

Research on Reconstruction and Simulation of Rail Traffic in an Ancient Township through 3D Animation

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Abstract: - The Japanese were dedicated to building Huwei into a new industrial city after the Japan Sugar Refining Corp. was established in Huwei Township, Yunlin County during the Japanese Occupation. Since then, Huwei has been called the "Sugar Capital". The development of Huwei Sugar Refinery directly influenced spatial development in Huwei. Currently, the township structure is facing many changes due to the construction of the Central Taiwan Science Park (CTSP), Huwei Park, and the future opening of the Taiwan High Speed Railway and Yunlin Station in 2010. Insufficient traffic functions and road capacity will impede local development. This study used aerial photos of the Huwei area as base maps, designed 3D train animation running along Huwei Sugar Refinery rail lines, and produced 3D designs of abandoned areas near the refinery and riverbank bicycle paths with ASP.NET. Rail transport in Huwei can increase traffic capacity and promote the developments in industry.

Key-Words: - reconstruction of an ancient township, rail service, aerial photos, 3D animation simulation, Flash, ASP.NET

1 Introduction

The Taiwan Sugar Railways radiate outward, with the center at the sugar refinery for the convenience of transportation, it also connects with state-operated railways for transfers. During the prime era of granulated sugar production, there were vast sugarcane fields in Taiwan, and the 3,000km long sugar railways were constructed by year 1938. Various locomotives (30 feet gauge) ran along these railway lines with one third of the cars carrying passengers. The passenger service lines were connected with 21 Taiwan Railway lines, which passed through areas of dense population and abundant resources. The lines made significant contributions to local development (Chen, 2008).

Taiwan Sugar Railways, operated by the Taiwan Sugar Corp. were light gauge railways, 762mm gauge (Su, 2002), and simply called Sugar Railways, or the sugarcane train, which were constructed to haul sugarcane, but were also capable of providing limited passenger service. The Sugar Railways were one of the most important traffic lines in Taiwan. After the war, the Taiwan Sugar Corp. took over all the sugar refineries. In 1950, the Taiwan Sugar Corp. built the Taiwan Sugar South-North Preparation Line for war preparedness, running north from the provincial railway (now known as the Taiwan Railway Administration) and Taichung Station, and

south to the Pingtung Sugar Railway Tielizi Inner Station in the Chianchen District, Kaohsiung City, with a full length of 274.2 km. The trains on the Sugar Railways lines ran from the Taichung Sugar Refinery to Pingtung County Tunggang Refinery (the name was changed to the Nanchou Sugar Refinery in June 1957), and these lines were called the Taiwan West Second Railway. During the war, the lines assisted provincial railways in military transportation, and at other times the lines played an important role by providing transportation of sugar equipment, raw sugarcane, granulated sugar, bagasse, fertilizer, and sugar cane seedlings. In the decade after 1945, the sugar transported by the Sugar Railways had to be carried to a trunk line first, and then to Kaohsiung before 1953. This problem was solved after the South-North Line was opened, in fact, the western refineries were connected by this line, which made a great contribution to sugar manufacturing, local transportation, and a rural economy boom. This period was the sugar industry's peak and it promoted Taiwan's economic development. In 1984, Taiwan's sugar exports decreased and were replaced by overseas sugar imports, thus it became a sunset industry and many refineries were closed, the trains stop running. Most of lines went out of service and were removed. In recent years, some lines have resumed operation to cater to tourism.

Huwei Township is located in central Yunlin County, during the Japanese Occupation Period, Taiwan's Governor General implemented a policy to launch new sugar refineries, and hence the Japan Sugar Refining Corp. founded the Taiwan Branch of the Wujiancu Sugar Refinery in 1906. The sugar output of the Taiwan Branch of the Wujiancu Sugar Refinery reached its peak in 1907, and has been reputed as the "Sugar Capital" since then. The service station for the sugar refineries was named Wujiancu Station in its earliest time, and was changed to the Huwei Station in 1920. These were the most important transportation lines, and they ran from the city center of Huwei. The Japanese were dedicated to building Huwei into a new industrial city, and the development of the Huwei Sugar Refinery directly influenced space development in Huwei. Concerns regarding historical space development considered that, the old street blocks of the township have high density of occupation and the traffic roads are narrow and disordered. The construction of CTSP Huwei Park in 2003 (Yunlin County Government, 2003) and road traffic requiring links after the completion of the HSR Yunlin Station will cause traffic congestion, and thus hinder transportation and city development. Furthermore, inner factory areas of the Huwei Sugar Refinery are out of operation (e.g. alcohol factory) and the buildings on the riverbanks surrounding the refinery, such as Tongxin Park and lodging houses have become dilapidated over time, creating issues in public order management and public safety concerns of the nearby residents.

1.1 Research motives and purposes

Crude oil prices have increased dramatically in recent years, Taiwan's crude oil import amounts fell 0.9% in 2007. Oil price increases to service stations (CPC, 2008) are shown in Table 1.1. Many countries promote energy conservation to face increasing oil prices and consider effects of climate change and greenhouse gases. According to the Ministry of Economic Affairs, R.O.C. (MOEA), promotion of oil conservation can relieve the influences of price increases on the public's livelihood. Therefore, MOEA actively encourages and promotes the public's use of public transportation (MOEA, 2007). Provincial energy-conservation and low-pollution methods of transportation are promoted to improve township environmental quality, and the Sugar Railway Rapid Transit planning will improve Huwei's public transportation system and regional development.

Huwei is located in central Yunlin County.

CTSP are still under construction. Huwei became a long-distance traffic artery after the Taiwan High Speed Railway was opened 5 January, 2007. The HSR, Yunlin Station (Taiwan High Speed Railway, 2008) will open in 2010, which will bring new opportunities for science and technology development in Huwei.

Table 1.1 Gasoline price

Unit: NTD

| Price Adjustment Bulletin Date | Lead-free Gasoline 92 | Lead-free Gasoline 95 | Lead-free Gasoline 98 | Super/High Qualified Diesel Oil |
|--------------------------------|-----------------------|-----------------------|-----------------------|---------------------------------|
| April 17, 2008 | 30.0 | 30.7 | 32.7 | 27.5 |
| April 17, 2007 | 26.8 | 27.5 | 29.0 | 24.0 |
| ∖ | ∖ | ∖ | ∖ | ∖ |
| April 17, 2000 | 17.6 | 18.6 | 19.6 | 13.8 |

Source: CPC Oil Marketing Dept., April 2008

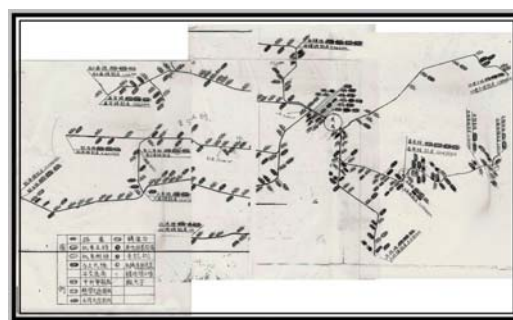


Figure 1.1 Old Railways Lines (Taiwan Sugar Corp. General Administration Dept., Mar. 1, 2007)

According to an interview with the General Office of the Taiwan Sugar Corp., the Huwei Sugar Factory Railways trains remain useful lines of future plans, (see Figure 1.1), with access to Siluo, Lunbei, and Shalun in the north, to Douliu and Chuwei in the east, extending to Dounan and Dalin in the south, and to Beigang, Wengang, and Longhai in the west. At present, only the Huwei-Magongcu line still undertakes the transportation of raw materials, other lines are out of service, however, the rail tracks remain intact for use with the Huwei-HSR Yunlin Station, which will be reconstructed in the future. A local rapid transit system will be constructed, based on old railways lines, and will embrace the original landscape of Yunlin County. This planning solves local issues in traffic capacity and maintains the historical Japanese style buildings, which attracts tourism.

At present, the Taiwan Sugar Corp. Huwei Railway is the single existing line for transportation of raw materials and therefore, is very valuable in the aspects of transportation and culture. Currently, the inner factory areas of the Huwei Sugar Refinery are out of operation, which causing Tunghsin Park and the lodging houses along the riverbank surrounding the refinery to become dilapidated with time. These areas have become problematic regarding public order management and have raised issues of safety concerns from nearby residents. These issues should be solved as soon as possible.

Take the Taiwan Sugar Corp. Wushulin Sugar Factory as an example, the Wushulin Tourism Plaza is located in Houbi Township, of Tainan County and was reconstructed from the Tainan Hsinying Sugar Refinery in 1910. Wushulin Station belonged to the Wushulin Sugar Refinery, and shared sugarcane transport exchanges from Baihe and Tungshan to Hsinying. Wushulin sugarcane trains carrying passengers went out of service in 1979. In 2001, the sugarcane trains were renovated into trains for short distance tourism trips (Wushulin Tourism Plaza, 2008), which brought new life to the sugarcane trains.

It is hoped that HSR Yunlin Station can be linked with Huwei Township and the sugarcane trains will be employed as transportation vehicles through our research, which will assist in solving traffic issues and encourage economical development. This beautiful and vigorous township will be revived within the plans for the factory areas. The riverbank surrounding the Taiwan Sugar Corp. can be converted into a park with bicycle paths for residents and tourists to exercise, engage in sports, or simply enjoy the beautiful scenery. The nearby Tunghsin Park and old factory dormitory can be rebuilt into commercial areas able to revive the area that can be governed by public security departments. This commercial area, together with a bicycle path will have potentially great opportunities in the future. It is necessary to guide the Taiwan Sugar Railways for re-positioning of its functions. The recovery of the Sugar Railways can facilitate township traffic and bring economic upswings to Huwei, and may also improve Taiwan's economic development. It is expected that Huwei Township can turn over a new leaf in development through the previously mentioned plans.

2. Research Method

2.1 5W1H Question Thinking Method

The 5W1H theory is applied in this research, which procedures are: find a fact -> find a problem -> find an idea -> find a solution-> prove.

Couger, et al. (1993) proposed the 5W1H method (Who, What, Where, Why, When, and How, six views to think over problems) to inspire planners. See table 2.1 for 5W1H details.

Table 2.1 5W1H Method

| 5W1H | Thinking direction and contents |
|-------|---|
| Why | Why do this at this time? Why do it in this place? Determine core problem? |
| Who | Who is involved? |
| What | What should we do ? What are the required conditions to solve the problem? |
| Where | where to use? Where is the key to solving these problems? |
| When | when to use? When did these problems happen, the period or any time limits? |
| How | How to do and plan? |

1. Why: why do this at this time? Why do it in this place? Determine core problems?

The Kyoto Protocol of the United Nations Framework Convention on Climate Change was adopted in Kyoto, Japan in December 1997, its objective is to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate systems." The greenhouse gases includes carbon dioxide (CO₂), ozone (O₃), methane (CH₄), nitrogen monoxide (also called laughing gas, N₂O), chlorofluorocarbon (CFCs), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), chloro-fluoro-hydrocar (HCFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), etc., and among others, the carbon dioxide produced by fossil fuels burnt by humans. In recent years, the rapid rise of global warming is the result of human activities that increase the concentration of greenhouse gases. The greenhouse effects are more serious when compared with the past, this abnormal situation is described as global warming . Since the industrial revolution, the burning of fossil fuels has increased, which produce more carbon dioxide, 30% in the last ten years. Global warming is caused by increasing greenhouse gases that enhance greenhouse effects. Every country in the world has arrived at a common understanding, global warming is caused by greenhouse effects. The Kyoto Protocol was promoted by the UN to reduce greenhouse gas emissions and has been ratified by many countries.

The Directorate General of Budget, Accounting,

and Statistics, Executive Yuan has issued annual increase rates of consumer pricing from 1998 to 2007 (Ministry of Economic Affairs, 2008). Consumer price fluctuations are shown in Table 2.2. The price increases in oil and life goods have deep influence on the public's livelihood.

Table 2.2 Consumer Price Fluctuations

Unit: %

| Recent 10 years | Annual increase rate of consumer |
|-----------------|----------------------------------|
| 1998 | 1.67 |
| 1999 | 0.18 |
| 2000 | 1.25 |
| 2001 | -0.01 |
| 2002 | -0.20 |
| 2003 | -0.28 |
| 2004 | 1.62 |
| 2005 | 2.31 |
| 2006 | 0.59 |
| 2007 | 1.80 |

Source: Directorate General of Budget, Accounting and Statistics, Executive Yuan "Price Statistics", 2008

Currently, the Taiwan Sugar Corp. is planning a recreation and leisure industry for the area, including the Wushulin Tourism Plaza, the Kaohsiung Tourism Floral Park, and the Sihua Floral Cultural Park, in addition, many old factory areas have been converted into resorts, shopping centers, and hotels. Therefore the reconstruction plan for the deserted buildings of the Huwei Sugar Refinery are proposed in this research.

CTSP Huwei Base development promotes population growth and improved traffic flows. The blocks of street in this township are narrow and have dense populations. The removal of homes for widening roads will have great impact on the public's livelihood, and acquiring land is difficult and very expensive.

Mass transit vehicles can provide convenient and comfortable services and improve township traffic, which brings the new life to the township's development.

2. Who: who is most involved in the problem?

Family numbers, registered permanent resident numbers, and population density of Yunlin County are shown in Table 2.3. In 2000, the population was 68742 and density was 983.66 persons/km² in Huwei township; in 2006, the population was 68979 and density was 1003.45 persons/km² in Huwei township; in 2007, the population was 69437 in Huwei

Township (Yunlin County, Civil Administration Department, 2008), and the density was higher. According to the "Disposable Family Incomes" of Yunlin County government information (see Table 2.4 disposable family income in Yunlin County), the family income continued to steadily increase, however, disposable family income has reduced each year and consumer prices have increased. The high price of oil increases burdens on the people. Mass transit vehicles in Huwei, which will pass through the CTSP Huwei Base and the HSR Yunlin Station, will facilitate traffic, save energy, and reduce air pollution.

Table 2.3 Disposable Family Incomes in Yunlin County

| Year | 2001 | 2002 | 2003 | 2004 | 2005 |
|------|---------|---------|---------|---------|---------|
| Yuan | 732,284 | 688,011 | 673,606 | 703,806 | 648,685 |

Source: Yunlin County Government—Yunlin County Statistics Compendium, No. 56 (Sept. 2006)

Table 2.4 Number of families, registered permanent residents, and population density

| Year | Families | Registered Permanent Residents | Population density (persons/km ²) |
|------|----------|--------------------------------|---|
| 1997 | 191,376 | 751,913 | 582.50 |
| 1998 | 194,350 | 748,995 | 580.24 |
| 1999 | 196,518 | 746,241 | 578.11 |
| 2000 | 200,473 | 743,368 | 575.88 |
| 2001 | 203,751 | 743,562 | 576.03 |
| 2002 | 205,823 | 742,797 | 575.44 |
| 2003 | 207,921 | 740,501 | 573.66 |
| 2004 | 210,843 | 736,772 | 570.77 |
| 2005 | 213,216 | 733,330 | 568.11 |
| 2006 | 215,893 | 728,490 | 564.36 |

Source: Yunlin County Civil Administration Department, 2008

The reconstruction plan for the Huwei Sugar Refinery provides good leisure areas for nearby residents and tourists. It offers a new image for the Huwei Sugar Refinery, which will allow the area to become more competitive in meeting modern challenges and improve the development of Taiwan's sugar industry. The people from Southern and Northern Taiwan passing through Huwei, local residents, businessmen and tourists are the potential clients.

3. What: what to do to achieve the end results? What are the necessary conditions to solve these problems?

The reconstruction of the Sugar Railways should include the current surroundings and past data

of Yunlin, Huwei, and the Taiwan Sugar Corp., the Huwei Sugar Refinery, and original line maps of the Sugar Railways. Do these original line maps of the Sugar Railways still exist? Fieldwork should be carried out on the current situation of the Sugar Railways.

4. Where: where to use? Where is the key to solving these problems?

The Huwei Taiwan Sugar Railway, the factory areas, and old dormitories of the Taiwan Sugar Corp. and the surrounding lands are included in the plan. The old railways, abandoned by the Taiwan Sugar Corp., will be recovered as mass transit and facilitate transportation of traffic to the HSR Yunlin Station.

This recovery area will include both the Huwei Stop Station of Taiwan High Speed Railway and CTSP Huwei Base.

The urban district in Huwei, the Huwei Sugar Railways, factory areas, old dormitories, and areas of unplanned land are included in the combination of tourism lines; the sites should be taken into account.

The convenience and punctuality of trains can shorten travel time and improve the quality of life in the area.

5. When: when to use? When did these problems happen, the period or any time limits?

Now is the best time to propose this plan due to the opening of the Taiwan High Speed Railway and Huwei Stop Station, as well as the launching of the CTSP Huwei Base project, which will promote more enterprises and people entering into business in Huwei Township. This plan can solve rush hour traffic jams. Huwei is the birthplace of the Glove Puppet Show, and performances in Cultural and Ghost Festivals every year will cause traffic congestion, this plan can solve these problems.

6. How: how to proceed and plan?

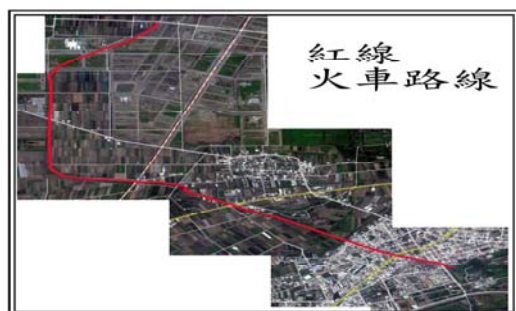


Figure 2.1 Railways lines

The simulation of Hawaiian Rapid Railway passing CTSP is designed in consideration of bicycle paths and new commercial circles. Literature reviews, fieldwork, and the Tang Railways Passengers Service line were used for our simulation. The red lines, in Figure 2.1, represent railway lines. 2D/3D software is applied to simulate dynamic driving images, which can be created in small sets of trains and railways. The parts are then put together to present virtual township images.

2.3 Fieldwork and literature analysis

The use of interviews, field observations, questionnaire surveys, literature analysis, and file surveys are adopted to implement literature collection and the observation of Sugar Railways in this research.

- (1) Interview methods: information and literature can be obtained through interviews of the Legislators' Service Office, Yunlin County Government, Huwei Township Office, and the Taiwan Sugar Corp. Huwei Factory.
- (2) Field observations: survey the sugar railways and the geographical conditions of the surrounding environment of the sugar refinery.
- (3) Questionnaire methods: implement questionnaires during interviews.
- (4) Literature analysis: compare the collected data with internet data to analysis, and further discuss, the development of the Sugar Railways Rapid Transit and planning for abandoned areas near the Sugar Refinery, then reconstructed into 3D leisure areas including the possibility of converting the river banks into bicycle paths.

The redevelopment of Huwei will benefit the local people and surrounding areas. This website provides many services for the public in conjunction with other websites including, Yunlin County Government, Huwei Township Offices, and international information websites where the public can find the desired information:

- (1) Yunlin Station schedule
- (2) Sugarcane trains schedule
- (3) Relevant activities in Huwei
- (4) Information including; geographic conditions, leisure activities, cultural, and folk customs.
- (5) Huwei government decrees

2.4 Webpage technology

It is hoped that the simulation of 2D/3D Sugar Railways can realize the networking of Huwei Township to benefit the local people and provide

tourism and leisure websites for tourists. Air photos, 3D-MAX, FLASH, and ASP.NET are applied in this website to enhance its reality.

(1) Air photos

In this research, 1/5000 air photos, from Geoforce Technology Co., Ltd., were employed as Flash base maps, 3D suites were used for these photo to create sugarcane animation because air photos reflect the reality of geographic information.

(2) 3D-MAX

In order to vividly display landmarks and buildings when setting up the ASP.NET system, 3D-MAX where used to set the suites, which imitate real scenes through the application of lighting coefficients and material characteristics, etc. 3D-MAX can set many 3D suites, for example, sugarcane trains (see Figure 2.2(a)3D train, (b)3D rail tracks), buildings, and bicycle paths, then the suites were combined with FLASH to display stereoscopic visions of animation. The users can enter into a realistic picture to enjoy Huwei scenes when viewing websites based on ASP.NET.

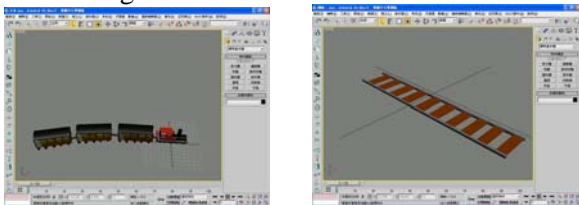


Figure 2.2 (a) 3D train, (b) 3D rail track

(3) FLASH

The volume of objects created by FLASH is smaller, they are suitable for internet media transmissions, and many animations on websites are made through Flash. The reuse of sugarcane trains is emphasized in ASP.NET websites, it is hoped that mass transit and tourism lines as well as transportation development can be combined with the sugarcane trains. The operation interface was designed through Action Script with interactive animation. The viewer can see clear sugarcane train lines, stations, prices, nearby sightseeing locations, and dynamic images of moving trains on the website.

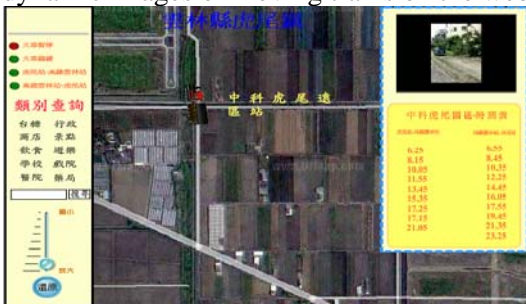


Figure 2.3 Flash animation - Taiwan Sugar trains



Figure 2.4 Flash animation-dot positions of key landmarks

The base map and air photos are combined to display positions and introductions of important sightseeing locations, shops, and administrative departments on the ASP.NET website (see Figure 2.3, Figure 2.4).

(4) ASP.NET



Figure 2.5 ASP.NET-Design

The website was built through ASP.NET. ASP.NET is free software able to reduce development costs. It is an ideal choice for dynamic websites with integrated visualization environments, easy debugging options, and offers more add-on components. Its greatest advantage is its support of many programming languages making it very convenient for programmers, which saves development time and costs (see Figure 2.5).

2.5 Creating and controlling technology

(1) 3D MAX:

The simulations of 3D Sugar Railways trains, 3D Tunghsin Park, 3D riverbank and dormitories are implemented in this research. The creation procedures of the 3D Sugar Railways are as follows: selected suite Box, drawn to shape of appropriate length and width, using right button, to create locomotive, then selection of a cylinder, drawn to shape of appropriate size, then dragged to the relative location with right button to create compartment top, then compress Y axis to cause the cylinder to change to oblong shape, then use right button to select rotation, rotate 90 degrees to form the basic locomotive model; create another cylinder, use right

button to draw its shape to appropriate size, then use the right button to create a chimney (see Figure 2.6a); create a cuboid to create the compartment. Create cylinder and select color, rotate it 90 degrees using the right button, shape to required size for creating tires, then select right button clone->copy to copy several times. As for the railings on the both sides of the train, Change Standard Primitives to ACE Extended, select Railings and draw to appropriate shape and size using the right button, then select red color, and then press right button to Move the railing to an appropriate position, press right button Clone, to display clone options, select Copy and pressed right button Move, to move it to appropriate position. Create cuboid box to create door and windows, then select clone->copy, and press right button Move, to move to the opposite side (see Figure 2.6b), Huwei Sugar trains (see Figure 2.6c). The round top of the compartment was created with a cylinder, select Scale to compress axis with right button, then change the cylinder to oblong.

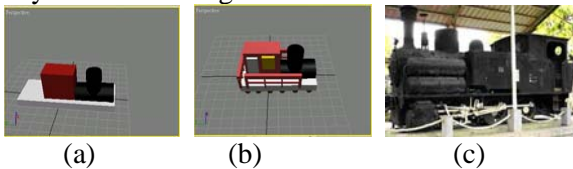


Figure 2.6(a) locomotive basic model, (b) Railings, doors, and windows, (c) Huwei sugar trains

(2) Train Driving Technology in Flash

The setting process is displayed by a serial connection of frames to form the animation of a train driving along the tracks in FLASH. A 3D train was fixed on a dot of frames, the track was produced by drawing images, for example, the train runs on the left line, the position of the train is fixed, the map is drawn with easy-to-use drawing methods to the right side, the position of the train, using coordinates fixed on the map are moved from the original side to the left side. This method of serial connection of frames is applied for each serial connection of frames to form the animation of a moving train, shown as Figure 2.7.

Huwei Station -> HSR Yunlin Station as an example, the procedures (video play) for the moving train are controlled as follows:

```
on (release){
//press mouse left button, the action begins.
_root.photo_mc.gotoAndStop(48);
//the final frame number is 48
_root.photo_mc.video_mc.play();
//Video is playing
_root.map_mc.gotoAndPlay(2);
// start frame number is 2
}
```

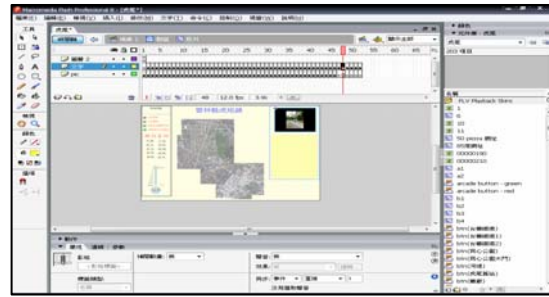


Figure 2.7 FLASH video play making

Train stop instructions:

```
on (release) {
// press mouse left button, the action begins
_root.map_mc.stop();
//image stops
_root.photo_mc.video_mc.stop();
//video playing stops
}
```

Instructions for the schedule display when the train arrives at the station: When the train pulls into the station frame, the numbered control is written down. For example, Xianshili station frame's number was 15, the frame was then judged whether it equaled to 15, the schedule in the right region would display when the frame equaled to 15, see Figure 2.8.

```
_root.time_mc.gotoAndStop(2);
//when the train is driving on the specific line, the
schedule would display on the second frame.
```

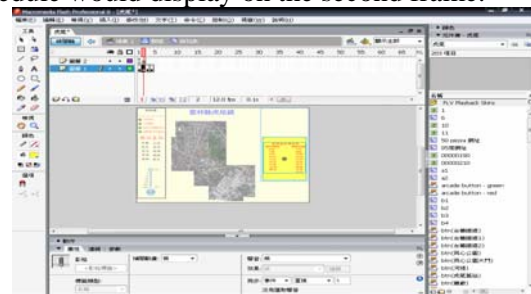


Figure 2.8 Schedule in Flash

Grammar of map zooms:

A control box set on the left in Flash can enlarge and reduce map size, programming instructions are written in this section for control. The instructions are as follows:

```
Map enlargement technology
onClipEvent (load) {
// notice of initial state after fragment loading
top = _y;
bottom = _y+150;
//Y coordinate added with 150 distances
left = _x;
```

```

right = _x;
}
onClipEvent(enterFrame)
{
_root.map_mc._xscale = this._y + 20;
// map size is y coordinate+20
_root.map_mc._yscale = this._y + 20;
}

```

Instructions for map zoom recovery:

```

on(release){
_root.map_mc._x=old_x;
//current X coordinate equals to previous X
coordinate
_root.map_mc._y=old_y;
//current Y coordinate equals to previous Y
coordinate
scale_btn.knob._y=0;
}

```

Query instructions:

The query function is set in the left tools list, the query items are classified by category (e.g.: dinning, hospital, etc.), the class can be enlarged by clicking the mouse left button, then the position point of the class is displayed clearly, or the upper slipping number of the point can be clicked by left button, and the right tools list would show relevant picture and introduction.

```

on(release){
if (aa%2==0){
_root.map_mc.surgar._xscale+=200;
// surgar's X coordinate is enlarged by 200
_root.map_mc.surgar._yscale+=200;
//surgar Y coordinate is enlarged by 200
_root.map_mc.surgar1._xscale+=200;
// surgar1's X coordinate is enlarged by 200
_root.map_mc.surgar1._yscale+=200;
// surgar1's Y coordinate is enlarged by 200
_root.map_mc.surgar2._xscale+=200;
_root.map_mc.surgar2._yscale+=200;
_root.map_mc.surgar3._xscale+=200;
_root.map_mc.surgar3._yscale+=200;
_root.map_mc.surgar4._xscale+=200;
_root.map_mc.surgar4._yscale+=200;
_root.map_mc.surgar5._xscale+=200;
_root.map_mc.surgar5._yscale+=200;
_root.map_mc.surgar6._xscale+=200;
_root.map_mc.surgar6._yscale+=200;
_root.map_mc.surgar7._xscale+=200;
_root.map_mc.surgar7._yscale+=200;
_root.map_mc.surgar8._xscale+=200;
_root.map_mc.surgar8._yscale+=200;
aa=aa+1;
}else{

```

```

_root.map_mc.surgar._xscale-=200;
// surgar's X coordinate is reduced by 200
_root.map_mc.surgar._yscale-=200;
// surgar's Y coordinate is reduced by 200
_root.map_mc.surgar1._xscale-=200;
// surgar1's X coordinate is reduced by 200
_root.map_mc.surgar1._yscale-=200;
// surgar1's Y coordinate is reduced by 200
_root.map_mc.surgar2._xscale-=200;
_root.map_mc.surgar2._yscale-=200;
_root.map_mc.surgar3._xscale-=200;
_root.map_mc.surgar3._yscale-=200;
_root.map_mc.surgar4._xscale-=200;
_root.map_mc.surgar4._yscale-=200;
_root.map_mc.surgar5._xscale-=200;
_root.map_mc.surgar5._yscale-=200;
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_root.map_mc.surgar6._yscale-=200;
_root.map_mc.surgar7._xscale-=200;
_root.map_mc.surgar7._yscale-=200;
_root.map_mc.surgar8._xscale-=200;
_root.map_mc.surgar8._yscale-=200;
aa=aa+1;
}

```

Super link instructions:

Any point on the map can be clicked with the mouse left button, the correct tools list will display relevant information, such as, picture, shop name, and telephone. The picture is clicked with mouse left button to link with the shop's website. For any further information, the picture can be directly used as a link, which saves search time. The instructions are as follows:

```

on(press){
getURL("http://website address", blank);
//enter link address
}

```

(3) ASP.NET:

Main page frame:

configure /insert form, select and click template, then select inner page frame, see Figure 2.9.

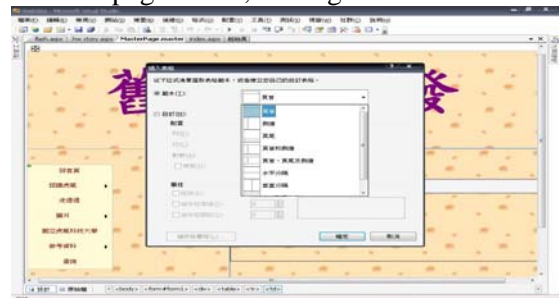


Figure 2.9 Main page frame

Menu:

Toolbox/View/Menu, drag Ment control out, click the small triangles to implement, select menu-> edit to enter guide item, click automatic format to select inner style, see Figure 2.10.

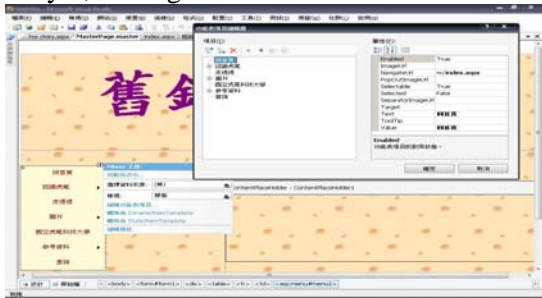


Figure 2.10 Menu

(4) Flash is connected with ASP.NET (see Figure 2.11), a button was added and the following instructions are written after the button.:

```
<a href="hu flash.swf"
//flash file name
.....
//style grammar
target="_blank">Huwei.swf</a><br />
// characters on the page
```

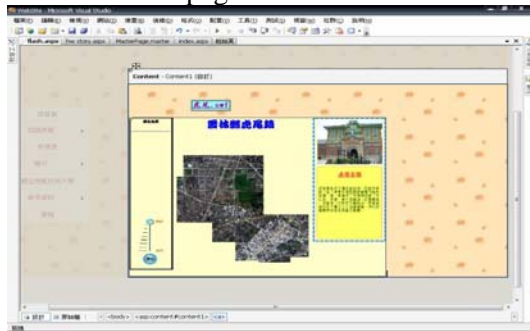


Figure 2.11 ASP.NET connected with Flash

3. Results

3.1 Reuse of sugarcane trains:

The railway line for sugarcane trains runs from the HSR Yunlin Station to the Huwei Sugar Refinery, they are transport vehicles from HSR Yunlin Station to Huwei. Visitors can travel by High Speed Railway train and transfer to a sugarcane train to get to Huwei, saving more travel time when compared to buses or bikes.

The distance from the HSR Yunlin Station to the Huwei Sugar Refinery is approximately 7.5km and the stops are shown in Table 4.1. When the estimated train speed is 30km/h, with only one sugarcane train running on each line, the traveling time from Huwei Sugar Refinery Huwei Station to Lianshili station is 5 minutes, the traveling time from Lianshili Station

to CTSP Huwei Park is about 8 minutes, and the time from CTSP Huwei Park to HSR Yunlin Station is about 3 minutes, together with the duration of the stop, about 45 minutes. At present, no schedule is available for HSR Yunlin Station because it has not been in service. The estimated schedule is shown in Table 4.1 and Table 3.2. In conjunction with HSR, this line will be more convenient for the public.

Table 3.1 Distances Between the Stop Stations from Huwei Station to HSR Yunlin Station

| Stations | Distance |
|--------------------------------------|----------|
| HSR Yunlin Station ->CTSP Huwei Park | 1.5km |
| CTSP Huwei Park->Lianshili Station | 3.5km |
| Lianshili Station ->Huwei Station | 2.5km |

(Surveyed by this study)

Table 3.2 Schedules from Huwei Station to HSR Yunlin Station

| Departure time | | -> | | Arrival time | |
|----------------|-------------------|-----------------|--------------------|--------------|--|
| Huwei Station | Lianshili Station | CTSP Huwei Park | HSR Yunlin Station | | |
| 5.50 | 6.05 | 6.25 | 6.35 | | |
| 7.40 | 7.55 | 8.15 | 8.25 | | |
| 9.30 | 9.45 | 10.05 | 10.15 | | |
| 11.20 | 11.35 | 11.55 | 12.05 | | |
| 13.10 | 13.25 | 13.45 | 13.55 | | |
| 15.00 | 15.15 | 15.35 | 15.45 | | |
| 16.50 | 17.05 | 17.25 | 17.35 | | |
| 18.40 | 18.55 | 19.15 | 19.25 | | |
| 20.30 | 20.45 | 21.05 | 21.15 | | |
| 22.20 | 22.35 | 22.55 | 23.05 | | |

(Planned by this study)

Table 3.3 Schedules from HSR Yunlin Station to Huwei Station

| Departure time | | -> | | Arrival time | |
|----------------|-------|-------|-------|--------------|--|
| | | | | | |
| 6.45 | 6.55 | 7.15 | 7.30 | | |
| 8.35 | 8.45 | 9.05 | 9.20 | | |
| 10.25 | 10.35 | 10.55 | 11.10 | | |
| 12.15 | 12.25 | 12.45 | 13.00 | | |
| 14.05 | 14.15 | 14.35 | 14.50 | | |
| 15.55 | 16.05 | 16.25 | 16.40 | | |
| 17.45 | 17.55 | 18.15 | 18.30 | | |
| 19.35 | 19.45 | 20.05 | 20.20 | | |
| 21.25 | 21.35 | 21.55 | 22.10 | | |
| 23.15 | 23.25 | 23.45 | 00.00 | | |

(Planned by this study)

3.2 Bicycle path on the riverbank

The riverbank is shown in Figure 3.1 (a), extending from Huwei Pinghe Bridge to Tuku Bridge, 5km long. The 3D river bank is shown in Figure 3.1(b).



Figure 3.1 (a) Current Riverbank (b) 3D Riverbank

3.3 Tunghsin Park

Tunghsin Park is adjacent to the Huwei Sugar Refinery. It was a leisure area for employees in the past. (Figure 3.2 (a) Current Tunghsin Park (b) 3D Tunghsin Park Design)

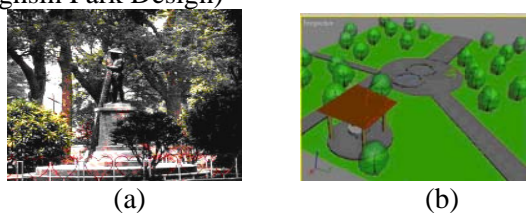


Figure 3.2 (a) Current Tunghsin Park (b) 3D Tunghsin Park Design

3.4 Dormitories

The sugar refinery and Tunghsin Park are not far from the future riverbank bicycle paths and the terminal station for sugarcane trains, therefore, this location will be converted into a commercial area. Visitors can come by sugarcane train to shop and see the local sights, and the cyclists can stop for a scenic rest (see Figure 3.3 (a) current dormitories and (b) 3D dormitory's design).

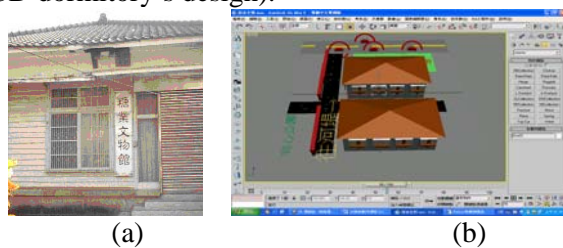


Figure 3.3 (a) Current dormitories (b) 3D Dormitory's Design

4. Conclusions

As leisure and recreational activities become more popular, mass transport railways are able to meet the demands of tourism, however, local transportation still requires improvement. The Sugar Railways Rapid Transit is important for local commuters as well as providing easy access for tourists. The comfort and beauty of rapid transit should be taken into account, as well as the humanistic care. Public arts, architectural design, historic site protection,

landscape planning, disabled-friendly facilities, cultural activities, and attention to interactive mechanisms for the public are included in this reconstruction research, allowing Huwei, and the surrounding areas and locals, to benefit.

4.1 Contribution

The objective of this research is to reconstruct an old township and built it into a new and vigorous one. Many abandoned resources can be employed, arranged, and integrated, which will bring new hope to Huwei, and contribute to its cyberization:

- (1) The Taiwan Sugar Railways should be recovered and maintained, extending from HSR Yunlin Station to the Huwei Sugar Refinery (National Formosa University), via CTSP Huwei Park and Lianshili. This can improve Huwei traffic and form a convenient transportation system, which will bring great business opportunities to the area.
- (2) The current existing farmlands should be fully developed to improve traffic and develop commercial area and push tourism. The reconstruction of Huwei and maintenance of its original landscapes should be simultaneously performed. The residential areas should be reconstructed to improve local quality of living. Furthermore, the development of CTSP will attract investment in the amount of 900 billion Yuan and provide 50,000 jobs. (Legislator Li-shan Chang's Service Office, Mar. 1, 2007). This will increase the number of residents, reduce local emigration, and attract the younger generations to return to their hometown. Yunlin center and Huwei's prosperity can be expected soon.
- (3) The bicycle paths will provide a scenic rest area for the local people and tourists alike.
- (4) Traditional cultural will continue to be passed down through the generations.

Cyberization has the following advantages:

- (1) More information is easily provided for residents
- (2) Websites providing services to the residents can link with other sites relevant to handle reconstruction affairs.

Considering high oil prices, and in response to sustainable development, the sugarcane trains can use alcohol-gasoline blends to save energy and meet environmental protection requirements.

4.2 Potential Issues and Solutions

- (1) Potential issues:

- I. Land acquisition: Whether the land can be acquired in the timeframe must be considered in the reconstruction plans of the sugar railway rapid transit network as it is a key factor, in addition to technology, economical efficiency, and financial evaluations.
- II. Construction of transit station: The future returns should be considered during the construction of the transit stations, these future returns reduce the expenditures.
- III. Increase the public's will-to-use : Attract more citizens to ride the sugar railways rapid transit by offering transport/transfer service of personal motorcycle to the area, provide automobiles for rent, and buses for group tours arriving by train, such ideas will increase the carrying capacity and realize sustainable business operations.
- IV. Communication: Beginning in the planning period, communication and interactions for the public should be implemented; in addition, public opinions should be included in planning. These efforts will reduce the concerns of local residents allowing them to support the reconstruction.
- (2) Solution:
- I. The road network plan should match with township plans, and both the transit areas and stations should be reserved to reduce land acquisition resistances.
- II. The lands nearby the stations should be surveyed, and only the lands with development potential should be selected. The future sugar railways rapid transit will bring more people and promote local development. The cost of transit construction can be saved by returns from land development.
- (3) The plans of various vehicles can be integrated by sugar railways rapid transit system facilities. Transfer facilities are provided in some important transit stations to increase carrying capacity, and this may also guide the transport vehicles to form an integrated transport network.
- (4) Communications with the public should be enhanced. The public's opinions can be collected through internet, speaking at conferences, forums, and public hearings during the planning period, and the revised planning results will be given back to the people to provide assurance.

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