FROM NODES TO CENTRALITIES

Creating new pedestrian urban vitality under the background of upcoming public transportation systems
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This is a mono-centric and intensive city.

This is the center and capital city of an eastern Chinese province, Anhui.

This is a common and noteless city for foreigners and even for amount of Chinese people.

This is the city of Hefei.

Nevertheless, in the economy evolution period of this decade, Hefei has been making effort to become a real economic, cultural, political and commercial center of Anhui Province, and even energetically to let itself be involved in the economic activities of Yangtze River Delta Region. In the wake of more efficient public transportation coming up in the region and inside the city, Hefei will meet an excellent opportunity for self development.
Complex Cities is a research and design studio. In this studio, we start regional and metropolitan level research at the beginning and research part is pretty important for the future stage’s strategy. The figure below indicate the effort what I paid on different scale and what kind of tools I applied on.

This thesis makes research on this specific city and some vital transportation nodes relying on TOD theory, urban configuration theory to try to conclude the relationship between mass rapid transportation and people’s natural movement to eventually generate some concrete urban design projects to help specific area grow maturely from a normal node to place and finally centrality.
How could new coming-up transportation systems (high-speed rail and MRT system) improve or optimize urban transformation in the city of Heifei?

**Sub Research Questions**

Theoretical sub-questions
- How could I define the scale of research objectives?
- How does the TOD theory stimulate the massive rail transit system working, especially for increasing pedestrian activities?
- What is the role of spatial configuration theory and tool in the research of natural movement and in the design period?

Practical sub-questions
- What could be brought by two new transit systems’ coming-out to the strategic vision for the whole metropolis?
- How could the most potential site be defined and chosen?
- How could I organize the public space and urban structure in the chosen strategic site, the centre of which is an intermodal transit hub, to make an urban design to integrate all the fragmentations and enable the natural movement and pedestrian activities?

**Keywords**

Public transportation; CRH (China Railway High-speed); MRT (Mass Rapid Transit); Natural movement; Pedestrian activities; Urban vitality
What TOD is

A transit-oriented development (TOD) is a mixed-use residential or commercial area designed to maximize access to public transport, and often incorporates features to encourage transit ridership. A TOD neighborhood typically has a center with a train station, metro station, tram stop, or bus stop, surrounded by relatively high-density development with progressively lower-density development spreading outwards from the center.

Main surpporting theory

TOD (transit oriented development)
Urban configuration theory

Problem Statement

The city of Hefei is a fast growing city which has over 4 million people within the whole metropolitan area. As long as the city exploding incredibly, government plans to build a new MRT system to connect each centrality or high intensive community distributed in over 250 sqkm built area. On the other hand, from a regional point of view, new upcoming national policy which will bring high speed connection to other vital cities would impact the local development, more global people coming, and transportation hub upgrading even new stations building in plan. Simply according to TOD theory, the new public transportation system is great opportunity to make the city more compact so that the sustainability makes sense. Consequently, how to organize a new urban space for pedestrian between each two vital transportation nodes is a new challenge before us.

Let us start from a global view...
"A key dynamic explaining the place of major cities in the world economy is that they concentrate the infrastructure and the servicing that produce a capability for global control. The latter is essential if geographic dispersal of economic activity—whether factories, offices or financial markets—is to take place under continued concentration of ownership and profit appropriation."

- Saskia Sassen, 'Global City'

This is a new era of metropolis. Globalization has been discussed hundreds and thousands of times for its impact to the urban transformation of megapolises, metropolises and even small towns. As most people know, the less developed countries especially those which in Asia are in their golden period of extreme urban exploding, which not only caused by amazingly raising urban population and built area but also the increasingly constructed infrastructure connecting the urban components much more compact to enable the urban function effective.
There are three vital metropolitan regions distributed along China east coastal area, involving Beijing, Shanghai, Shenzhen and Hong Kong, all of which are the most important great cities of present China. However, they couldn’t represent all the cities of China. What is the current situation and future’s orientation of other secondary cities in the hinterland, over 20 cities of which are capitals and economic cultural centers of respective provinces? What is the relationship between these common cities and great metropolis, Rim Bohai Bay, Yangtze River Delta and Pearl River Delta?
Normally speaking when talking about YRD (Yangtze River Delta), which is probably the most developed region of China; people could only be reminded as Shanghai, south part of Jiangsu Province and north part of Zhejiang Province, the most highlight area in the night view map above. Whereas another province also located around and passed by Yangtze River, which called Anhui, is comparatively dusky. The only one shiniest spot is actually the objective city of this thesis, Hefei, the singular metropolis of Anhui.
Among overall 33 provinces and executive regions, the GDP of Anhui is at Ranking 16 in 2008, last but one of all 7 eastern provinces. However, Anhui Province actually has amount of resources. What is the main reason that this region cannot grow as fast as Zhejiang and Jiangsu which are both just adjacent it on economic aspect? I suppose there must be some underlying external factors influence the economy. In the next stage the most concerned one factor, infrastructure for mobility and logistic will be considered as the most crucial one.
Anhui Province is separated into 3 parts by two big rivers, Huai River, the geographical boundary of North China and South China, and Yangtze River, the longest river of China.

The interesting thing is the population distribution throughout the whole province could be defined by the two water boundary on some degree.
The north part has the largest population and is correspondingly economically dominated by some labor intensive heavy industry.

The terrain of south part is extremely covered by great mountains. This geographical reason is the primary cause of less density of population and in the mean time offering the local people great enormous tourism resource.
Hefei is located in the central part. Because of several universities located in this region, the Yangtze-Huai Region (region between two rivers) elaborates on manufacturing especially auto industry and some high tech industry by using the advantage of plenty of high educated population.

The 5 municipalities located along Yangtze River and Chaohu Lake, which is the 4th largest one in China, mainly situated along Yangtze River are the most developed areas of this province. One third of the total population dominates almost half of GDP.
How large the sub-region is

- **Flemish Diamond**
  - Population: 5,500,000
  - Area: 4,522 km²
  - Density: 1,216.3 inh/km²

- **Randstad**
  - Population: 7,500,000
  - Area: 2,928.5 km²
  - Density: 2,561 km²

- **Rhine Ruhr**
  - Population: 5,300,000
  - Area: 1,195 km²
  - Density: 4,435 km²

- **Hefei**
  - Population: 4,867,400
  - Area: 690.7 km²
  - Density: 7,047 km²

- **Nanjing**
  - Population: 7,590,000
  - Area: 1,123.5 km²
  - Density: 6,598 km²

- **Hangzhou**
  - Population: 7,731,000
  - Area: 458.9 km²
  - Density: 16,847 km²

- **Shanghai**
  - Population: 18,884,600
  - Area: 2,683.6 km²
  - Density: 7,037 km²
1.4 MOBILITY & NETWORKING

Inner city mobility

Public transportation

Private transportation
In this stage of the thesis, we start to concern the one of the main topics, mobility. Here the mobility means both the connection towards other cities and inner-city networks. Firstly, just as a corresponding material to the previous study for this region, some research result about socio-economic issue could be concluded by the following step of regional networks analysis.
1.4.1 RAILWAY NETWORKS IN REGION

Railway System Situation Before 2008

CRH= China Rail Highspeed

CRH1, 200-250km/h  CRH2, 200-250km/h  CRH3, 330-380km/h  CRH4, 200-250km/h
After CRH Partly Coming Into Use Currently, 2010

It is getting much more efficient to connect Hefei, Nanjing and Shanghai after some new CRH rails coming up in these a couple of years.

However there is no effect for connections to lower level cities.
After all railways updated for being run by CRH trains in 2020

The transportation from Hefei to other three secondary cities will become extremely convenient after 2020, the normal railways being upgraded for CRH usage.
In the meantime, Chinese government also concentrates on the highway construction on different scale in recent years. When we zoom in to focus on the highway system of east part of China, we could be clarified that all the cities we discussed previously in this region and sub-region are all linkable through the region highway.
YRD Region is a “within-3-hour” economic circle because the distance among three main engine cities, Shanghai, Nanjing and Hangzhou is quite short. In addition, all of these three are typical intensive capital city of this region, plenty of famous universities, upstanding service sector, and enormous amount of cultural activities. Other secondary cities working around this triangle collaborate independently to shape this more and more compact, efficient and productive region.

On the other hand, just located in the west wing of YRD, another potential workable sub-economic circle is shaping gradually as the engine of the city of Hefei. Moreover, based on the previous analysis, we could easily conclude the city of Hefei and adjacent region are both less developed, backward in economy. Due to the geographical and economic center of the province, Hefei would be potential to become bond to link YRD Region and hinterland.
In this increasingly globalized world, network connects everybody and every place collaborating together. Different kinds of network function on different scale. Rapid long distance transit could enable a 3-hour economic circle for connecting several interdependent metropolises. So do the relationship between downtown and satellite towns.

As imagined virtual interface connecting urban components, networks represent as different forms of infrastructure to function in reality. Hereby what I am introducing are two essential forms, rail for transit and road system, which will be researched throughout the whole thesis.
The regional public transport getting more convenient is helpful to strengthen the leading position of Hefei in this sub-region. Depending on the various product could be provided by the around areas, what we need to be create is a service economy oriented commercial city for the future’s Hefei after 2020.
Hefei is a pretty monocentric city. One high urbanized area located in the center of whole municipality. In the south part of this city, the fourth biggest lake of China, Chaohu Lake is going to be touched by the urban body.
Before the People's Republic of China was founded in 1949, the city of Hefei was still a small town consisting of several streets. There was no automobile running on the road. Commercial activities happen on some integrated spaces mainly concentrated along the river. In addition, the river was also used for logistics and transportation.
2.2 PERIOD FROM 1950-1990

During a long period under the communists’ leading, especially before 1980s, the whole China was obstructed on almost everything including slow speed of economic growth, low quality of education but high birth rate. Although Chinese government was keeping very good relationship with Soviet Union, and always got knowledge and technique from this communism great country. The soviet style city plan cannot help the urban economy but somehow implied the authority by straight and wide no-sense avenues. On the other hand, as long as the reform and opening-up policy was carried out, the urban life became more activated and some old local streets recovered into a new spring again because of their high quality for pedestrian activities.
2.2.1 Governmental Plans in 1958 and 1979

The main idea of the plans in 1958 and 1979 are both making it a ecological city. The concept of a green belt surrounding the old town center was initialed at that time. This so called "green necklace" which consist of several parks linking as a ring, has already been kind of icon of this city.
2.2.2 Green Belt
Historical map of Hefei, 1803
Overall population and population of labors were both increasing dramatically. However the numbers of staffs working in national-owned and collective-owned enterprise were both decreasing modestely. This phenomenon implies the economy is in an evolution process and the tertiary industry is growing up and almost occupying half of GDP in total.

The raising on population and GDP is extraordinary after 1990s' especially entering the new millennium.
The world urban population is expected nearly to double by 2050, increasing from 3.3 billion in 2007 to 6.4 billion in 2050. Virtually all of the world’s population growth will be absorbed by the urban areas of the less developed regions, whose population is projected increase from 2.4 billion in 2007 to 5.3 billion in 2050.

Hefei, standing at a less developed position, is right in its amazingly growth.
2.3.1 Governmental Plans after 1990

After 1990, every 5 years making a new plan for the whole city has been guiding the city sprawling towards south and west.
Series of top-down urban planning can not completely control this city growing as government expected. Especially after 1990s' the urban exploding changes the main structure of this city at all. That is the reason why alteration of the city's master plan was made every 5 years.
The plans and realistic urbanization procedure act and react, influencing each other to lead this monocentric city sprawling to south and west.
a fast expanding city towards lake and mountain
As long as the urban area expanded and population rose rapidly in last decade, the local government concentrates on the solution for making this growing city more effective for citizens for years. A long term approach in terms of TOD theory (Transit Oriented Development) would be carried out for the upcoming 10-15 years to construct a **MRT (Mass Rapid Transit) system** to strengthen the compactness of Hefei.

According to TOD theory and the relationship between compactness and sustainable, I would like to make hypothesis that the development of some parts of the city would be more sustainable with the combination of various type of movement which briefly oriented by pedestrian and public MRT.
3.1 POPULATION DISPERSAL & MRT SYSTEM

- =1000 inhabitants, R=100 m
- Built urban area, 2009

Proposed MRT
- =1000 inhabitants, R=100 m
- Built urban area, 2009
As I introduced in the previous chapter, the city is sprawling towards south and west, correspondingly, the government planned to create more road connection on different level mainly in the west and south outskirt of the city of Hefei.

As long as the existing airport area and its vicinities are urbanized, the airport would be shift to the northwest corner. The old Luogang Airport will be reconstructed for other programme.
3.2 RAILWAY SYSTEM & AIRPORTS

Existing Situation
After an old railway crossing the urban body removed and the airport shifted to another place, a brand new railway line only serving for CRH train will be constructed from west to east.

In the Future
In addition, a new CRH station will be situated near the old airport area.
The main station before reconstruction

The main station after reconstruction

The current status of west station

The existing situation of the three stations is completely different. The main station is just finished the upgrading reconstruction in 2010.

The west station is still in unprogressive and dull condition.

The impression of future's CRH station

While the new CRH station which has already determined to locate on the south, is still in architectural design stage.

The abandon old station

The platform has become the pedestrian for citizens.

On the other hand, along with a single railway crossing the northwest urban area would be abandoned in this a couple of years, the old station, which totally cannot afford any transportation function, will also be removed.
We can conclude three important transit node form the overlapping transportation system map above.

3.3 TRANSIT SYSTEMS& VITAL NODES
In light of **TOD** theory (Transit Oriented Development),

the site chosen of public transit nodes is based on the current situation of urban function and population density;

Correspondingly, the determined transit nodes would stimulate the service economy of surroundings as a reaction.

I hope,

these nodes on different level, which are existing or will be constructed, could be situated and designed in some positive way for integrating the local service economy, commercial, logistic and so on.

That is from **node to place and to centrality** eventually.

Moreover, massive public transit would be helpful to make the city more compact and generate more pedestrian activities. That is a sustainable urban development approach inside urban area under the big background of rapid urban exploding of the whole city.
On this stage I zoom in to focus on the three specific areas on lower scale. Assuming the three nodes have already mature to be kind of centralities with a radius of 3 km is the first step. Then I put different urban function on a same map as below to be implied the urban vitality of the three areas on empirical way.

Obviously we could realize the most concentrated area is the old city center. The southwest part is in rapid growing period, located with plenty of educational institutions and public space.

Although from a geographical view, the locations of these three assumed centralities are equally more or less. The northeast one (Main station area) seems to be more attractive concentrated more urban functions compared with other two.
Then from another point of view of statistics, I compare the FAR (Floor Area Ratio) value of each block within the three areas and the amount of distributed small scale commerce.

The mapping result could indicate directly that the hottest place should be the central and south part of main station area, which situated large amount of restaurant, retails and different types of stores. The fascination is just beside the high density block, some blocks are more or less FAR zero.

Comparatively the west station area and CRH station area are both much more dull as kind of suburbia.
The strong dominant position of main station area in terms of population distribution is apparent as well basing on the above figure which indicates the population density researched by C. Jinlong and W. Zhiqiang.

Why does this kind of urban asymmetry happen? It could not be easily concluded by saying it is consequence of policy or some specific macro planning. People always say it is the complexity of urban issue when referring to complex urban questions. This blur answering throwing the positive attitude away makes no sense at all.

Prof. Bill Hillier answered this question with his brand new concept of urban configuration. The next stage of theory study and experiment will help us to understand how urban configuration works and influences the vitality of urban components.
Natural movement has come to light as a formal and empirical phenomenon through the application of new techniques of configurational analysis known as ‘space syntax’ to the analysis of the local and global structure of the urban grid, and their coupling to simple techniques for observing space use and movement. It is noteworthy that the space-syntax techniques which postdict (techniques which find regularities that form the basis for prediction) natural movement were not originally aimed at modeling movement but at understanding the morphological logic of urban grids, especially their growth.

-B. Hillier, *Natural movement: or configuration and attraction in urban pedestrian movement*, 1993

In this stage, I would apply several different tools or models for research on urban grid. The oriented theory is urban configuration and basic tool is space syntax based software Depthmap. Stephen Marshall’s method described in his book ‘Urban& Patterns’ about the road continuity will also be applied to test. Prof. Taeke de Jong’s urban road model is the basis of grouping experiment tested in Depthmap.
5.1 DEFINITION OF URBAN CONFIGURATION

Different forms of urban structure all could connect each urban component with others. People could access the destination through various types of combination of single connection as options. This is a topological issue.

Psychologically, people always choose the least turning or least distance route. So that is why different forms of urban structure combination function totally different for integration value that indicated in Depthmap testing. That is so called urban configuration.
Parameters should be taken into account

- Hierarchy of Roads
  Regional Highway
  Inner City Freeway
  Main Road
  Neighbourhood Road
  Local Street

- Density of Roads

- Continuity of Roads
  X-junction/ T-junction

Altering the parameters:

Starting from the basic urban pattern model, firstly I categorized them into three groups according to three main parameters, the location of dense area, density and continuity. Here the dense and density means the density of road mesh.

Conclusion:

1. The ones which crossing more dense area dominate higher integration value ($R=n$)

2. One road which gets more dense meshes crossing, dominates the higher integration value.

3. In the same case, the continuity determines the connectivity value as well, thus one T-junction comes a series of lower integrated roads appear consequently.
This step of comparison study compares the road mesh situation of 3 research objects of Hefei and 3 Railways station area in London. Apparently, the low density of road mesh of Hefei, especially on the neighborhood level is a big shortage of this city. From my personal experience, I surmise there are three main reasons: top-down road construction policy, blocked community because of the security, and downgraded areas having no accessible route inside.
5.4 CLARIFICATION OF URBAN GRID

This figure demonstrates four extreme illustrations might not exist in reality. According to Stephen Marshall’s book, more cell-ratio and more X-ratio could help an area become more accessible and connected.

Applying this method to count the number of cell and cul, T and X junctions of three areas and input the outcomes into the chart in the next page.
To abide by the previous description and in light of the chart above, Main station area is dominated by much higher cell ratio than other two. While referring to X-ratio, there is no too much gap. Consequently, on this aspect, Main station area should be the most prosperous one.
Isovist is an architectural term what means the area within people's field of view. As an illustration of the figure besides, we assume the 4 white blocks as buildings or solid pattern in urban context from a view of plan. The calculated outcome of all line analysis shows all the isovist lines and implies which the highest integrated line is. Basing on this essential knowledge, Depthmap could get a visual integration map for such a case.

Conclusion:

Better visual integration at X-junction than T-junction;
The above urban grid could be imagined as a comparison of a homogenous low road mesh density city and another grown up city which has a high dense road downtown area and surrounded by low dense grid.

Manifestly, after a denser core area coming up, the vitality of the road changed a lot. We could conclude that the main road passing through the high dense city core would be more intensive on the aspect of visual analysis.

Better visual integration at junction point which situated at the intersection of two roads besides more dense (density of road mesh) area;

Local dense area might be less integrated on visual aspect.
Practical Conclusion as Further Design Principle:

1. In order to make a road more integrated, the best approach is enabling it to be crossed as dense meshes as possible. X-junction works better than T-junction.

2. In order to situate a transit node at a most visual integrated point, the best approach is locating it at the intersection of two higher level roads which are high configurative integrated. Public open space is indispensable.

3. Dense stops could be arranged in high vitality urban area to decrease the auto traffic. Correspondingly, the dense urban grid appearing, especially the lower level ones could release the traffic pressure as well.

The radius controls each respectively from local to global.
In space syntax theory, there are two very important value, integration and choice. Integration means the vitality of somewhere people would go to as destination. While choice means the vitality of somewhere people would go through as chosen route.

All tests would be carried out from three aspect, metric meaning the real distance, topological meaning the turning times, and angular meaning the turning angel.

The radius controls each respectively from local to global.

Normally speaking each value or outcomes could represent some specific urban preference.

For instance, the high topological integration areas generally are high intensive roads which could get by turning least.

The high topological choice value areas are streets which normally chosen by strangers not familiar with the city, while high metric choice areas are more frequently chosen by local.

And another value which would be taken into account is metric total length that could imply the urban geometric center.

The test will be carried out on different radius to show the various result from pedestrian to auto scale.
Road with least topological turns, local & global integration

- Topo-Global Integration $R=n$
  - End on one important avenue which is high global integrated
  - Surrounded by three high global integrated roads, one horizontal highway and two urban main streets

- Topo-Local Integration $R=3$
  - The avenue is also high local integrated
  - The highway is less local integrated

Vitality scale: lower to higher
The vitality of road chosen by outcomers, pedestrian level

This image shows vital roads for strangers on local walking movement level.

On this pedestrian scale, the people who are not familiar with this city used to walk inside old city. Some activities also might exist in the main station area.

Inside the west station area, some routes accessing the mountain are activated as well. New station area cannot afford too much walking activities at this time.

Inside the west station area, some routes accessing the mountain are activated as well. New station area cannot afford too much walking activities at this time.

Some same conclusion similar with the above one could be made as well.
The vitality of road chosen by outcomers, automobile level

This image shows vital roads for strangers on long distance walking or cycling movement level.

In this step, what I want emphasis is the strong link from main station towards the old center is very clear. This is a pretty important point for the strangers from other cities.

Other two do not have this advantage for comparing.

This image shows vital roads for strangers on automobile movement level.

Clear and strong linkage between old center and southwest part is implied again. In addition, on this driving level, the routes guiding towards three stations are all clear fortunately that means all locations are suitable for building a public transit hub at least on the driving aspect.
The vitality of urban commercial area, pedestrian level

This image shows urban hot area on short distance walking movement level.

If we zoom in further more, some similar conclusion with previous one comes out.

Main station's vicinity has great potential to develop the pedestrian activities.

This image shows urban hot area on long distance walking movement level.

We can easily conclude, the hottest spot within the city core area, which is the most red part, is actually also the most popular shopping streets.

Manifestly, the main station is most potentially involved into such a pedestrian commercial district. West station has some local potential as well. For located on the suburban, CRH station is surrounded by fields till now.
The vitality of urban commercial area, auto level

This image shows urban hot area on short distance automobile movement level.

It indicates on this level, also for cycling movement, the most popular area is also around the city core and especially on the south part of old center.

This image shows urban hot area on automobile movement level.

From previous study we can conclude this city is one monocentric metropolis which consist of two engines, one city core another the south-west new urban area. From this image, the most hot auto movement area is the part which connecting two engines.

West station is the nearest one.
The vitality of road chosen by local, pedestrian level

This image shows vital roads for local inhabitants on local walking movement level.

We could see the hottest area is inside the old city center. Besides, some local communities are also used so well by local people, for instance the communities on the northwest corner of west station area.

The center part and south part of main station area is obviously with great potential to create strong local connection with the old center for the natural movement.

Of course, the local pedestrian movement is happening all the time over the whole city mostly. From this image, we can again to demonstrate that the two engines assuming. Whereas when we concentrate on the three nodes, the differentiations appear.

Main station is on the area which full of this level's vital streets. Beside west station there is one area very activated for it is residential communities. Nevertheless, no vital road facing directly to the station. Around CRH station, it is completely empty.
The vitality of road chosen by local, auto level

This image shows vital roads for local inhabitants on long distance walking or cycling movement level.

Some similar conclusions like previous one we can made. One unique thing is on this level, the main station shows less activated.

Opposite result got from this image, are also understandable through empiricism study on this city. The most vital automobile roads are always the great avenues or main roads or highway.

When we concentrate on west station, the vital road which connect it directly is very frequently used by cars and also high global integrated. The highlighted roads around CRH station correspond the image in integrated map as well.

While in the vicinity of main station, much less auto flows are enabled.
Main Station:
located in the adjacent area of the hottest walking commercial district;
potential to load pedestrian activities as well;
only one integrated road connected; (not integrated enough)

West Station:
located in the less urbanized area, close to one crowded car traffic road;
directly connected with a very integrated road;
easily accessible with auto traffic however difficult by foot.

New CRH Station:
located in the outskirt area, surrounded by three very integrated roads, which
are city main roads and freeway;
easily accessible with auto traffic however difficult by foot.
6. STRATEGIC PLAN FOR METROPOLIS

The strategic position of 3 centralities in urban expansion

The concept of the strategy could be interpreted by this scheme very clearly. The city started from a historical core, and then a sub centre and green ring came out, the linkage between two urban engines is very strong.

The coming transportation systems’ updating is next opportunity for the city urbanization for more mobility will bring more activities. The three strategic transit hubs would potentially grow as three important centralities with different identities.

West would be a green and recreational integrative transportation service centrality. South, starting from the new CRH station, a step by step new town could be built towards the big lake. The main station vicinities, has the most urgent demand to be integrated with the original old city center as a whole entire commercial center area which is full of pedestrian activities.
If you still remember the question I asked in the first chapter how the urban components work independently inside the city, hereby we could conclude from the strategic urban transformation process that what the vision is.

THE GOAL

To enlarge the engine of urban economy, making the hot commercial district expand more and work more efficiently for pedestrian activities is necessary.

Consequently along with the previous study, the best way is merging the old center and main station area as a huge commercial oriented mixed district, which is also walkable when the MRT coming out. The main station would grow as a new center point working more like a "central station".
The site is chosen as the intermediate zone between old center and main station. In the future, a MRT line will connect these two hot spots very well. Plenty of elements and confliction would be great opportunity and challenge as well.
The old center is surrounded by several iconic parks like a green necklace. Commercial streets with green around are the identity of the core of this city.

I would like to extend this concept. Downgrade area here would be utilized as opportunity to regenerate as some productive and indentified district. These several patches will grow mature to encircle the main station and eventually blend into each other as a independent centralities.
The old center is surrounded by several iconic parks like a green necklace. Commercial streets with green around are the identity of the core of this city.

I would like to extend this concept. Downgrade area here would be utilized as opportunity to regenerate as some productive and indentified district. These several patches will grow mature to encircle the main station and eventually blend into each other as a independent centralities.
Within this walkable range, the north side of railways is difficult to access to the forecourt of station. While the south side is pretty good.
On this driving level, railways and rivers as barriers do not influence the north area so crucially.
Manifestly strong connection towards south is much better than the north direction. There is even a second step directly link to the city center.

There is no direct connection from north to forecourt is the key reason.
Dispersal of the commerce

Most of the commercial spots are distributed along the first step and at least the second step. According to this reality, create more roads easily connected to the main connection is a considerable action.
Bus lines & stops, reach radius = 250 m

In the abandoned rail area, it looks like a huge blank block and totally not accessed within the walkable radius of bus stops. Thus the inhabitants living here can not utilize the public transport tools so conveniently.

Bus lines & stops, reach radius = 500 m
7.5 VISUAL ANALYSIS FOR THE SITE

Visual integration [HH], R=n

with downgrades

Visual integration analysis indicates the most visual integrated nodes, which are potentially to be situated the MRT stations.

removing downgrades
Agent simulation

This is an AI simulation to demonstrate how the particles’ trajectory is and where would be more preferable to construct a new road and public space from another point of view.

with downgrades

removing downgrades
All line analysis

with downgrades

In this step of all line analysis which could best indicate the integration level of space, we could be immediately implied that after removing the downgrade settlement, the big open space would be much more integrated which means the potential for reorganizing a new pedestrian public space here is existing.

removing downgrades
In last stage of Space Syntax spatial visual analysis, I assumed removing all downgrade part for testing.

In all maps, more high light part means more vitality in this vicinity.

In this all line analysis, we could be told that where the potential route and public space is.

Accordingly, some initial proposed action was made especially focusing on creating new roads or reconstructing road to make this area with denser road mesh, more X-ratio and cell-ratio.

The areas containing more intensive actions would be set as the location of strategic key projects.
8.1 OLD STATION AREA

The existing situation
I made this questionnaire by the help of the students of Faculty of Architecture and Art, Hefei University of Technology. The investigated groups contain local inhabitants living in the new communities and old communities, local commercial people and people taking activities along the river.
This questionnaire implies the local inhabitants asking for more convenient public transport; more quality and quantity of public space and facilities.

The local pedestrian commerce is quite potential for evolution.
The ambition is create a new complex center with plenty of high rise along another side of green belt. The green linkage between this new district and old center would be nice.
Land use and roads

Programmes

- Park
- Residence
- Complex
- Transit
- Education
- Commerce
- Reconstructed
- Public facility
- Main road
- District road
- Neighbor road
- MRT line
- Preserved railway

- Dwelling
- Complex
- Transit
- Education
- Commerce
- Art center
- Parking
- MRT line
- Preserved railway
Preserved railway

MRT line

Preserved storage

height less than 30 M

height less than 50 M

height more than 50 M
In the past, the narrow roads between buildings in the informal settlement and some other downgrade communities were hardly used for both pedestrian activities and vehicle moving. On this urban composition of neighborhood scale, the chosen strategy is raising the capacity of each residential building and enlarging the urban public space for more urban life. As compensation, every removed family will get an apartment which still located in the original site. People who were living there will get a new urban life afterwards in the same place however could also continue their previous daily custom in terms of the urban context would be respected and preserved in some depth.
The most improved quality which I want to emphasize includes two things, one is the increased FAR which means more economic and commercial activities would happen in this place and another is the new parks which also has kind of link to the old green belt. The high-rise behind green is the general impression what I conceived for this site, particularly from the point you standing in the south bank of the river and in the light rail as well. High quality of public space and some global attractions such as the renovated old storages and stations as new art center will help this centrality grow rapidly as an extending part of the old center.
Impression of Rail Park and MRT station
impression of new high-rise and reconstructed part
8.2 RECONSTRUCTION OF MAINSTATION FORECOURT

The existing situation
Creating a permeable MRT station to make the forecourt of main station also takes the responsibility assistant natural movement more efficient. The major task in this stage is clarify the various circulation including bus, taxi, private cars and pedestrian.
The challenge in this step of urban design approach is to solve some problem about accessibility. For the reason of some Chinese policy, the building of train station is actually not a completely public building. People cannot go in or out at any time as they wish. So that an idea of creating kind of crossing bridge above the platforms comes out. In the meantime, combining other urban functions such as MRT stations, passing-by commercial spots and Park& Ride, the most important building across the railways and vertical intersect with the main train station emerges. Another quite important issue for reorganizing the circulation of the square in front of the train station is adopted the solution for making the usage of the roads around the two blocks on both side of the forecourt.
Impression of the new forecourt
8.3 STREETS & SECTIONS

- River Bank
- MRT Station & Rail Park
- Parking
- Parking
- Parking
- Parking
- Parking
There are several issues to be solved on this main road, Shengli Road. Barrier lying in the middle obstruct the pedestrian walking across. No enough parking space thus, private parking cars occupy the pavement and the space in front of the stores.

Existing situation
This scheme is a public transportation domain way, 4 car lanes and 2 BRT lanes in total. The width of pavement is 12 meters and sometimes be shorten to make space for parking.
MRT station & renovated Rail Park

Renovated Rail Park  Car parking  Regional bus station  MRT station
Whether I achieve the goal which I set before in the chapter 6, to enlarge the engine of urban economy, making the hot commercial district expand more and work more efficiently for pedestrian activities is what the most crucial thing I should assess. From the point of view of spatial organization that the identified circles which I tackle in the urban design procedure, in the images left below almost got their brand new characters. Furthermore, inside each bubble, the walking environment is quite good and all bubbles which I deal with are all somehow connected both on foot and in terms of public transport. Nevertheless another thing should be check is that if the natural movement could fill in most of new designed urban space? For completing this task I choose the tool of space syntax again to make several comparisons with how the natural movement looks like before and after design.
9.1 VISUAL SPATIAL ASSESSMENT ON SITE SCALE

Visual integration [HH], R=n

**Beforewards**

The high integrated intersection of roads has already used for building some frequently used public facilities particularly like the MRT stations. After adding lower scale road inside the site, we could apparently be indicated that more high visual integrated nodes coming out.

**Afterwards**
This agent simulation image showing the probability of how people's natural movement is could imply the great success of the vitality of new created public space and high integrated main road. What I want enhance is the linkage of the park, the diagonal main road and the crossing passage for connecting two squares beside the main station.
Some same conclusion with the previous one could be got at this step. The intersection of the renovated rail park and the diagonal main roads become quite high attracted. The impact what I did not anticipate but really encouraged is the effect for increasing the vitality of some old public space.
All line analysis

Beforewards

In the comparison of all line analysis, some expected result doesn’t come out in fact. The possible reason in my opinion is the much higher integrated level of the main road Shengli Road comparing with others, so that the other space shows not so red color. Nevertheless I suppose a good result could be seen on a higher level of axial analysis.

Afterwards
9.2 AXIAL ANALYSIS ASSESSMENT, URBAN CONFIGURATION EVALUATION FOR NATURAL MOVEMENT

9.2.1 Metric Total Length, Urban Vitality

Metric Total Length R=300, before regeneration

Metric Total Length R=300, after regeneration
Comparison of urban hot area shifting from old center towards east, and the old station area become more popular.
9.2.2 Metric Choice, hot streets chosen by locals
Comparison of natural movement of local people
old station area will be used more frequently especially the new rail park
the new add link bestriding the station platform is also highlight

Metric Choice R=1500, before regeneration

Metric Choice R=1500, after regeneration
9.2.3 Topological Choice, hot streets chosen by outcomers
Comparison of natural movement of outcomers
the new main road crossing the old station area is pretty hot, it is suitable for locating some complex highrise to situate financial service and big commerce
9.3 STAKEHOLDERS & PARTNERSHIP

Stakeholders

- Bureau of Urban Planning
- Bureau of Water Management
- Bureau of Housing Management
- Bureau of Land Management
- Bureau of Parks
- Ministry of Railway
- MRT Company
- Bus Company
- Real Estate investors
- Art industrial investors
- Catering industrial investors
- Logistic Companies
- Travel Companies
- Mega Markets investors

Projects

- Reconstruction of Main Station & forecourt
- New commercial buildings around station
- New MRT stations
- MRT tracks
- New park along north bank
- Renovation of the preserved railway park
- Renovation the old station as a art center
- New high-rise complex
- New social housing as compensation
- New Parking buildings
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