant is quite gross, it is a fairly good space to action.

6.1.3

Around the da-en building's plant is not many, besides a strong breeze too much. It can plant some check winds of plants to step up the student quality of the walk, still more can reform quality of the air degree and add the sense of sight and landscape.

6.1.4

Increase the plant or the greensward in campus of the internal part to raise the quality of the air in campus and to be affected by the sense of sight and landscape. In every building (a comprehensive classroom) can add exit and entrance in this suggestion, to appropriate to relax stream of people.

6.1.5

To establish the system in teaching of plant and planning of space . If the campus establish the system, it not only can control the grow density of population efficacious and quality of the air, campus to monitor....., it have very large help.

6.2 Suggest

6.2.1

Due to the relation between to special topography and location in Chinese Culture University (CCU) campus, maybe it affect not very serious.

But the method is a new think direction, the rest maybe be deduced by analogy to use the trees to improve it in many space plan. Make the tree not only the function can to beautify the campus but also quality of the air can to promote in campus.

6.2.2

Following the research suggest up, it can establish the age of trees and plans and the height of trees and plans, it can join the idea of times change in future to use. Making the campus to have more and more development.

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